EMISSIONS REDUCTION ASSURANCE COMMITTEE

Review of the Human-Induced Regeneration and Native Forest from Managed Regrowth methods

FINAL REPORT

March 2019

Contents

Abbreviations

ABS	Australian Bureau of Statistics
ACCU	Australian Carbon Credit Unit
Act	*Carbon Credits (Carbon Farming Initiative) Act 2011*
CEA	Carbon estimation area
CFI	Carbon Farming Initiative
CO_2-e	Carbon dioxide equivalent
Committee	Emissions Reduction Assurance Committee
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Department	Department of the Environment and Energy
ERF	Emissions Reduction Fund
FullCAM	Full Carbon Accounting Model
ha	Hectare
HIR method	*Carbon Credits (Carbon Farming Initiative) (Human-Induced Regeneration of a Permanent Even-Aged Native Forest—1.1) Methodology Determination 2013*
Mapping Guidelines	CFI Mapping Guidelines
Mapping Tool	CFI Mapping Tool
Minister	Minister for the Environment
National Accounts	National Greenhouse Gas Accounts
NFMR method	*Carbon Credits (Carbon Farming Initiative) (Native Forest from Managed Regrowth) Methodology Determination 2013*
NRM	Natural resource management
Regeneration methods	HIR and NFMR methods
Regulations	*Carbon Credits (Carbon Farming Initiative) Regulations 2011*
Regulator	Clean Energy Regulator
RMT	Reforestation Modelling Tool
Rule	*Carbon Credits (Carbon Farming Initiative) Rule 2015*
UNFCCC	United Nations Framework Convention on Climate Change

Executive summary

The Emissions Reduction Assurance Committee (the Committee) has reviewed two Emissions Reduction Fund (ERF) methods that provide opportunities for people to obtain carbon credits by changing the management of their land to regenerate native forest. The methods are the:

- *Carbon Credits (Carbon Farming Initiative) (Human-Induced Regeneration of a Permanent Even-Aged Native Forest—1.1) Methodology Determination 2013* (the HIR method)
- *Carbon Credits (Carbon Farming Initiative) (Native Forest from Managed Regrowth) Methodology Determination 2013* (the NFMR method).

The Committee has reviewed the two regeneration methods at the same time because, while there are some differences, there are enough similarities to warrant concurrent review. In particular, both methods are available for use on land that has no existing forest (as defined for the purpose of Australia's international climate change reporting obligations) due to previous clearing or suppression, but has native vegetation with potential to regenerate into a forest.

Both methods are also primarily designed for use on grazing lands in semi-arid regions. Consistent with this, most of the current HIR projects are located on grazing lands in rangeland areas of northwest New South Wales and southwest Queensland. A number of projects have recently been registered in Western Australia, also in rangeland regions, and there is a small number in South Australia. All current NFMR projects are in semi-arid areas in southwest Queensland.

There are substantial opportunities for low cost abatement through the regeneration and protection of native forest on grazing lands in semi-arid regions. The capture of these opportunities could play an important role in helping Australia to meet its 2030 target and Paris Agreement commitments at low cost. The traditional approach to the design of vegetation methods has involved reliance on field measurements to estimate abatement. The costs associated with undertaking these measurements can act as a significant barrier to participation. To address this, both methods use a fully model-based approach to the estimation of abatement, where biomass accumulation and abatement are calculated using the Australian Government's Full Carbon Accounting Model (FullCAM).

When first made in 2013, the HIR and NFMR methods were the first model-based carbon offset methods for regenerating native vegetation in the world. The approach was, and remains, highly innovative, and it has successfully incentivised the uptake of a large number of regeneration projects. As of February 2019, there were 258 HIR projects and 35 NFMR projects, representing 33 per cent and five per cent respectively of all projects registered under the ERF. These projects account for 48 per cent and two per cent respectively of the total emissions abatement contracted by the Government through the ERF.

While successful in many respects, the Committee identified a number of areas for improvement in the design of the methods. The three most significant issues identified by the Committee concerned the inclusion of land in carbon estimation areas (CEAs)—where project activities are undertaken—that:

- appears incapable of attaining forest cover in a timeframe consistent with model projections
- appears to lack the potential to attain forest cover, or
- already had forest cover when the project began.

The Committee found these issues could lead to some projects receiving credits for sequestration that has not yet occurred (forward-crediting) and, in the worst cases, may not occur over the life of the project (over-crediting).

The Clean Energy Regulator will soon issue guidelines to proponents that will mitigate the risks associated with these issues. Amongst other things, the guidelines will require proponents to provide information at five-yearly intervals to demonstrate land is regenerating and will attain forest cover. They will also clarify the procedures for the identification and removal of areas with pre-existing forest cover from CEAs.

To further mitigate the risk of forward- and/or over-crediting for areas where regeneration is slow, the *Carbon Credits (Carbon Farming Initiative) Rule 2015* (the Rule) has been amended to provide clarity around the timeframes within which land must attain forest cover. The amendments to the Rule—which apply to existing and new projects—restrict crediting where CEAs do not meet requirements for attaining forest cover within a prescribed period.

The Committee identified a further risk of forward- and/or over-crediting in relation to the treatment of pre-project abatement and emissions from planned fires under the NFMR method.

The NFMR method and FullCAM Guidelines allowed proponents to model levels of pre-project abatement that were inconsistent with the requirement that, at project commencement, eligible land must not already have forest cover. The issue arose because the method and FullCAM Guidelines did not specify a sufficient limit on the amount of pre-project modelling of regeneration permitted, nor did they expressly provide for the modelling of factors suppressing or slowing regeneration (like grazing).

The concerns related to planned fires stemmed from the fact NFMR projects could model the use of fire for managing regeneration in the default baseline without evidence such fires had occurred in the relevant CEAs. Where this has occurred, it will have lowered the baseline and, in doing so, could lead to over-crediting.

To address these issues, the NFMR FullCAM Guidelines have been amended to require all proponents to model suppressors in future offsets reports. For new projects, the FullCAM Guidelines also now limit the modelling of pre-project regeneration to 10 years and restrict the type and timing of fire events that can be modelled in the absence of evidence for the CEA.

The Committee is satisfied the amendments to the Rule and NFMR FullCAM Guidelines sufficiently mitigate the risk of forward- and/or over-crediting for new projects. On this basis, the Committee found the methods satisfy the offsets integrity standards.

In addition to these issues, the Committee found there are opportunities to reduce the complexity and transaction costs associated with the methods, and potentially to expand their scope. Addressing these issues will help ensure the opportunities for low cost abatement that are associated with the regeneration and protection of native forest in semi-arid regions can be realised.

The Committee recommends the methods be varied to enhance their integrity, promote greater consistency and encourage further uptake of projects. In the course of making these amendments, the Committee suggests additional consideration be given to the environmental and socio-economic outcomes of project activities.

The Committee stresses that, while a number of integrity issues were identified in the course of the review, the regeneration projects under the methods are in the relatively early stages of their permanence periods. While the Committee would like more land in projects to have already attained forest cover, regeneration of native forest in semi-arid regions is variable and, in certain circumstances, can take a considerable period of time.

Appropriate changes have been made to ensure projects attain forest cover and the modelled abatement reflects actual regeneration. This cycle of method improvement is necessary and normal.

The development of carbon offset methods is complex, requiring measures to be designed to manage multiple risk factors in the absence of perfect information. The degree of complexity and uncertainty means method design errors are, to some extent, unavoidable. The ERF's processes for the monitoring, review and amendment of methods were designed with this in mind.

Building on these processes, the Committee recommends further consideration be given to how the risks associated with method errors can be shared between the Government and proponents. There is a need for a risk sharing framework that strikes an appropriate balance between the need for flexibility to address method errors to maintain high integrity, while also providing proponents with sufficient certainty to invest in projects.

Findings and recommendations

The Committee's recommendations cover opportunities to enhance the integrity of the methods, ensure method requirements are unambiguous, improve ease of use and enable wider uptake. The Committee's views were informed by extensive and constructive consultation with stakeholders, including carbon service providers. In making these findings and recommendations, the Committee notes the regeneration projects are making, and are likely to continue to make, an important contribution towards Australia's climate change targets.

Compliance with the offsets integrity standards

Finding 1

The ERF regeneration methods, with amendments to the Rule and FullCAM Guidelines, comply with the offsets integrity standards. Both methods should be varied to enhance their integrity, promote greater consistency and encourage further uptake of projects.

Additionality

Finding 2

To ensure credits are issued only to projects that store additional carbon by regenerating vegetation, the HIR method requires that CEAs not have forest cover for 10 years before project registration. This is important to ensure the land would be unlikely to attain forest cover without a project, as it can be difficult to provide evidence of land management changes that support regeneration. However, 10 years may not be long enough to prevent the inclusion of land with vegetation that is slow growing and not necessarily suppressed, and hence there is a risk that credits could be issued for non-additional abatement.

Recommendation 1

The Government should vary the HIR method to strengthen the requirements for evidence demonstrating that projects will result in additional abatement. This may include extending the baseline period from 10 years to 15 years.

Finding 3

The general nature of the evidentiary requirements that support assessment of HIR project additionality, and the complexity involved in ensuring project activities are not already legally required, pose additionality risks. More clarity is needed to better inform proponents and simplify assessment by the Regulator.

Recommendation 2

The Government should clarify how the HIR method's restrictions on clearing vegetation interact with state government regulations, including those allowing the harvesting of vegetation for fodder.

The Government should vary the HIR method to ensure proponents are required to provide the information needed for the Regulator to verify that lands included in CEAs satisfy regulatory additionality requirements.

Estimating project abatement

Finding 4

There is a risk of forward- and/or over-crediting associated with the regeneration methods that stems from the inclusion of land in CEAs that:

- appears incapable of attaining forest cover in a timeframe consistent with model projections
- appears to lack the potential to attain forest cover, or
- already had forest cover when the project began.

The methods prohibit the inclusion of pre-existing forest cover and areas without forest potential in CEAs. To reinforce this, the Regulator will soon publish guidelines (applicable to both methods) to clarify the procedures for the identification and removal of such areas from CEAs. The guidelines will also require regeneration to be assessed at five-yearly intervals to facilitate the staged removal of areas that lack forest potential. These intervals serve as 'gateways' where certain requirements must be satisfied for CEAs to continue to receive credits and remain eligible.

To further mitigate the risk of forward- and/or over-crediting for areas where regeneration is slow, the Rule has been amended to provide clarity around the timeframes within which land must attain forest cover. The amendments to the Rule—which apply to existing and new projects—restrict crediting where CEAs do not meet requirements for attaining forest cover within a prescribed period. The amendments to the Rule sufficiently mitigate this aspect of the forward- and/or over-crediting risk for new projects.

The five-yearly gateways for assessing regeneration and the forest cover attainment timeframes have been designed for the regions of Queensland and New South Wales where most of the existing regeneration projects are located. The requirements should be tailored for each region in which projects can be undertaken on the basis of the relationship between biomass and crown cover in relevant forest types.

Recommendation 3

The Government should vary the regeneration methods to require:

- regeneration in CEAs to be assessed at five-yearly gateways, as will be required under the Regulator's guidelines
- CEAs to attain forest cover within a prescribed timeframe, consistent with the amendments to the Rule.

The variation to the methods should be made in a way that allows for the prescribed timeframes to be readily updated to account for different forest types and improvements in the science.

Finding 5

The regeneration methods require forest potential and forest cover to be assessed at the 0.2 hectare (ha) scale but it is impractical with existing technology for proponents and the Regulator to always assess forest potential in this manner. This is particularly the case at the time of initial stratification (project commencement), when regeneration may be in its initial stages and the trees on site may be limited to saplings.

By limiting crediting for CEAs that do not attain forest cover (defined at the 0.2 ha scale) within a prescribed period, the Rule amendments reduce the need for a high level of assurance at the time of initial stratification that each 0.2 ha area contains trees with the potential to attain forest cover. The Regulator's guidelines will also help by requiring the assessment of regeneration at five-yearly gateways and providing for the removal of areas that lack forest potential from CEAs.

The Regulator has taken a pragmatic approach that requires the attainment of forest cover and the existence of pre-existing forest cover—but not forest potential—to be assessed at the 0.2 ha scale. This approach should be reflected in variations to the methods.

Recommendation 4

The Government should vary the regeneration methods to:

- ensure forest is assessed at the 0.2 ha scale for the purpose of evaluating the attainment of forest cover and excluding pre-existing forest cover
- ensure forest potential can be assessed at a scale greater than 0.2 ha prior to the assessment of forest cover attainment.

Finding 6

The NFMR method is premised on the assumption that, in the absence of the incentive provided by the ERF, relevant CEAs would be subject to cycles of natural regeneration and human-induced re-clearing over periods not exceeding 15 years. The primary test used in the method to support this assumption is a requirement that land must have been cleared of native forest at least once (the 'single clearing event' test): if it was deforested in the past, it is assumed that, in the absence of the project, it will be re-cleared periodically in the future.

The available historical evidence to support this test is relatively weak. Given the context in which the test is used, the weak evidentiary base does not undermine the integrity of the method—in most cases, it is likely to lead to under-crediting of projects. However, the test could be made more robust by including an additional requirement that eligible land must have been subject to a woody vegetation clearing event in the 15 years prior to registration.

Recommendation 5

The Government should vary the NFMR method to require eligible land to have been both deforested at some point in the past and subject to a woody vegetation clearing event in the 15 years prior to registration.

Finding 7

The available data suggest that, where land has been cleared more than once in the region in which NFMR projects are currently located, on average, it tends to be cleared every 15 years, consistent with the re-clearing assumptions in the method. The re-clearing assumptions provide the basis for the calculation of net emissions in the baseline scenario.

Finding 8

The NFMR method requires regeneration to be modelled in FullCAM from a date that corresponds with the establishment of forest potential within the CEA. The method also requires the land not to contain forest cover at the date of the commencement of the project. Together, these two requirements were intended to ensure the modelled regeneration provides a reasonable estimate of actual pre-project regeneration and does not reach a level corresponding to a forest (as defined by the method) prior to the date of project commencement.

However, under the NFMR method and FullCAM Guidelines, it was previously possible to model regeneration commencing as far back as the day after the last comprehensive clearing event, regardless of how long ago that may have occurred. This could result in an incongruity, where proponents are credited on the basis of modelled regeneration that should have attained forest cover yet the method prohibits the land from containing forest cover. In most cases, the practical consequence of this occurring is that projects would be forward-credited.

In December 2017, the NFMR FullCAM Guidelines were amended to limit the modelling of pre-project regeneration to a maximum of 14 years for new projects. However, subsequent analysis by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) indicated that NFMR CEAs should typically attain forest cover after reaching five tonnes of carbon per hectare (in tree and debris pools), which corresponds to 8–11 years of unhindered regeneration under FullCAM modelling for applicable areas. In response, the FullCAM Guidelines were amended again in March 2019 to limit the modelling of pre-project regeneration to 10 years for new projects.

Two other issues were identified with the FullCAM Guidelines. Firstly, they did not contain an express mechanism requiring proponents to reflect suppression or slowing of regeneration in the modelling. Both factors could potentially enable proponents to model higher levels of abatement by project commencement than has occurred and should be possible if the land meets the method's eligibility requirements. Secondly, they allowed proponents to model planned fires in the default baseline without evidence that such fires had occurred in the past in the relevant CEAs. To address these issues, the FullCAM Guidelines have been amended to:

- provide a mechanism to model suppression factors in future offsets reports
- restrict the type and timing of fire events that can be modelled for new projects in the absence of direct evidence for the applicable CEA.

The method should be varied to provide a more comprehensive solution to the issues associated with planned fires. However, the amendments to the FullCAM Guidelines are a sufficient interim solution.

Recommendation 6

The Government should vary the NFMR method to limit the modelling of planned fires in the baseline to evidenced fire events that occurred in the relevant CEA after the last comprehensive clearing event.

Other integrity risks

Finding 9

Evidence from existing projects indicates that emissions from fuel use associated with regeneration projects are not material.

Recommendation 7

The Government should remove requirements in the regeneration methods to account for emissions from fuel use.

Finding 10

Vegetation in regeneration projects with a 25-year permanence period may be cleared after 25 years, where legally allowed. To offset the potential cost to the Government of replacing carbon stores where this occurs, a 20 per cent discount is applied to credits issued to the projects. A higher discount may be needed to address the risk of clearing after the end of the permanence period. Allowing proponents to transition from a 25-year permanence period to a 100-year permanence period could also help mitigate this risk.

Recommendation 8

The Government should undertake analysis to determine whether to revise the discount applied to credits issued to regeneration projects with a 25-year permanence period. The Government should also consider allowing proponents to transition from a 25-year permanence period to a 100-year permanence period.

Broader considerations

Finding 11

Well-managed regeneration projects have the potential to generate environmental and socio-economic benefits, including dependable new income that can be reinvested to improve farm productivity and environmental sustainability. However, there are varying stakeholder views on matters such as fire risk, biodiversity and broader economic outcomes. The Committee saw no evidence of adverse impacts arising from existing projects, but recognises that they involve long-term changes in land management, the full consequences of which may take some time to become apparent.

Finding 12

The HIR method requirement that CEAs fit within a circle of 1.5 kilometre (km) radius increases complexity and transaction costs. There may be lower-cost ways to appropriately account for the variability in sequestration rates across project areas. Any consideration of changes to the current requirement should take into account the potential for future projects to be undertaken in higher rainfall areas where vegetation growth rates and carbon carrying capacities are generally more variable. Careful thought should also be given to the need to ensure all abatement estimates are representative of the sequestration rates achieved across CEAs.

Recommendation 9

The Department of the Environment and Energy (the Department) should investigate whether the 1.5 km radius requirement could be altered or replaced so as to lower transaction costs while maintaining the integrity of abatement estimates.

Finding 13

The retention of secondary forests that would otherwise be re-cleared for agriculture can provide a significant and cheap source of abatement. At present, there is only one ERF method that incentivises the retention of secondary forests: the *Carbon Credits (Carbon Farming Initiative – Avoided Clearing of Native Regrowth) Methodology Determination 2015* (Avoided Clearing method). The stringency of the eligibility requirements under this method have restricted its uptake.

The NFMR method is similar to the Avoided Clearing method in that it is intended to incentivise the retention of regrowing native vegetation that is likely to be cleared in the future. However, it only applies where the regeneration has not attained forest cover. There is the potential to expand the scope of the NFMR method to include regeneration that has already attained forest cover.

Recommendation 10

The Department should consider expanding the scope of the NFMR method to include regeneration that has already attained forest cover. To address additionality risks, consideration should be given to a risk-based approach to eligibility or a similar approach that uses variables such as vegetation type, time since clearing and suitability for pastoral development (e.g. slope) to exclude forests that are unlikely to be re-cleared in the future.

Finding 14

The regeneration methods are reasonably complex, requiring a high level of technical skill to develop and implement projects. To reduce costs and help encourage uptake, a simplified version of the HIR method could be developed that relies exclusively on the use of National Greenhouse Gas Accounts (National Accounts) data for stratification. The method could be similar to the existing one, with tailored gateways at five-yearly intervals to ensure timely progress towards forest cover and uncertainty discounts to manage integrity risks.

Recommendation 11

The Department should scope the development of a simplified version of the HIR method that relies exclusively on National Accounts data for stratification and incorporates other streamlining options. This method could be designed as a standalone method or included as an option within a varied form of the HIR method.

Finding 15

Some proponents prefer direct measurement methods over modelled methods, despite the higher transaction costs, because they consider direct measurement may provide greater certainty about abatement estimates. A direct measurement method is attractive as it might also provide valuable additional data on the biomass in regenerating forests in semi-arid regions and on the influence of different variables on regeneration rates. This could help improve national accounting.

Recommendation 12

The Department should consider the potential to develop a direct measurement HIR method.

Finding 16

The development of carbon offset methods is complex, requiring measures to be designed to manage multiple risk factors in the absence of perfect information. The degree of complexity and uncertainty means method design errors are, to some extent, unavoidable. There is a need for a risk sharing framework that strikes an appropriate balance between the need for flexibility to address method errors to maintain high integrity, while also providing proponents with sufficient certainty to invest in projects.

Recommendation 13

The Government should consider developing a framework for the sharing of the risks associated with method design errors between proponents and the Government.

1 Background

1.1 Periodic review of methods

The Committee is an independent, expert committee that helps ensure the integrity of methods under the ERF. The Committee advises the Minister for the Environment (the Minister) on whether methods meet the offsets integrity standards, which are defined in s. 133 of the *Carbon Credits (Carbon Farming Initiative) Act 2011* (the Act) and summarised in Box 1.1, below.

The functions of the Committee include undertaking periodic reviews of methods (s. 255 of the Act). In undertaking these reviews, the Committee's main focus is to assess whether the relevant methods continue to meet the offsets integrity standards. The Committee also considers whether there are any aspects of the methods that could be improved to enhance environmental integrity, promote uptake or address secondary socio-economic or environmental impacts.

Method reviews are informed by public consultation, discussions with the Regulator and the Department and, where it is considered necessary, the commissioning of research by technical experts. At the completion of periodic reviews, the Committee provides written advice to the Minister. The Minister is not obliged to act on the Committee's advice but may choose to respond by varying or revoking the methods.

If a method is varied, the Department prepares the variation in accordance with the normal variation process, which includes public, industry and technical consultation. The Committee is required to advise the Minister whether the varied method would comply with the offsets integrity standards. If the Committee does not believe the varied method meets the offsets integrity standards, the Minister is not permitted to make it into a final determination. Similarly, before revoking a method, the Minister must request separate advice from the Committee on the revocation proposal.

Box 1.1: The offsets integrity standards

- *Additionality*—projects covered by the methods should result in abatement that is unlikely to occur in the ordinary course of events (i.e. unlikely to occur in the absence of the incentive provided by the scheme).
- *Measurement and verification*—removals of greenhouse gases from the atmosphere, emissions reductions and emissions covered by the methods should be measurable and capable of being verified.
- *Eligible carbon abatement*—abatement credited under the methods should be able to be counted towards Australia's climate change targets.
- *Evidence*—methods should be supported by clear and convincing evidence.
- *Project emissions*—material emissions resulting from projects covered by the methods should be accounted for.
- *Conservativeness*—estimates, projections or assumptions used in the methods should be conservative.

1.2 The methods under review

In this report, the Committee provides its findings from the review of two methods:

- *Carbon Credits (Carbon Farming Initiative) (Human-Induced Regeneration of a Permanent Even-Aged Native Forest—1.1) Methodology Determination 2013* (the HIR method)
- *Carbon Credits (Carbon Farming Initiative) (Native Forest from Managed Regrowth) Methodology Determination 2013* (the NFMR method).

Both methods incentivise project managers to generate eligible carbon abatement through changes in land management that result in the regeneration of native forests. When first made in 2013, the HIR and NFMR methods were the first model-based carbon offset methods for regenerating native vegetation in the world. Other carbon offset schemes have reforestation methods but most involve planting and direct measurement of changes in carbon stock, rather than relying on computer modelling.

The decision to make the methods was prompted by the nature of the forest systems and agriculture undertaken in Australia's rangeland regions, and the potential for abatement in these systems. The native forests in these regions, especially in Queensland, New South Wales, South Australia and Western Australia, have been cleared extensively for livestock grazing since European settlement. Soils in many of these lands still contain substantial native plant seed banks, which enable seedling establishment or recruitment when climatic and land management conditions allow germination and survival. Landholders generally suppress this regeneration through periodic clearing and livestock management practices. Grazing by feral animals and competition from weeds can also play a part in preventing the re-establishment of native forests and woodlands.

In addition to having conditions that are conducive to human-induced native forest regeneration, these regions are relatively unproductive for agriculture when compared to other regions in Australia with more reliable rainfall and better soils. Livestock carrying capacities and economic returns are low on a per hectare basis (Marinoni et al. 2012). Due to this, the opportunity costs of allowing the forests to regenerate on a proportion of the area of large properties can be low. The combination of low opportunity costs and minimal direct forest establishment and monitoring costs (because planting or on-ground measurement is not required) means HIR and NFMR projects can be profitable at relatively low carbon prices, even where the amount of carbon stored per hectare is low compared to higher rainfall regions.

This is reflected in the data on project uptake and ERF contracting. The HIR method has the most registered projects, most proponents with contracts and most contracted abatement under the ERF (Table 1.1).[1] The HIR method accounted for 33 per cent of all projects and 48 per cent of all contracted abatement as at February 2019. Most of the registered HIR projects are located in northwest New South Wales and southwest Queensland, with a smaller number in Western Australia

[1] Proponents must apply to the Regulator to have a project registered as an eligible offsets project. Table 1.1 identifies these projects as 'registered projects'. Once registered, proponents must undertake project activities and submit estimates of abatement in an offsets report to the Regulator within the reporting period, which for sequestration projects cannot exceed five years. The Regulator may then issue the proponent with one Australian Carbon Credit Unit (ACCU) for each tonne of carbon dioxide equivalent (CO_2-e) stored in vegetation regenerating under the project. Proponents may sell ACCUs to the Government if they are successful at an ERF auction, or to other purchasers through secondary markets. Table 1.1 identifies the number of contracts (complete or active) that the Government has entered into with project proponents, and the abatement they have contracted to deliver (including from future reporting periods). The contracted abatement need not come from the particular project associated with the contract. The table also identifies the total number of ACCUs issued to registered projects, whether contracted or not.

and South Australia (Figure 1.1). The CEAs in the 258 registered HIR projects covered 2,224,369 ha—0.6 per cent of the area used for agriculture in Australia (ABS 2018).

There has been lower uptake of the NFMR method, largely because of the requirement to provide evidence of prior clearing. As of February 2019, there were 35 registered NFMR projects, all in southwest Queensland, from which 3.5 million tonnes of abatement have been contracted. The CEAs in NFMR projects covered an area of 89,786 ha.

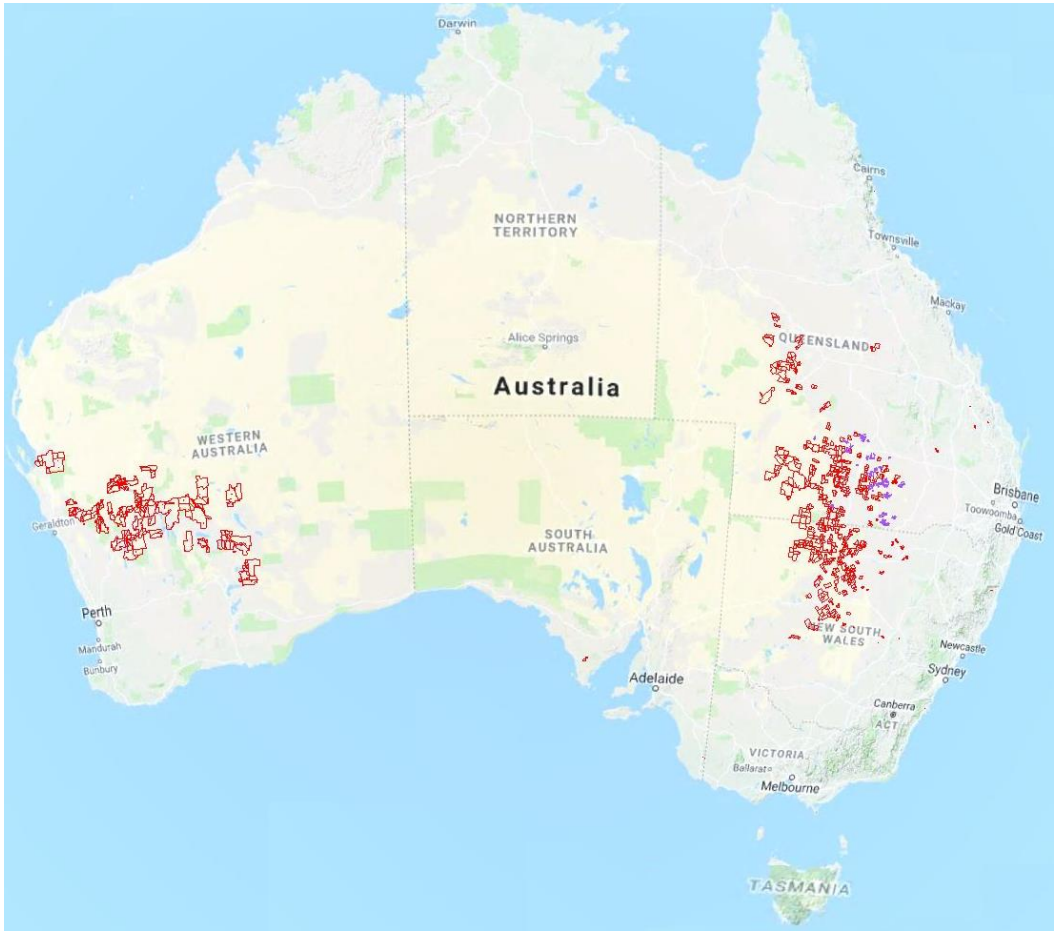
As shown in Figure 1.1, a small number of HIR projects have been registered in higher rainfall regions. The Committee anticipates growing interest in registering projects in such regions.

Table 1.1: HIR and NFMR method statistics as of February 2019

Statistic	**HIR**	**NFMR**
Registered projects	258	35
Number of contracts	184	20
Contracted abatement (tonnes CO_2-e)	91.7 million	3.5 million
Australian Carbon Credit Units (ACCUs) issued (tonnes CO_2-e)	12.2 million	2.3 million

Source: Clean Energy Regulator, 2019.

Figure 1.1: Location of projects registered under the HIR (red) or NFMR (purple) methods as of February 2019



Source: Publicly available project area data from the Clean Energy Regulator, 2019.

1.3 History of the methods

The HIR method was developed by the former Department of Climate Change and Energy Efficiency in consultation with Australian Carbon Traders and Essential Change Advisory Services. It was first made in 2013 under the former Carbon Farming Initiative (CFI) and has subsequently been amended on three occasions: in 2015, 2016 and 2018.[2] The 2015 amendments were minor and were intended to maintain consistency with the Act following the legislative changes that established the ERF. The HIR method was varied again in 2016 to:

- replace the model used in estimating carbon abatement
- clarify the criteria for determining the eligibility of land to be included in projects
- permit a subset of eligible project activities on publicly-owned conservation land
- clarify treatment of negative abatement and baseline commencement dates
- limit the potential for land variability in project implementation areas to help ensure the accuracy of abatement modelling.

In its advice to the former Minister on the 2016 variation, the Committee recommended the method be monitored closely to ensure it continued to meet the offsets integrity standards in the Act and to minimise natural resource management (NRM) risks.

The 2018 amendments removed the reference to the use of the CFI Mapping Tool (the Mapping Tool) to undertake required mapping and replaced it with a new provision requiring all relevant mapping to be undertaken in accordance with the CFI Mapping Guidelines (the Mapping Guidelines), as in force from time to time.

The NFMR method was developed from a proposal by the Queensland Department of Science, Information Technology, Innovation and the Arts in consultation with The Carbon Store and the University of Queensland. It was first made in 2013 and was amended in 2015 and 2018. The 2015 amendments mirrored the 2015 amendments to the HIR method and were designed to ensure consistency with the ERF changes to the Act. The 2018 amendments were minor in nature, the most significant of which was the removal of previous references to the Mapping Tool.

1.4 Objective of the methods

The HIR and NFMR methods aim to generate carbon abatement by incentivising changes in land management that result in the regeneration of native forest. Reflecting this, the HIR method (s. 12(1)) specifies that project proponents must undertake eligible land management activities 'in a way that can reasonably be expected to result in the area becoming native forest, and attaining forest cover, through regeneration'.

Similarly, the NFMR method (s. 2.2) states that projects 'must involve generating abatement through a change in land management which enables native vegetation to grow to attain forest cover through the promotion and management of regeneration of in situ seeds, rootstock or lignotubers, and not through direct seeding or planting'.

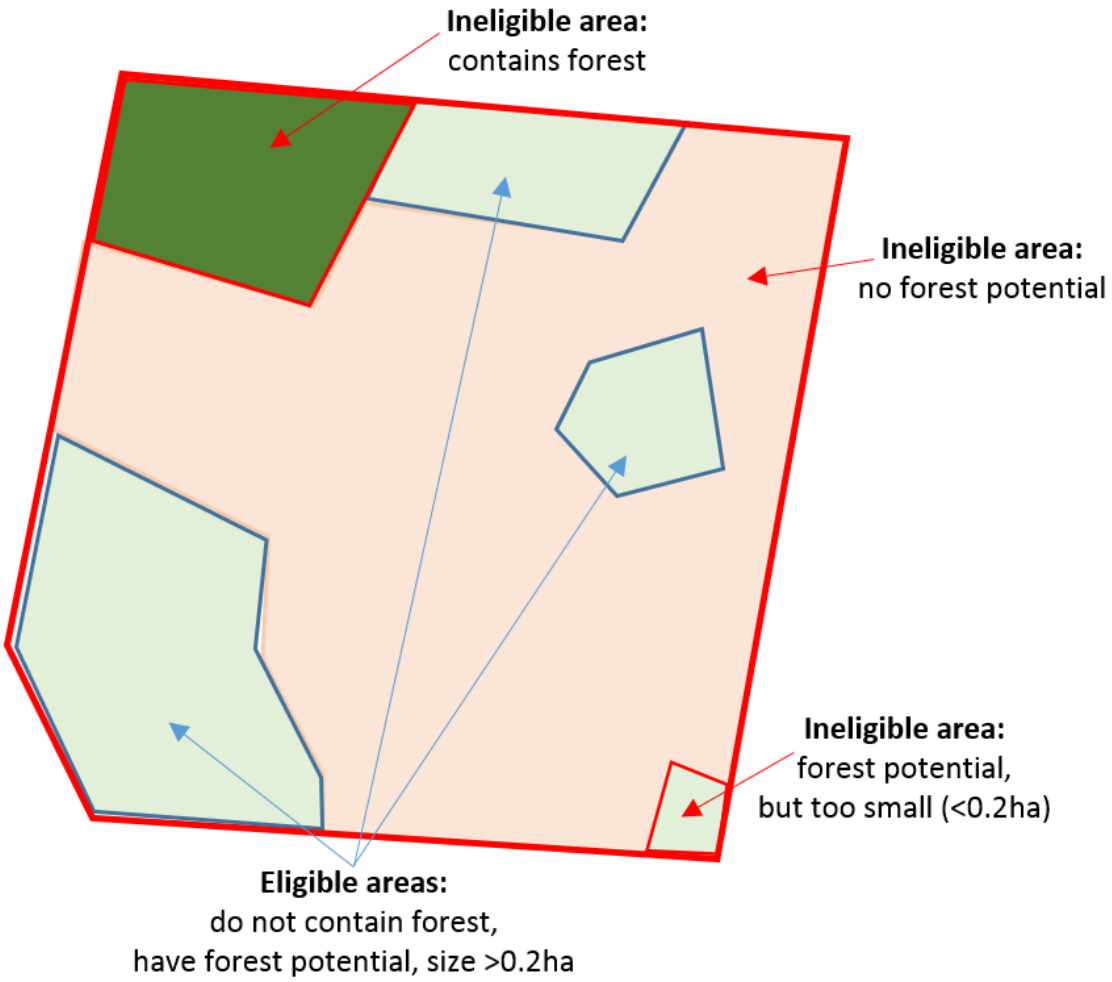
'Forest' and 'forest cover' are defined under the methods in a manner consistent with the approach adopted by the Government for the purposes of reporting under the United Nations Framework Convention on Climate Change (UNFCCC): an area of at least 0.2 ha with trees that are two metres or

[2] New projects are registered under a method as in force at the time of registration. Where methods are subsequently varied, proponents of existing projects can either continue to use the version of the method in operation when their project commenced, or apply to transfer their projects to the newer version.

more in height and provide crown cover of at least 20 per cent of the land (Department of the Environment and Energy 2017). Complementary thresholds are used in Australia's National Forest Inventory, which is used for reporting to the Food and Agriculture Organization of the United Nations and Montréal Process.

Areas with trees or vegetation that have not attained 20 per cent crown cover are classed as either 'non-woody' (less than five per cent crown cover) or 'sparse woody' (5–19 per cent crown cover).[3] To be eligible under the regeneration methods, land must have 'forest potential', which refers to the inherent ability of the vegetation to grow to attain forest cover. The methods require proponents to stratify (delineate) sub-areas of eligible project land on which project activities are undertaken into CEAs. Figure 1.2 depicts the key requirements governing the stratification of regeneration project land into areas that are eligible to earn carbon credits and those that are not.

Figure 1.2: Stratification of a regeneration project area



A defining feature of the HIR and NFMR methods is that they are modelled methods, meaning project proponents are generally not required to undertake field measurements to estimate changes

[3] Note that land within the 'non-woody' category can feature woody vegetation such as young growing trees and shrubs, as long as the total crown cover is less than five per cent.

in relevant carbon stocks. Instead, abatement is credited on the basis of modelled sequestration using FullCAM.[4]

The application of FullCAM is governed by provisions in the methods and accompanying FullCAM Guidelines, the Mapping Guidelines and the Rule. These provisions are intended to ensure the use of FullCAM results in conservative estimates of the actual carbon abatement achieved through the regeneration of native forest. Proponents must use the version of FullCAM and associated FullCAM Guidelines in force at the end of each reporting period.

Both methods account for the following carbon pools: live above-ground biomass; live below-ground biomass; and dead plant material and debris. The methods do not account for soil organic carbon because of scientific uncertainty about the impacts of forest regeneration on soil carbon. In addition to accounting for the live and dead biomass carbon pools, the methods also require projects to make deductions for greenhouse gas emissions (methane, nitrous oxide and carbon dioxide) stemming from fuel use and fire.

1.5 Consultation

To inform the review of the HIR and NFMR methods, the Committee released a discussion paper on 2 March 2018 and invited written submissions from the public. The public consultation period closed on 20 April 2018. The Committee received 16 submissions from carbon service providers, landholders, state government agencies, industry representatives, consultants, scientific bodies and conservation groups. Non-confidential submissions are available on the Department's website (http://www.environment.gov.au).

Members of the Committee, with representatives from the Department and the Regulator, visited the regions in Queensland and New South Wales where most projects are located (most HIR projects in Western Australia were only registered in May 2018, and there are only two projects in South Australia).[5] The Committee held stakeholder workshops in Charleville, Queensland, on 6 March 2018 and in Bourke, New South Wales, on 1 April 2018. Participants included landholders, carbon service providers, state government agencies, regional NRM bodies and other community members. Around 50 people attended the Charleville workshop and 44 attended the workshop in Bourke. The Committee visited registered projects in both regions.

Committee members and/or departmental staff held further discussions on the methods with carbon service providers, state government representatives, auditors, researchers, industry bodies and the Department of Agriculture and Water Resources. The Committee and Department consulted closely with the Regulator on implementation aspects of the methods.

The main areas of stakeholder interest related to:

[4] The HIR method initially used the Reforestation Modelling Tool (RMT), a simplified version of FullCAM. Projects registered under earlier versions of the method are still able to use the RMT but projects registered since the 2016 variation are required to use FullCAM. As of February 2019, 105 of the 258 registered HIR projects (41 per cent) were registered under the RMT version of the method, with the remaining 153 (59 per cent) registered under the FullCAM version.

[5] On 18 April 2018, the Government of Western Australia gave in-principle support for pastoral lessees to register HIR projects under the ERF as part of a 12-month pilot. Projects must involve grazing management and have a 25-year permanence period. The state government will decide whether to provide eligible interest holder consent, as required under the ERF, to further projects after the 12-month pilot period (MacTiernan et al. 2018; Department of Primary Industries and Regional Development 2018).

- how well FullCAM's modelled estimates align with actual regeneration, and the merit of supplementing modelling with on-ground and remote sensing information
- how stratification is undertaken, including whether CEAs have forest potential and attain forest cover, and the spatial resolution at which to apply these requirements
- whether trends in regeneration and clearing indicate regeneration projects are delivering abatement that is unlikely to occur in the absence of the incentive provided by the ERF
- the environmental and socio-economic outcomes from projects under the methods.

More detailed stakeholder feedback is reflected in relevant sections of the report.

2 Integrity of the methods

The review focused on the compliance of the regeneration methods with the offsets integrity standards, which are summarised in section 1.2. The Committee's assessment of the methods against the offsets integrity standards is summarised below.

In assessing compliance with the standards, the Committee considered the main risks typically associated with carbon offsets methods:

- absence of additionality, which refers to the risk of credits being issued for abatement that would have occurred in the ordinary course of events (i.e. without the incentive provided by the offsets scheme)
- inaccurate measurement, which refers to the risk that the emissions and/or removals from offsets projects will be estimated inaccurately (particularly where inaccuracies result in abatement being significantly over-estimated)
- unaccounted for project emissions, which refers to the risk that emissions reductions are overstated because emissions arising within the project boundary as a result of the project activities are not appropriately accounted for
- leakage, which refers to the risk that offset projects will trigger a consequential increase in emissions or reduction in removals outside the project boundary
- non-permanence, which is relevant only to sequestration projects and refers to the risk that the stored carbon will not be maintained at the levels credited under the offsets scheme.

Of these risks, the most significant concerns for the HIR and NFMR methods were found to relate to additionality and measurement (estimation) of project abatement. Those matters are discussed in detail in sections 2.2 and 2.3 respectively, while the risks relating to leakage, project emissions and permanence are discussed in section 2.4.

2.1 Summary of compliance with the offsets integrity standards

Additionality

The additionality standard requires the substantial majority of the abatement credited under the method to be unlikely to occur in the absence of the incentive provided by the scheme. The Committee found the methods continue to meet this standard. A combination of method-specific requirements and requirements in the broader legislative framework help ensure this outcome.

The Committee identified opportunities to enhance the additionality of the abatement credited by varying the HIR method to:

- extend the baseline period during which CEAs must not have forest cover
- clarify the application of the ERF's regulatory additionality requirement to the selective clearing of vegetation for livestock fodder, given state government regulation of vegetation clearing
- strengthen the requirements for proponents to provide evidence demonstrating the additionality of project activities.

Measurement and verification

During the course of the review, it was identified that the methods did not contain sufficient safeguards to ensure the actual rate of sequestration aligns with the modelled rate of sequestration

in areas where there is slow regeneration, contributing to a risk of forward- and/or over-crediting. However, the Committee was satisfied that amendments to the Rule (see section 2.3) should sufficiently mitigate this risk for new projects if implemented as intended.

The Committee also identified a problem with the inclusion of pre-existing forest cover in the CEAs of HIR and NFMR projects. While concerned about the potential for this to lead to forward- and/or over-crediting, the Committee was satisfied with the treatment of pre-existing forest cover in the methods and with the steps taken by the Regulator to address the issue. To further minimise risk, the Committee recommends the methods be varied to clarify the definitions of forest potential and forest cover.

The Committee identified a further risk of forward- and/or over-crediting in relation to the treatment of pre-project abatement and emissions from planned fires under the NFMR method.

The NFMR method and FullCAM Guidelines allowed proponents to model levels of pre-project abatement that are inconsistent with the requirement that, at project commencement, eligible land must not already have forest cover. The issue arose because the method and FullCAM Guidelines did not specify a sufficient limit on the amount of pre-project modelling of regeneration permitted, nor did they expressly provide for the modelling of factors suppressing or slowing regeneration.

To address this issue, in December 2017, the Department introduced a 14 year limit on the modelling of regeneration for new projects.[6] Subsequent analysis by the CSIRO supported a tighter limit of 10 years, extendable by modelling growth pauses to account for any suppression factors such as grazing. Due to this, the FullCAM Guidelines were amended again in March 2019 to limit the modelling of pre-project regeneration to 10 years for new projects.

Two other issues were identified with the FullCAM Guidelines. Firstly, they did not contain an express mechanism requiring proponents to reflect suppression or slowing of regeneration in the modelling. Both factors could potentially enable proponents to model higher levels of abatement by project commencement than has occurred and should be possible if the land meets the method's eligibility requirements. Secondly, they allowed proponents to model planned fires in the default baseline without evidence that such fires had occurred in the past in the relevant CEAs. To address these issues, the FullCAM Guidelines have been amended to:

- provide a mechanism to model suppression factors in future offsets reports
- restrict the type and timing of fire events that can be modelled for new projects in the absence of direct evidence for the applicable CEA.

The NFMR method should be varied to provide a more comprehensive solution to the issues associated with planned fires. However, the amendments to the FullCAM Guidelines are a sufficient interim solution.

The Committee is satisfied the amendments to the Rule and NFMR FullCAM Guidelines should sufficiently mitigate the risk of forward- and/or over-crediting in new projects if implemented as intended. On this basis, the Committee concluded the methods satisfy this offsets integrity standard. However, both methods should be varied to enhance their integrity and ensure the requirements are consistently interpreted.

[6] Prior to this, proponents could model regeneration as far back as the day after the last comprehensive clearing event, regardless of when that occurred.

Eligible carbon abatement

The Committee found the abatement that results from projects under the methods is eligible carbon abatement. It is possible the number of credits issued under the methods will not correspond to the regeneration recorded in the National Accounts. However, the eligible carbon abatement standard does not require complete consistency between the method and the National Accounts.

The approaches used for the National Accounts are designed to estimate emissions and removals at a national scale, while methods are designed to estimate abatement at a project scale. The differences in focus and scale necessitate different approaches. The Committee is of the view that the standard only requires the abatement to be from sources and sinks that are accounted for by Australia under the Kyoto Protocol and Paris Agreement and that is capable of being used to meet Australia's mitigation targets.

In the case of the regeneration methods, both requirements are met.

Evidence

The Committee found the methods are supported by clear and convincing evidence that changes to land management can assist regeneration. The Committee noted that some submissions to the review questioned the effectiveness of certain project activities. After examining the methods and the intent behind them, the Committee considers they are appropriately focussed on the attainment of forest cover, without overly prescribing the activities that can be used to achieve that aim.

The NFMR method is premised on the assumption that, in the absence of the incentive provided by the ERF, relevant CEAs would be subject to cycles of natural regeneration and human-induced re-clearing over periods not exceeding 15 years. The primary test used in the method to support this assumption is a requirement that land must have been cleared of native forest at least once (the 'single clearing event' test): if it was deforested in the past, it is assumed that, in the absence of the project, it will be re-cleared periodically in the future.

The Committee found the available historical evidence to support this test is relatively weak. Despite this, given the context in which the test is used and the consequences of its application, the Committee does not believe it results in the method failing the clear and convincing evidence test. However, to enhance the additionality of the method and make the application of the single clearing event test more robust, the Committee recommends the NFMR method be varied to require eligible land to have been both deforested at some point in the past and subject to a woody vegetation clearing event in the 15 years prior to registration.

Project emissions

The review confirmed requirements in the methods for the deduction of material amounts of greenhouse gases emitted as a direct consequence of projects are clear. The methods require accounting for emissions from fires and fuel use. The Committee is of the opinion that proponents should not need to account for fuel use emissions as analysis shows they are immaterial (see section 2.4).

Conservativeness

The Committee found that, with the amendments to the Rule and FullCAM Guidelines, the methods comply with the requirement that abatement estimates be conservative (see section 2.3). The Committee also considered whether abatement estimates adequately account for potential 'leakage' from project activities but found no evidence of material project leakage having occurred.

Finding 1

The ERF regeneration methods, with amendments to the Rule and FullCAM Guidelines, comply with the offsets integrity standards. Both methods should be varied to enhance their integrity, promote greater consistency and encourage further uptake of projects.

2.2 Additionality

A combination of method-specific requirements and requirements in the broader legislative framework help ensure that projects under the regeneration methods provide additional abatement. Requirements under the methods relating to past land use are key to ensuring only land that is otherwise unlikely to regenerate and be maintained as native forest is eligible for projects. The project additionality requirements of the Act ensure that projects that have already commenced, or are already required under state or territory legislation, are not eligible for the ERF. The requirements as they apply to each method are outlined below.

HIR method

The main measures used to address additionality risks under the HIR method are as follows.

- **The statutory newness, regulatory and government program requirements.** Section 27(4A) of the Act, together with s. 21 of the Rule, requires all projects that apply for registration under the ERF to meet three requirements:
    - they must not have begun to be implemented (the 'newness requirement')
    - they must not be required to be carried out by or under a law of the Commonwealth, a state or a territory (the 'regulatory additionality requirement')
    - they must not include activities also carried out under other specified Commonwealth, state or territory government program or schemes (the 'government program requirement'). At present, the only relevant specified program from which projects are not permitted to receive support at any time is the 20 Million Trees Programme.
- **No forest cover in the baseline period.** Lands included in CEAs must not have had forest cover at any time during the 10 years prior to project registration or, for land later added to a project, the 10 years prior to that date (known as the 'baseline period'). This requirement prevents the inclusion of land that has already attained forest cover (pre-existing forest cover), and serves as a proxy measure of the likely condition of the land in the future without the changes in land management incentivised under the method.
- **Addressing suppressors that obstruct the regeneration of forest.** The regeneration of forest on lands included in CEAs must have been obstructed by specified suppressors in the baseline period. Project activities undertaken by the proponent must address suppressors, to enable forest cover to be attained. The details of these requirements are provided in Table 2.1.
- **Deduction of prior growth.** The HIR method assumes that, in the absence of the incentive provided by the ERF, suppression would prevent forest regeneration. However, to be included in a CEA, land must have forest potential, meaning it must have sufficient trees (including seedlings and saplings) to reach forest cover. Proponents are able to commence modelling of regeneration prior to project registration to account for the initial presence of

woody plants with forest potential. Where proponents elect to do this, they must subtract the carbon sequestered in the biomass prior to commencement when calculating project abatement.

Table 2.1: Key HIR method provisions concerning suppression and changes to land management

Provision	Requirement	Details
s. 4(1)(b)	Suppression	During the baseline period: • for land that is not 'conservation land' (land owned and managed by the Commonwealth or a state or a territory government for biodiversity conservation), livestock, feral animals, weeds or the mechanical or chemical clearing of vegetation must have contributed to suppressing the development of forest cover • for conservation land, feral animals or weeds must have contributed to suppressing the development of forest cover and there must not have been any mechanical or chemical destruction, or suppression of regeneration, of native vegetation.
ss. 4(1)(c), 7(1) and 7(2)	Removal of suppression	At the end of the baseline period, it must be reasonable to expect it is or was necessary to undertake one or more HIR activities on the land in order for it to attain forest cover. For land that is not conservation land, the designated HIR activities are: the exclusion of livestock; management of timing and extent of grazing; management of feral animals; management of weeds; and a decision to permanently cease the mechanical or chemical destruction or suppression of regeneration. For conservation land, the HIR activities are confined to management of feral animals or weeds, and the management must not be ordinarily undertaken, or not ordinarily undertaken to the proposed extent, on conservation land of that type in the relevant jurisdiction.
ss. 7(1)(a) and 12(1)	Attainment of forest cover	Proponents must assist the regeneration of native forest and attain forest cover by undertaking one or more HIR activities. Proponents must undertake one or more eligible land management activities in a way that can reasonably be expected to result in the area becoming native forest, and attaining forest cover, through regeneration.

The Committee found that the HIR method supports activities that are unlikely to have occurred in the ordinary course of events (projects result in additional sequestration compared to the business-as-usual scenario). The Committee considered several matters in reaching this conclusion, some of which merit further attention in any future variations to the methods. These are discussed below.

Inclusion of pre-existing forest cover within CEAs

The HIR method allows proponents to use remotely-sensed imagery (including the National Accounts Forest Extent Data) or other sources of information as evidence that land has forest potential, or of the presence or absence of forest cover.

The Committee has considered analysis by the Department and the Regulator of information from offsets reports and other available sources, which suggests the approaches and data used for stratification have resulted in parts of some CEAs containing pre-existing forest cover (see section 2.3 for further details).

The Committee is of the opinion that the method clearly prohibits the inclusion of pre-existing forest cover in CEAs and that the exclusion of these areas is necessary to ensure the additionality of credited sequestration. To uphold the integrity of the method, proponents should be required to verify the accuracy of their stratification of projects using multiple reference points (such as high-resolution aerial imagery and ground-truthing). The Committee notes the proposed guidelines developed by the Regulator provide a process for verifying initial land stratification, which could be incorporated into future methods.

Baseline requirement of no forest cover over preceding 10 years due to suppression

The HIR method requirement that eligible land has not had forest cover over the 10 years preceding project registration supports the premise that regeneration has been suppressed and, in the absence of an ERF project, the land is unlikely to develop forest cover. The HIR method requires applications for project registration to include a description of the past suppression factors and proposed project activity or activities for at least one area of land (a 'candidate CEA'). It also requires all offsets reports to include a description of the project activities undertaken in each CEA and requires proponents to keep records of past activities that have suppressed forest cover.

The Committee considers that due to the difficulties in providing verifiable evidence of past suppression and changes in land management in some cases, the requirement that eligible land not contain forest cover during the baseline period is important to ensure projects provide additional abatement. However, there is a risk that the 10-year baseline may allow projects to include land where regeneration is not necessarily suppressed, but is just slow growing.

The Committee recommends consideration be given to strengthening the baseline requirement by lengthening the baseline period—from 10 years to 15 years—to ensure only land with suppressed regeneration meets the eligibility requirements.

Finding 2

To ensure credits are issued only to projects that store additional carbon by regenerating vegetation, the HIR method requires that CEAs not have forest cover for 10 years before project registration. This is important to ensure the land would be unlikely to attain forest cover without a project, as it can be difficult to provide evidence of land management changes that support regeneration. However, 10 years may not be long enough to prevent the inclusion of land with vegetation that is slow growing and not necessarily suppressed, and hence there is a risk that credits could be issued for non-additional abatement.

Recommendation 1

The Government should vary the HIR method to strengthen the requirements for evidence demonstrating that projects will result in additional abatement. This may include extending the baseline period from 10 years to 15 years.

Statutory additionality requirements for projects

Evidentiary requirements under the regeneration methods help support the Regulator in determining whether the projects meet the additionality requirements, in particular whether they satisfy the regulatory additionality and newness requirements.

The HIR method requires 'a description' of the HIR activity or activities undertaken in each CEA at each report. The Regulator has suggested this evidentiary requirement could be strengthened, noting the general nature of the requirement for 'a description'. The Committee agrees that more-specific evidentiary requirements based on the information typically available to landholders and managers could be designed to strengthen assessment of project additionality. Any design of more specific requirements would need to take into account challenges in obtaining evidence where historical records are absent, or land has changed owners.

The Committee saw evidence that some projects are located on land restricted from clearing under state legislation. In these cases, ceasing clearing is not an eligible activity, as it is already required by law. However, on land where clearing is not allowed and where factors other than clearing have suppressed regeneration, projects can implement the other activities available under the HIR method. The Committee supports the use of the method in this respect, as long as there is good evidence that regeneration has been suppressed and that the land would not have obtained forest cover if the suppressors remained unaddressed.

Some of the regulatory restrictions governing the clearing of native vegetation are complex, which can create difficulties in the application of the regulatory additionality requirements. The most relevant example of this concern is fodder harvesting regulations (Department of Natural Resources, Mines and Energy 2018).

Fodder harvesting refers to the harvesting of native trees and shrubs (mainly *Acacia* species) to provide fodder for livestock. It is a common practice in many semi-arid grazing areas in Queensland, including regions containing a significant number of HIR and NFMR projects, and in New South Wales. The circumstances under which fodder harvesting can occur in these areas without government approval depends on a number of factors, including the jurisdiction in which it occurs. In Queensland, whether fodder harvesting can be undertaken without approval depends on, among other things, the type of tree species and ecosystems involved, the size of the trees, geography, the method of harvesting, the amount of harvesting and whether (and when) the area has previously been subject to fodder harvesting.

Determining whether an area of land can be lawfully harvested without approval can be difficult for proponents, auditors and the Regulator alike. The uncertainty about the application of these restrictions could lead to proponents inadvertently or intentionally including areas that are subject to clearing restrictions within their CEAs, and the auditors and Regulator failing to detect them. In these circumstances, not only should the cessation of fodder harvesting be an ineligible activity but legitimate questions could be asked about the additionality of the abatement.

Regulatory regimes, such as those governing fodder harvesting, change over time, which increases the complexity. Under the Act, if a project is found to satisfy the regulatory additionality test at registration, the project will not be reassessed should the applicable regulatory regime later change.

The Committee was not able to determine the extent to which the complexity of native vegetation laws has caused additionality problems with existing projects. However, to address this issue, the Committee recommends the HIR method be varied to ensure proponents are required to provide the information needed for the Regulator to verify that lands included in CEAs satisfy the regulatory additionality requirements.

Finding 3

The general nature of the evidentiary requirements that support assessment of HIR project additionality, and the complexity involved in ensuring project activities are not already legally required, pose additionality risks. More clarity is needed to better inform proponents and simplify assessment by the Regulator.

Recommendation 2

The Government should clarify how the HIR method's restrictions on clearing vegetation interact with state government regulations, including those allowing the harvesting of vegetation for fodder.

The Government should vary the HIR method to ensure proponents are required to provide the information needed for the Regulator to verify that lands included in CEAs satisfy regulatory additionality requirements.

Regeneration under projects and in broader areas

The Department carried out an analysis of satellite imagery that compared the rates of forest regeneration in a sample of project CEAs and in 20 km 'buffer zones' around the CEAs. The analysis was not intended to provide conclusive evidence of the additionality or non-additionality of the abatement credited under the methods. It was a first pass assessment that was intended to gauge whether there was cause for concern. The results did not raise any apparent integrity concerns regarding the additionality of HIR projects. The Committee notes the method provides mechanisms to deal with instances where the project activities fail to result in verifiable abatement. The absence of prescription around how to undertake activities ensures that projects can be tailored to particular circumstances.

NFMR method

The main measures used to address additionality risks in the NFMR method are as follows.

- **The statutory newness, regulatory and government program requirements.** These requirements are the same as for the HIR method described above.
- **No forest cover at the time of the decision to implement the project**. At the time of the decision to implement the project, which can either be the date the application is made to register the project with the Regulator or an earlier date if specified evidence is provided, the land must not have had forest cover. This requirement prevents the inclusion of land that has already attained forest cover without the changes in land management.
- **The land must have been comprehensively cleared at least once for pastoral use**. The NFMR method is premised on the assumption that, in the absence of the incentive provided by the ERF, relevant CEAs would be subject to periodic clearing. The requirement that land has been subject to at least one comprehensive clearing event is intended to provide the primary test for this assumption: if it was cleared once in the past, it is assumed that, in the

absence of the project, it will be cleared periodically in the future (the 'single clearing event test').

Relatedly, the *Carbon Credits (Carbon Farming Initiative) Regulations 2011* (the Regulations) require that land in projects must not have been subject to the clearing of native forest in the seven years preceding project commencement (or five years where the land has changed ownership). This provision restricts landholders from clearing to make their land eligible for a project.

- **Change in land management that enables the attainment of forest cover**. Projects must involve a change in land management that enables native vegetation to grow to attain forest cover. To enable regeneration, proponents must cease mechanical or chemical destruction, or suppression, of regeneration—this ties with the underlying assumption that the land would otherwise be subject to periodic clearing. Proponents may also exclude livestock, manage the timing and extent of grazing, or manage feral animals or weeds to assist in the regeneration of forest.
- **Non-zero baseline.** To account for the assumed periodic clearing, where the 'baseline carbon stock' is 'material', the NFMR method requires proponents to deduct the baseline carbon stock from the modelled project carbon stock when calculating project abatement. The baseline carbon stock refers to the carbon stock in vegetation in the baseline scenario, where the project activities are not undertaken. The baseline carbon stock is taken to be material if the carbon mass of trees in the 10 years before the project mechanism was implemented is more than five per cent of the modelled carbon mass of trees 100 years after the implementation date.

The Committee found that the NFMR method supports activities that are unlikely to have occurred in the ordinary course of events but that some aspects warrant further consideration.

Inclusion of pre-existing forest cover within CEAs

The NFMR method requires that forest cover was not present at the time the application for registration of the project was made. The Committee's concerns around the inclusion of pre-existing forest cover within CEAs, discussed above for the HIR method, also apply to the NFMR method.

Evidence of natural forest regeneration without project activities

As with the HIR method, the Committee considers that due to the difficulties in providing verifiable evidence of past suppression and changes in land management, the requirements that eligible land must have been subject to a comprehensive clearing event in the past, not have been subject to a deforestation event in the past seven years (or five years where the land has changed ownership) and not contain forest cover at the date of the decision to undertake the project are fundamental to ensuring projects provide additional abatement.

The single clearing event test underpins the logic of the method and provides a secondary additionality check. As discussed below in section 2.3, there is a lack of historical evidence to support this test. Analysis undertaken for the Committee using National Accounts data for southwest Queensland and western New South Wales (National Accounts tiles SG55 and SH55)[7] found that, of the land that was deforested over the period 1972–2017, only 23 per cent was subject to subsequent cycles of forest regeneration and re-clearing. The majority of the land, 77 per cent, was deforested once and, of this, 83 per cent remained clear of forest cover over the period.

[7] A 'tile' refers to an area of land as identified for preparing the National Accounts (Australia is divided into a grid of tiles for this purpose). The location of tiles SG55 and SH55 is shown in Appendix 1.

These data and other related data presented in section 2.3 suggest that, while the evidence base for the single clearing event test is weak, it does not pose an additionality problem because most land that is deforested in these areas either:

- remains in a non-forest condition and, hence, is not likely to return to forest without a change in land management practices to remove relevant suppressors, or
- is subject to cycles of forest regeneration and re-clearing, in which case, it would not return to, and remain in, a forest condition without the cessation of clearing.

Statutory additionality requirements for projects

The Committee found that, for the NFMR method, challenges for determining project additionality are similar to the HIR method regarding interactions with state or territory legislation around clearing. However, the Committee notes that, as projects are only permitted where land has been previously cleared legally, the land would be less likely to be subject to clearing restrictions.

Regeneration under projects and in broader areas

As for the HIR method, the analysis of regeneration between project CEAs and 20 km buffer zones around the CEAs did not raise any apparent integrity concerns for the additionality of NFMR projects (see Appendix 1 for further details).

2.3 Estimating project abatement

Models are widely used in greenhouse gas accounting to estimate emissions and removals. This is because of the impracticality of measuring emissions and removals from certain sources, the lower costs of modelling relative to direct measurement, and the increasingly high quality of the data underpinning the models.

Models offer many benefits, but represent a simplified version of what happens on the ground. While providing a good estimate at an aggregated scale (that is, across multiple projects), a model cannot represent all of the variability at the project scale, and care also needs to be taken to ensure models are not applied in ways that produce biased results. For these reasons, the requirements of the methods and associated guidelines are important to ensure FullCAM, the model required to be used to calculate abatement in the HIR and NFMR methods, is used as intended.

The HIR and NFMR methods contain a number of provisions designed to ensure CEAs are stratified in a way that supports the assumptions underpinning the use of FullCAM (see section 1.4 for a depiction of stratification). These include the following.

- **CEAs must have consistent site characteristics and management.** The way FullCAM is used under the methods assumes land areas have consistent patterns of regeneration. To ensure this reflects on-ground conditions, proponents must ensure project areas are stratified in such a way that each CEA has consistent site characteristics, regeneration and management across the area.

- **CEAs must have forest potential.** Land can only be included in a CEA if it has forest potential (i.e. trees capable of reaching at least two metres in height and providing at least 20 per cent crown cover). This requirement helps ensure modelled abatement estimates are calculated only for areas that will develop forest cover. Proponents must align the regeneration start date used for FullCAM modelling with the commencement of on-ground regeneration in each CEA.

- **CEAs must not include pre-existing forest cover.** As discussed above, the methods require proponents to initially stratify their CEAs so as to exclude pre-existing forest cover. While this addresses additionality concerns, it also ensures the methods do not over-estimate abatement. This is because the way FullCAM is used under the methods assumes land areas do not contain forest cover and that they attain forest cover as a consequence of the project activities. Due to this, if pre-existing forest cover is included in CEAs, FullCAM will overestimate the 'additional' sequestration that occurs on the lands as a consequence of the project activities.

- **Forest potential and forest cover delineated at a 0.2 ha scale.** For FullCAM to provide robust estimates of onsite biomass, each 0.2 ha area within a CEA must contain woody vegetation that is capable of: (a) reaching more than two metres in height; and (b) providing crown cover of at least 20 per cent. FullCAM was not calibrated to provide biomass estimates where forest is delineated at a scale greater than 0.2 ha (i.e. where forest incorporates patches of non-forest land that are 0.2 ha or greater). Due to this, it was intended that both the HIR and NFMR methods use 0.2 ha as the scale at which proponents must delineate forest potential and forest cover when stratifying CEAs, both initially and in subsequent reporting periods.

- **Re-stratification requirements.** The boundaries of CEAs may need to be altered over time to ensure they continue to meet the above requirements. In particular, re-stratification is required where:
    - there is a change in management of vegetation in part of a CEA, or
    - part of a CEA is found not to have the potential to reach forest cover.[8]

After examining the methods—and drawing on information from proponents, the Department and the Regulator on method implementation over several years—the Committee found that aspects of the methods needed strengthening to better support the assumptions underpinning the use of FullCAM.

The three most significant issues identified by the Committee concern the inclusion of land in CEAs that:

- appears incapable of attaining forest cover in a timeframe consistent with model projections
- appears to lack the potential to attain forest cover, or
- already had forest cover when the project began.

The Committee found these issues could lead to forward- and/or over-crediting of projects under the regeneration methods.

The Committee stresses these concerns are not related to the FullCAM model *per se* or the way it is used to support the land sector component of the National Accounts. The Government's use of FullCAM is extensively reviewed each year by experts assigned by the UNFCCC. While the expert reviews have periodically made suggestions for the improvement of FullCAM, they have endorsed the accuracy of the FullCAM estimates used in the National Accounts, including in relation to the regeneration of native forest.

In addition to the above issues, the Committee identified several concerns about abatement estimation in the NFMR method. These related to the assumptions around cyclical clearing, crediting

[8] The methods contain other requirements to minimise discrepancies between modelled and actual sequestration, including restrictions on the clearing or thinning of vegetation in CEAs.

of pre-project abatement, the modelling of suppressors and treatment of fire events used for managing regeneration in the default baseline.

The alignment of modelled and actual abatement

Credits for areas with slow regeneration

The estimates of forest biomass provided by FullCAM are based on data from field measurements in forests across several thousand sites in Australia. Data on mature forest biomass were used, in conjunction with information on soil types and climate, to create a map of maximum potential biomass in Australia. FullCAM uses the maximum potential biomass layer and a prescribed growth function (the Tree Yield Formula) to estimate forest biomass growth through time towards the estimated maximum.

The rate at which forests regenerate is a function of a number of variables, including the soil seed bank, soil characteristics, climate, and land management practices (including feral animal grazing pressures). FullCAM's Tree Yield Formula currently accounts for the impacts of a number of these factors, including rainfall, temperatures and soil types. However, its coverage is incomplete.

Most notably, the default model configuration does not currently capture the impact of past management practices, the soil seed bank and grazing pressure. With adequate data, FullCAM could be configured to account for these factors. However, at present, they are not covered in the default model configuration used under the methods. Although less significant than the omission of these factors, the relative paucity of climate data in drier regions also means the model does not fully capture the variability in rainfall patterns across the landscape and the associated impacts on regeneration at the project scale. Due to these issues, under the default configuration, FullCAM generally models maximum biomass growth as being achieved 8–15 years after the commencement of regeneration events, regardless of on-ground conditions and management.[9]

The use of FullCAM is appropriate for the purposes of the National Accounts, where it seeks to model carbon accumulation at the landscape scale. However, inaccuracies can arise when it is used under its default configuration to estimate forest biomass at an individual project scale and appropriate adjustments are not made for the impacts of the variables that are not fully covered in the model. The methods contain some provisions that are intended to account for these factors. For example, the HIR FullCAM Guidelines require proponents to pause modelled regeneration when on-ground regeneration stops or slows due to suppression from grazing, pests or other causes. The relevant provisions reduced risks but they still left scope for material divergences to arise between the actual and modelled regeneration within individual CEAs.

Of particular concern to the Committee was the fact the methods do not contain sufficient provisions to constrain crediting where the amount of modelled forest biomass means forest cover should have been attained but forest cover is not present. There is a point in all forest systems where it becomes unlikely, and ultimately impossible, for there to be a certain amount of biomass without the vegetation having greater than 20 per cent crown cover and trees in excess of two metres. This point will differ depending on the forest type but there is a relationship between biomass and crown cover in all forest systems. Consequently, to ensure modelled estimates provide a reasonable and conservative approximation of actual regeneration, there needs to be explicit provisions in the

[9] The Department is currently undertaking work with the CSIRO to improve FullCAM's growth predictions for natural regeneration. This is part of the continuous improvement process that is followed to ensure FullCAM and Australia's National Accounts reflect the best available science on emissions and removals. Due to this ongoing process, the accuracy of FullCAM's estimates of the rates of regeneration is likely to improve through time.

methods to limit crediting where forest cover has not been attained despite the amount of modelled biomass suggesting it should be present.

If on-ground regeneration is slower than the rate predicted by FullCAM, the modelled level of biomass that should correspond to the attainment of forest cover could be reached much earlier than actually occurs. This discrepancy can occur even where actual and modelled regeneration commence at the same time. However, any gap between modelled and actual abatement would potentially be exacerbated by the modelling of regeneration prior to the commencement of project activities, as permitted under the methods.

The Department commissioned the CSIRO to undertake an analysis of the relationship between biomass and crown cover to identify the timeframe over which forest cover should be attained to ensure consistency with FullCAM's biomass estimates (Larmour et al. 2018). The Queensland Government also undertook a similar analysis using a smaller dataset (Queensland Government 2018). The analysis found forest cover in the areas in which projects are currently located should be attained by the time carbon in the trees (above and below ground) and the associated debris pool reaches approximately 3.6–5.5 tonnes per hectare.

According to simulations from the current version of FullCAM (Figure 2.1), 3.6–5.5 tonnes of carbon per hectare in the tree and debris pools for above and below ground biomass—the point at which CEAs should attain forest cover—corresponds to unhindered regeneration of 8–11 years for typically-located NFMR projects and 10–14 years for such HIR projects. The model locations used in these simulations are shown in Figure 2.2.

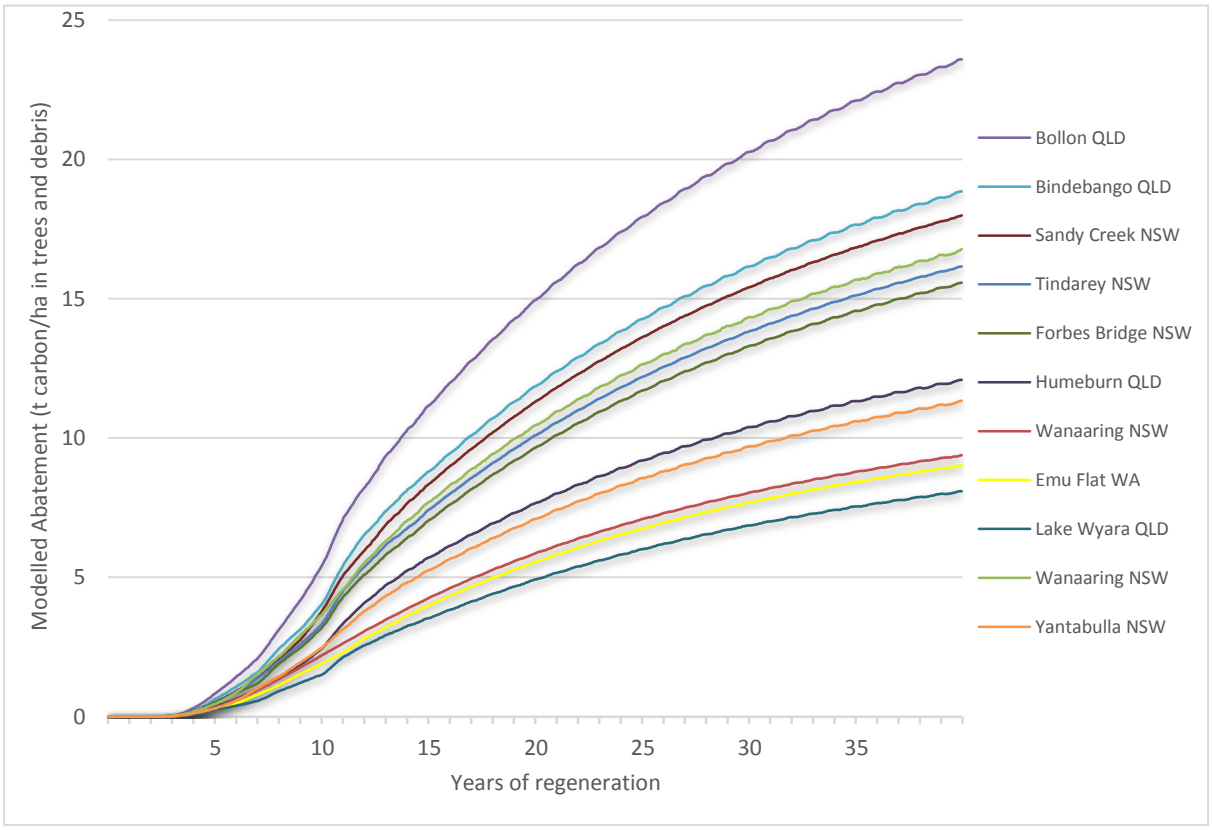
Data from NFMR projects shows they have already modelled 18 years of regeneration on average because they are able to model regeneration starting from when regeneration first occurs after the most recent clearing event. Most HIR projects have modelled 7–9 years of regeneration to date because they have typically nominated the point of regeneration as occurring in 2009–11, a period of high rainfall.

The Committee considered analysis of regeneration in 83 HIR and NFMR projects, based on National Accounts mapping from satellite imagery, which provides a guide to how CEAs may be progressing towards forest cover. Although these CEAs have been modelled as regenerating for a number of years, the mapping suggests a significant proportion of the CEAs assessed may have no sparse woody vegetation or forest cover (National Accounts dataset 2018).

Between 2010 and 2017, the area within the CEAs classed by the National Accounts as having sparse woody vegetation or forest cover increased by only 12 per cent—to 24 per cent forest cover and 28 per cent sparse vegetation—while 48 per cent was still classed as having no woody vegetation.

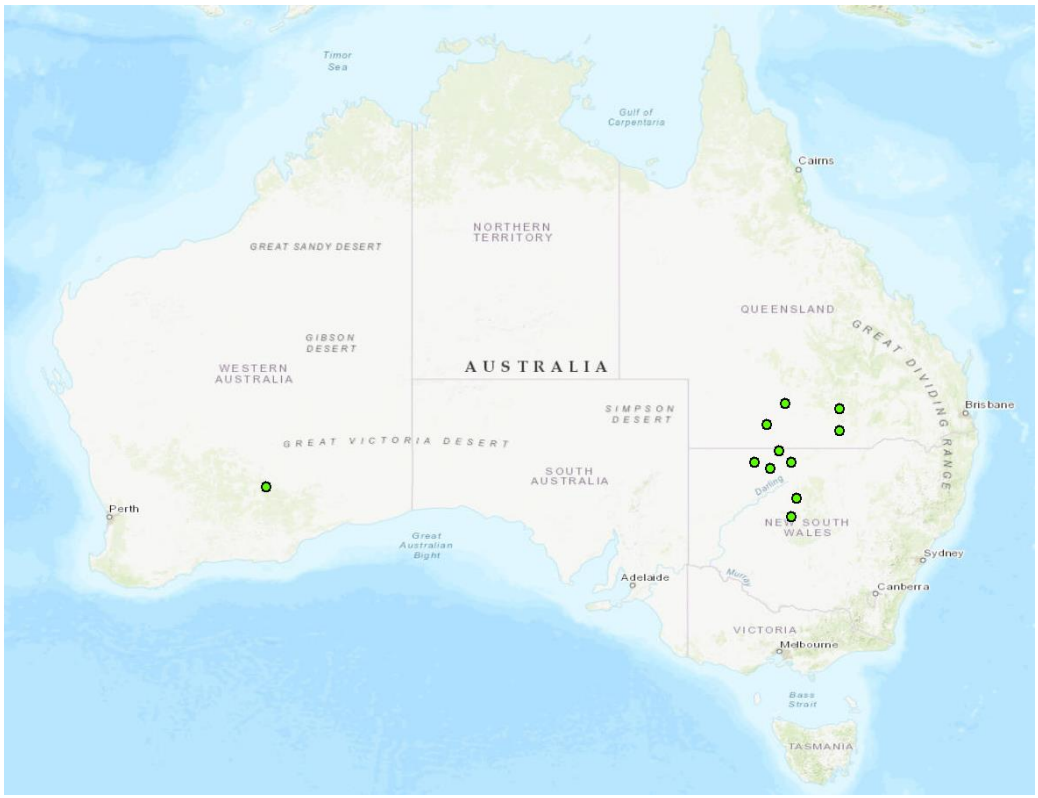
Given the data above indicating CEAs should attain forest cover within 15 years of regeneration, and the fact that NFMR and HIR projects already have an average of 18 and 7–9 years of modelled regeneration, respectively, the Committee was concerned that only 24 per cent of the land within the CEAs sampled is classed as having forest cover.

Figure 2.1: Modelled abatement for 11 locations representing the geographical span and variability in regeneration rates of HIR and NFMR projects



Source: 2016 Public Release of FullCAM using standard parameters for modelling a regeneration event beginning in 2000 (year 0) as per the HIR and NFMR FullCAM Guidelines. Locations modelled were informed by information on actual project locations from the Regulator.

Figure 2.2: Approximate map of 11 model locations used to represent the geographical span and variability in regeneration rates of HIR and NFMR projects



Given the range of factors that determine the rates and success of regeneration, variability in forest cover in CEA is to be expected, particularly when most projects are still less than five years old. However, forest cover should be attained in timeframes consistent with the rates of regeneration typically estimated by FullCAM for regeneration project regions, i.e. within a maximum of 15 years. The absence of a clear mechanism in the methods to constrain crediting for projects with slow regeneration undermined the accuracy of abatement estimates and suggested the assumptions underpinning the estimates might not be conservative, as required by the offsets integrity standards.

By the time of the review, the Regulator had begun developing guidelines setting out its expectations regarding stratification, evidence and recordkeeping for new and existing HIR and NFMR projects. These guidelines will help address the risk of forward- and/or over-crediting associated with areas of slow regeneration, as well as the risk associated with the inclusion of areas lacking forest potential or with pre-existing forest cover (discussed below).

To further mitigate the risk of forward- and/or over-crediting for areas where regeneration is slow, the Rule has been amended to provide clarity around the timeframes within which land under HIR and NFMR projects must attain forest cover. The amendments to the Rule—which apply to existing and new projects—restrict crediting where CEAs do not meet requirements for attaining forest cover by preventing the Regulator issuing a certificate of entitlement. A certificate of entitlement entitles its holder to receive credits based on the amount of abatement achieved by a project during a reporting period covered by an offsets report. Under s. 15(2) of the Act, the Regulator cannot issue a certificate of entitlement unless satisfied about a number of requirements. Further details of the changes to the Rule and Regulator's proposed guidelines are provided in Box 2.1.

Box 2.1: The Rule amendments and the Regulator's guidelines

Rule amendments

Under the Rule amendments, land under existing HIR and NFMR projects (those registered before 15 August 2018) is required to attain forest cover by 15 years after the declaration of the project, with some exceptions where regeneration has been relatively slow under the modelling. The amendments require 90 per cent of the area of each CEA to reach 20 per cent crown cover within the 15-year period and limit crediting for CEAs whose forest cover has not attained this benchmark. The amendments have no effect on crediting for CEAs that have reached forest cover within 15 years. Proponents can re-stratify CEAs so that crediting is only limited for areas of CEAs that have not reached forest cover.

For projects registered after 15 August 2018 or land added to an existing project after 15 August 2018, the same requirement applies but the 15-year period has a different starting point. The 15-year period starts at the relevant CEA's forest regeneration modelling commencement date. The Rule requires that forest cover be assessed at the 0.2 ha scale in assessing the attainment of forest cover (and in excluding pre-existing forest cover).

The amendments make allowances for projects affected by disturbances or pauses in regeneration by allowing for the date of the test to be extended by up to five years for 'eligible growth disruptions'. This supports the principle that regeneration projects should be undertaken on land with existing forest potential that is capable of attaining forest cover. The Rule also ensures that the forest attainment date falls no later than five years prior to the end of the crediting period, except where regeneration commences after the start of the crediting period.

The amendments are supported by data from the CSIRO and the Queensland Department of Environment and Science regarding the relationship between biomass and forest cover. They include provisions that seek to ensure vegetation in low productivity areas is required to attain forest cover within timeframes realistic for those conditions. In particular, modelling needs to show the CEA has more than five tonnes of carbon per hectare for the forest cover requirement to apply.

The Rule also seeks to clarify the additional information necessary to demonstrate—in offsets reports to the Regulator—that the requirements in relation to forest potential (in the methods) and forest cover attainment (in the Rule) are met. Under the Act, offsets reports must be provided at intervals of no longer than five years.

Regulator guidelines

The guidelines will require proponents to provide information at five-yearly intervals ('gateways') to demonstrate land within CEAs continues to have forest potential and has made progress towards attaining forest cover. If proponents cannot demonstrate adequate regeneration, the guidelines say the Regulator may ask for more evidence to demonstrate the validity of forest potential claims, allow more time to demonstrate regeneration, choose not to issue further ACCUs and (in some circumstances) ask proponents to relinquish ACCUs previously issued. The guidelines will also help proponents identify, and remove from projects, areas of land that have forest cover that predates a project or lack forest potential.

The guidelines will require forest areas to be defined at the 0.2 ha scale for the purpose of excluding pre-existing forest cover and evaluating the attainment of forest cover. However, forest potential is able to be assessed at scales greater than 0.2 ha.

A further contributing factor to the risk of forward- and/or over-crediting for areas where regeneration is slow is the treatment of suppressor and disturbance events in the FullCAM Guidelines. Under the HIR FullCAM Guidelines, where regeneration slows or stops due to a suppression disturbance event like grazing or disease, proponents are required to model a growth pause, which stops growth in the model. Information provided by the Regulator suggests that, to date, these requirements have not been applied consistently by proponents.

To promote consistency and ease of implementation, the Committee suggests clarifying the 'growth pause' event in the HIR FullCAM Guidelines. Particular attention should be given to the modelling of suppressors in the pre-project modelling period, when suppression factors, such as heavy livestock grazing, have not been removed through project implementation.

In the case of the NFMR method, the NFMR FullCAM Guidelines previously did not contain explicit requirements for suppressors to be modelled. To address this, the NFMR FullCAM Guidelines were amended to include mirror provisions to those contained in the HIR FullCAM Guidelines, which apply to all future offsets reporting periods. Any future changes to the HIR Guidelines to promote consistency and ease of implementation should be replicated in the NFMR Guidelines.

The Committee considers the amendments to the Rule and FullCAM Guidelines should sufficiently mitigate the risk of the forward- and/or over-crediting associated with slow regeneration for new projects if implemented as intended. The different initiation dates for the 15-year forest cover attainment period in the Rule, and the differential treatment of suppressors in the FullCAM Guidelines for previous offsets reports, mean there will be a higher risk of forward- and/or over-crediting for existing projects than new projects. This is a particular concern for the NFMR method, which allows for significant backdating of the forest regeneration modelling commencement date (see below for further details).

Variations should be made to embed the key requirements from the Rule amendments and Regulator guidelines—that regeneration in CEAs must be assessed at five-yearly gateways and attain forest cover within a prescribed timeframe—in both of the methods. The five-yearly gateways should place clear requirements on the levels of forest cover or biomass that must be present for CEAs to continue to be eligible to receive credits.

The gateways should be primarily based on forest cover but give proponents the option of direct measurement to calculate biomass where CEAs do not satisfy the crown cover requirements. The option for direct measurement will need to be governed by appropriate protocols on data collection and ensure the exclusion of mature onsite vegetation.

The Committee notes that the 15-year timeframe used in the Rule and Regulator guidelines is based on the relationship between biomass and crown cover in current areas of high method uptake, in rangeland regions. The Rule and Regulator guidelines may require further changes to account for the prospect of regeneration projects being developed in other regions. This is particularly the case for higher rainfall areas where the necessary timeframe for attaining forest cover is likely to be significantly less than 15 years after the commencement of regeneration.

To ensure the methods remain robust, the Committee recommends tailored gateways be developed for all areas in which the projects can be undertaken. Due to this, the variation to the methods should be made in a way that allows for the prescribed timeframes to be readily updated to account for different forest types and improvements in the science.

In the course of varying the methods to incorporate the gateways, consideration should be given to including a provision that deems land that has not attained forest cover by the third gateway (as adjusted for growth pauses) to not have forest potential. Consideration should also be given to

including amendments in the methods to provide greater clarity around the treatment of suppressors.

Finding 4

There is a risk of forward- and/or over-crediting associated with the regeneration methods that stems from the inclusion of land in CEAs that:

- appears incapable of attaining forest cover in a timeframe consistent with model projections
- appears to lack the potential to attain forest cover, or
- already had forest cover when the project began.

The methods prohibit the inclusion of pre-existing forest cover and areas without forest potential in CEAs. To reinforce this, the Regulator will soon publish guidelines (applicable to both methods) to clarify the procedures for the identification and removal of such areas from CEAs. The guidelines will also require regeneration to be assessed at five-yearly intervals to facilitate the staged removal of areas that lack forest potential. These intervals serve as 'gateways' where certain requirements must be satisfied for CEAs to continue to receive credits and remain eligible.

To further mitigate the risk of forward- and/or over-crediting for areas where regeneration is slow, the Rule has been amended to provide clarity around the timeframes within which land must attain forest cover. The amendments to the Rule—which apply to existing and new projects—restrict crediting where CEAs do not meet requirements for attaining forest cover within a prescribed period. The amendments to the Rule sufficiently mitigate this aspect of the forward- and/or over-crediting risk for new projects.

The five-yearly gateways for assessing regeneration and the forest cover attainment timeframes have been designed for the regions of Queensland and New South Wales where most of the existing regeneration projects are located. The requirements should be tailored for each region in which projects can be undertaken on the basis of the relationship between biomass and crown cover in relevant forest types.

Recommendation 3

The Government should vary the regeneration methods to require:

- regeneration in CEAs to be assessed at five-yearly gateways, as will be required under the Regulator's guidelines
- CEAs to attain forest cover within a prescribed timeframe, consistent with the amendments to the Rule.

The variation to the methods should be made in a way that allows for the prescribed timeframes to be readily updated to account for different forest types and improvements in the science.

Inclusion of areas without forest potential

The inclusion within CEAs of land that lacks forest potential could also lead to forward- and/or over-crediting under both methods. This is because including such land increases the area over which abatement is calculated but on which forest does not regenerate. The Regulator has detected a number of CEAs with areas that lack forest potential or have questionable forest potential.

The methods provide that only areas with forest potential can be included in CEAs. In this regard, s. 16(2)(c)(iii) of the HIR method provides that CEAs 'must … consist only of land … that has forest potential'. Section 3 of the method provides that

> a particular area of land has forest potential if: (a) the land has an area of at least 0.2 of a hectare; and (b) the land has trees that, having regard to the location and characteristics of the land, are reasonably likely to: (i) reach 2 metres or more in height; and (ii) provide crown cover of at least 20% of the land.

Trees are defined for these purposes as perennial plants that have primary supporting structures consisting of secondary xylem (HIR, s. 3; NFMR, s. 1.3).

The NFMR method contains similar provisions (ss. 1.3 and 2.4(5)) that require eligible land to have forest potential and provide that land has forest potential if it is at least 0.2 ha and has trees that have the potential to reach at least two metres in height and provide crown cover of at least 20 per cent.

While the methods explicitly require the land in CEAs to have forest potential, in some cases projects have included bare land without forest potential in CEAs based on the notion that forest potential and forest cover should be assessed using averages over land areas larger than 0.2 ha. For example, according to this argument, a 10 ha CEA with 2.5 ha that contains 100 per cent crown cover and 7.5 ha with no crown cover should be assessed as having forest cover across the entire 10 ha area.

In support of the argument that forest potential and forest cover should be assessed in this manner, some proponents and aggregators have pointed to the definitions of forest in the methods, which refer to forest having to be 'at least' 0.2 ha or a 'minimum area' of 0.2 ha and provide crown cover of 'at least' 20 per cent of the land (HIR, s. 3; NFMR, s. 1.3).

While the relevant provisions of the methods should be clearer, the Committee considers they require forest potential and forest cover to be assessed at the 0.2 ha scale. The alternative literal interpretation of the references to 'at least' and 'minimum area' does not have sufficient regard to the purpose of the methods and context of the relevant provisions. Taken to extremes, it could result in forest regeneration being modelled and credited across vast areas of bare land. The Committee does not believe this was the intent of the methods.

The methods rely on FullCAM, which was calibrated to estimate forest biomass on 0.2 ha areas containing trees of two metres or more in height that provide crown cover of at least 20 per cent of the land. It was not calibrated to estimate forest biomass across larger areas containing significant patches of non-forest land. As stated in the 2008 National Inventory Report, FullCAM's biomass estimates 'reflect the area under canopy … not an average that includes 'gaps' between areas of tree canopy' (Department of Climate Change and Energy Efficiency 2010, p. 46). Due to this, the assessment of forest cover at a scale greater than 0.2 ha would lead to the issuance of credits for the sequestration of carbon in biomass that does not exist, something that is manifestly inconsistent with the objects of the methods.

In addition, the NFMR method explicitly requires all areas of land greater than 0.2 ha on which regeneration does not occur to be removed from CEAs. This requirement is a clear expression of the intent for forest to be assessed at the 0.2 ha scale for all purposes. Further, the Explanatory Statement for the HIR method includes an example in relation to s. 16 (concerning CEAs and CEA parts) that explains that land differing at the 0.2 ha scale should be stratified separately.

Despite the methods requiring forest potential and forest cover to be assessed at the 0.2 ha scale, the ambiguity about this issue has led to the inclusion of areas that lack forest potential in CEAs. This issue has been partly addressed by the amendments to the Rule, which, as discussed, limit crediting for CEAs that do not attain forest cover (defined at the 0.2 ha scale) within a prescribed period. The

five-yearly gateway assessments that will be required under the Regulator's guidelines will also ensure there is appropriate progress towards forest cover and, where areas of material underperformance are identified, proponents will be required to remove these areas through re-stratification. Further, in some instances, the Regulator has already required proponents to re-stratify CEAs to exclude areas of bare land that manifestly do not contain forest potential.

A complication associated with the existing provisions of the methods regarding forest potential is that, at the time of the initial stratification, they require each 0.2 ha area within a CEA to contain trees that are reasonably likely to become a forest. However, the Regulator's guidelines will not require *forest potential* to be assessed at the 0.2 ha scale, allowing instead for assessment of forest potential at scales greater than 0.2 ha at the point of initial stratification, as well as at years five and 10 (i.e. the first two gateways specified in the guidelines). There are three reasons why the Regulator intends to adopt this approach:

- with existing technology, proponents are not always able to cost-effectively demonstrate the existence of trees across each 0.2 ha in the CEAs in their project areas, many of which cover thousands of hectares
- the Regulator has no practical way of evaluating strict compliance with the forest potential requirements when defined at the 0.2 ha scale
- the gateway assessments that will be required under the Regulator's guidelines, and the imposition of constraints on crediting for CEAs that do not attain forest cover within a prescribed period (as per the Rule changes), will reduce the need for a high level of assurance that each 0.2 ha area contains trees that have the potential to become a forest.

The approach taken by the Regulator to the assessment of forest potential and the application of the gateways is pragmatic and will ensure the forest potential requirements do not impose an unnecessary impediment to project uptake. However, it is not in strict accordance with the requirements of the method. To address this issue, the Committee recommends the Government vary both methods to ensure:

- forest and forest cover are assessed at the 0.2 ha scale for the purpose of excluding pre-existing forest and evaluating the attainment of forest cover
- forest potential can be assessed at a scale greater than 0.2 ha at the time of initial stratification and the first two assessment gateways, as per the Regulator's proposed guidelines.

Finding 5

The regeneration methods require forest potential and forest cover to be assessed at the 0.2 ha scale but it is impractical with existing technology for proponents and the Regulator to always assess forest potential in this manner. This is particularly the case at the time of initial stratification (project commencement), when regeneration may be in its initial stages and the trees on site may be limited to saplings.

By limiting crediting for CEAs that do not attain forest cover (defined at the 0.2 ha scale) within a prescribed period, the Rule amendments reduce the need for a high level of assurance at the time of initial stratification that each 0.2 ha area contains trees with the potential to attain forest cover. The Regulator's guidelines will also help by requiring the assessment of regeneration at five-yearly gateways and providing for the removal of areas that lack forest potential from CEAs.

The Regulator has taken a pragmatic approach that requires the attainment of forest cover and the existence of pre-existing forest cover—but not forest potential—to be assessed at the 0.2 ha scale. This approach should be reflected in variations to the methods.

Recommendation 4

The Government should vary the regeneration methods to:

- ensure forest is assessed at the 0.2 ha scale for the purpose of evaluating the attainment of forest cover and excluding pre-existing forest cover
- ensure forest potential can be assessed at a scale greater than 0.2 ha prior to the assessment of forest cover attainment.

Inclusion of pre-existing forest cover

As discussed in section 2.2, information from offsets reports and other available sources suggests some CEAs have included pre-existing forest cover. For example, the Department's analysis of National Accounts tiles SG55 and SH55 found forest cover in the CEAs of a sample of HIR and NFMR projects was approximately 14–15 per cent in 2013 when the methods first commenced and 5–7 per cent in 2010.

These findings are indicative, and reasons for finding forest cover in some areas could include some projects having commenced as early as July 2007 (as allowed under the CFI), and 2010–13 coinciding with high rainfall years for the relevant regions. However, the inclusion of pre-existing forest cover within CEAs creates a risk that the number of credits issued to proponents of those projects could exceed the amount of carbon sequestered in biomass due to the project activities.

The methods clearly require the exclusion of pre-existing forest cover. In this regard, s. 4(1)(a) of the HIR method limits eligible land to land that 'did not have forest cover at any time during its baseline period' (i.e. the 10 year period prior to the application for registration). Similarly, s. 2.4(5) of the NFMR method states that, in order for land to be eligible, at the date of the application for registration it must have forest potential and native vegetation, and must not have forest cover.

It has been proposed to the Committee by project proponents that the primary reason for the inclusion of pre-existing forest cover in the CEAs of HIR and NFMR projects has been the tendency to rely substantially, or solely, on National Accounts data to stratify their CEAs (without verifying the accuracy of this data using other sources). This explanation is plausible, as previous approaches that were used to detect forests for the purposes of the National Accounts may have underestimated forest extent for particular forest or soil types within the semi-arid regions in which most projects are located.[10] However, the extent of pre-existing forest cover detected in the sample of HIR and NFMR CEAs using National Accounts data suggests this reasoning is incomplete.

To support implementation of the method requirements, the Regulator's guidelines (supported by the Rule amendments) will require proponents to identify and remove any areas of land with forest cover that predates a project. The guidelines will clarify the Regulator's expectations regarding the provision of evidence and establish an 'evidence hierarchy' in which approved mapping may need supplementation with remote sensing and/or field data on crown cover, depending on the circumstances. The Committee supports this approach as a way to increase confidence in estimates of carbon abatement under the methods, while also encouraging the adoption of new technology.

The Regulator's approach has already resulted in the status and boundaries of some CEAs that were previously audited being reviewed using new higher resolution imagery. The Committee is aware that a number of proponents and aggregators have objected to these re-evaluations by the Regulator

[10] The National Accounts forest extent and change data are continuously improved and kept time-series-consistent in line with the UNFCCC requirements. Due to this, there is increased confidence in the absence of bias in the latest forest extent and change data.

on the grounds the changes are retrospective. The Rule amendments and the Regulator's proposed guidelines address these concerns by allowing proponents, in certain circumstances, to maintain CEA stratification undertaken using only National Accounts data. However, where this occurs, the Rule requires the proponent to subsequently use the same approach to detect forests for the purposes of demonstrating forest attainment.

The logic of this solution is that, if the approach that was used for the purposes of initially stratifying CEAs and excluding pre-existing forest cover was conservative in the detection of forests, it should also be conservative in the detection of regenerated forest cover. Therefore, what may be gained during the initial stratification of CEAs through the inclusion of pre-existing forest cover should be at least partly offset by losses in the assessment of whether land has attained forest cover. This should help mitigate the risk of forward- and/or over-crediting.

The Committee believes the exclusion of pre-existing forest cover from CEAs is necessary to maintain the integrity of the methods. Due to this, ideally, all pre-existing forest cover would be excluded from the CEAs. However, the Committee acknowledges that, in some cases, the use of an alternative approach that lessens the impacts of the adjustments on proponents may be warranted. In these cases, the Committee supports the approach adopted in the Rule and the Regulator's proposed guidelines, which ensures consistency in detecting forest cover for the purposes of initial stratification and forest cover attainment.

NFMR crediting: pre-project carbon abatement and the project baseline

Cyclical clearing assumptions

As discussed, the NFMR method is premised on the assumption that, in the absence of the incentive provided by the ERF, relevant CEAs would be subject to cycles of natural regeneration and human-induced re-clearing over periods not exceeding 15 years. The primary test used in the method to support this assumption is the single clearing event test.

The available historical evidence to support this test is relatively weak. Analysis undertaken on behalf of the Committee using National Accounts data for southwest Queensland and western New South Wales (National Accounts tiles SG55 and SH55) found only 23 per cent of land deforested over the period 1972–2017 was subject to multiple forest clearing events (Table 2.2). Of the remaining 77 per cent that was deforested once over the period, only 17 per cent regenerated to attain forest cover—the remainder was without forest cover over the period analysed.

Table 2.2: Extent and rates of forest loss and subsequent regeneration in National Accounts tiles SG55 and SH55, 1972–2017

	Area (ha) in tile SH 55	Area (ha) in tile SG 55	Total (ha)
Total area in tiles	25,751,136	26,725,344	52,480,499
Area cleared	1,504,298	5,687,734	7,192,032
Area cleared two or more times	448,930	1,214,826	1,663,756
Areas cleared once that remained non-forest	838,876	3,729,449	4,568,325
Areas cleared once with secondary forest	216,491	743,459	959,950
Of areas cleared, percentage cleared multiple times	30%	21%	23%

Source: National Accounts Forest Extent/Disturbance Layers 1972–2017 and associated FullCAM modelling data (National Accounts dataset 2018) concerning deforestation (forest cover converted to either sparse vegetation or non-woody class) and regeneration to forest cover (non-woody or sparse converted to forest cover) events.[11]

The absence of evidence of repeated cycles of forest regeneration and re-clearing in the National Accounts data could be attributable to either:

- landholders undertaking vegetation clearing on deforested land before any regeneration attains forest cover, which would be consistent with the single clearing event test, or
- the land being subject to non-clearing related suppressors that prevent the regeneration of woody vegetation and obviate the need for re-clearing, which would be inconsistent with the single clearing event test.

To test these hypotheses, further analysis of National Accounts tiles SG55 and SH55 was undertaken to evaluate the extent to which land subject to woody vegetation clearing, not just the conversion of forest to a non-forest state, was subsequently re-cleared over the period 1972–2017.[12] Of the 12.9 million ha that was detected as having been cleared of woody vegetation, only 2.5 million ha (19 per cent) was subject to multiple clearing events (Table 2.3).

Table 2.3: Extent and rates of woody vegetation clearing in National Accounts tiles SG55 and SH55, 1972-2017

	Area in tile SH 55	Area in tile SG 55	Total
Total area in tiles	25,112,674	25,987,169	51,099,844
Area cleared	4,793,241	8,098,720	12,891,961
Area cleared two or more times	832,689	1,625,253	2,457,942

Source: National Accounts Forest Extent/Disturbance Layers 1972–2017 (National Accounts dataset 2018) concerning loss of woody vegetation events (either forest cover or sparse vegetation converting to non-woody status).

Ideally, the analysis would be confined to land that was deforested in the past. That is, it would evaluate the extent to which land that was deforested (converted from forest to non-forest rather than forest *or* sparse vegetation to non-forest) has been subject to subsequent regeneration and woody vegetation clearing. Unfortunately, these data were not available to the Committee. However, when the analysis of woody vegetation clearing was confined to the CEAs of reported NFMR projects—which must have been subject to a previous deforestation event to be eligible—it produced similar results. Only 15 per cent of the land in the reported NFMR CEAs was found to have been subject to more than one clearing event.

The lack of historical evidence to support the single clearing event test potentially raises questions about the NFMR method's compliance with the offsets integrity standards, particularly those concerning additionality, conservatism and evidence.

[11] Note that National Accounts data is not definitive and there may be instances of forest loss and regeneration that have not been detected and vice versa. For information on the three-class categorisation of vegetation (forest, sparse or non-woody) see Department of the Environment and Energy (2018), pp. 137-38.

[12] Woody vegetation clearing events involve either the conversion of forest (≥20 per cent crown cover) to a non-woody condition (<5 per cent crown cover) or the conversion of sparse woody vegetation (≥5 per cent and ≤20 per cent crown cover) to a non-woody condition.

The lack of historical evidence to support the single clearing event test does not pose an additionality risk because, without the changes in land management practices prompted by a project, it is likely most eligible land would not attain forest cover. As the data in Table 2.4 show, in the region where projects have been undertaken to date, where land has been deforested, it has generally remained in a non-forest condition for a prolonged period. This provides sufficient confidence that, by supporting the regeneration of native forest, projects are incentivising sequestration that would not otherwise occur.

The lack of historical evidence to support the single clearing event test does not pose a risk to the conservatism of the method. Indeed, because proponents must model a baseline that assumes eligible land will be subject to cyclical forest regeneration and re-clearing on periods not exceeding 15 years over the following 100 years, the method generates more conservative abatement estimates than would otherwise be the case.

It could be argued that the lack of historical evidence to support the single clearing event test means the method should fail the 'clear and convincing evidence' standard. This standard requires 'a method specified in, or ascertained in accordance with, a methodology determination … should be supported by clear and convincing evidence'. However, the application of this standard to counterfactual assumptions like the single clearing event test is problematic because, by their very nature, counterfactuals cannot be proven or disproven (Lebow 2000). In this case, the single clearing event test involves a projection of what would occur on land subject to projects if the projects had not been undertaken. There can be no clear and convincing evidence of such a projection, only a judgment of whether it is reasonable or plausible.

Although the available historical evidence to support the single-clearing event test is weak, given the context in which it is used and the consequences of its application, the Committee does not believe it results in the method failing the clear and convincing evidence test. Having said this, the Committee considers the method should be varied to require eligible land to have been subject to:

- a deforestation event that converted the land from a forest to a non-forest condition for pastoral purposes (as per the existing method)
- a woody vegetation clearing event in the 15 years prior to registration.

The available research suggests that, in Queensland where most land clearing occurs, the longer the time period since the last clearing event, the less likely the land will be cleared again (Butler and Halford 2016). The inclusion of the requirement that eligible land must have been subject to a woody vegetation clearing event in the past 15 years would ensure that the method is only applicable to land subject to ongoing clearing cycles as originally intended and simultaneously bolster the method's additionality. This reduces the likelihood of the method being applied in land management scenarios for which it was not designed.

In tandem with this variation, the method or Regulations should be amended to exclude land that has been subject to woody vegetation clearing, not just deforestation, in the past seven years (or five years where the land has changed ownership), to ensure proponents do not clear vegetation in order to make land eligible.

A further point of note from the analysis of the National Accounts data for tiles SG55 and SH55 is that land detected as having been subject to multiple clearing events appears to conform to the timing assumptions of the method regarding clearing cycles (i.e. clearing occurs roughly every 15 years). The NFMR method proposal endorsed by the former Domestic Offsets Integrity Committee in 2013 quoted the National Inventory Report 2011 that 'the average re-clearing cycle is eight to 11 years' (Department of Industry, Innovation, Climate Change, Science, Research and Tertiary Education

2013, pp. 122-3) and also said the data from that report demonstrated that '75 per cent of re-clearing happens within 15 years of the last regrowth event'.

The analysis of National Accounts data conducted on behalf of the Committee found that, where land within tiles SG55 and SH55 was cleared more than once, the average re-clearing interval was 15 years (National Accounts dataset 2018 based on deforestation events detected). Repeatedly cleared land re-grew to forest within seven years on average, and remained forest for eight years before being re-cleared. While acknowledging that the analysis is not comprehensive, it is of note that the seven-year regeneration period aligns well with the results of the CSIRO analysis on the relationship between FullCAM's biomass estimates and forest cover, which showed 20 per cent crown cover should be attained within 8–11 years of unhindered regeneration in the region where NFMR projects are located.

Finding 6

The NFMR method is premised on the assumption that, in the absence of the incentive provided by the ERF, relevant CEAs would be subject to cycles of natural regeneration and human-induced re-clearing over periods not exceeding 15 years. The primary test used in the method to support this assumption is a requirement that land must have been cleared of native forest at least once (the 'single clearing event' test): if it was deforested in the past, it is assumed that, in the absence of the project, it will be re-cleared periodically in the future.

The available historical evidence to support this test is relatively weak. Given the context in which the test is used, the weak evidentiary base does not undermine the integrity of the method—in most cases, it is likely to lead to under-crediting of projects. However, the test could be made more robust by including an additional requirement that eligible land must have been subject to a woody vegetation clearing event in the 15 years prior to registration.

Recommendation 5

The Government should vary the NFMR method to require eligible land to have been both deforested at some point in the past and subject to a woody vegetation clearing event in the 15 years prior to registration.

Finding 7

The available data suggest that, where land has been cleared more than once in the region in which NFMR projects are currently located, on average, it tends to be cleared every 15 years, consistent with the re-clearing assumptions in the method. The re-clearing assumptions provide the basis for the calculation of net emissions in the baseline scenario.

Pre-project carbon abatement

Under the NFMR method, proponents are able to obtain credits for modelled regeneration that occurs prior to the initiation of the project.

The NFMR method requires regeneration to be modelled in FullCAM from a date that corresponds with the establishment of forest potential within the CEA. The method also requires the land not to contain forest cover at the date of the commencement of the project. Together, these two requirements were intended to ensure the modelled regeneration provides a reasonable estimate of

actual pre-project regeneration and does not reach a level corresponding to a standing forest prior to the date of project commencement.

However, under the NFMR method and FullCAM Guidelines, it was previously possible to model regeneration commencing as far back as the day after the last comprehensive clearing event, regardless of how long ago that may have occurred. This could result in an incongruity, where proponents are credited on the basis of modelled regeneration that should have attained forest cover yet the method prohibits the land from containing forest cover.

To address this issue, in December 2017, the FullCAM Guidelines were amended to limit pre-project modelling to 14 years for new projects, a limit derived from the baseline assumptions of the method. Subsequent analysis undertaken by the CSIRO in 2018 suggests that forest cover is generally attained by regenerating vegetation once the carbon per hectare in the tree and debris pools for above and below-ground biomass reaches approximately five tonnes. In areas where NFMR projects are typically undertaken, this figure corresponds to 8–11 years of regeneration according to FullCAM estimates. Due to this, the FullCAM Guidelines were amended again in March 2019 to limit the modelling of pre-project regeneration to 10 years for new projects. As discussed above, the FullCAM Guidelines were also amended to require new projects to model suppression disturbance events like grazing to ensure accredited abatement reflects actual regeneration.

Data provided by the Regulator on NFMR projects in February 2019 suggest 85 per cent of reported NFMR CEAs (from 21 projects) have modelled pre-project regeneration for greater than 10 years, with 37 per cent modelling more than 15 years of pre-project regeneration (Table 2.4). In most cases, the practical consequence of the extended pre-project regeneration modelling is that projects will be forward- (rather than over-) credited. This is because the CEAs will still be required to attain forest cover within the time periods prescribed under the Rule and most of the projects (23 of 35) are 100 year projects and are unlikely to be credited for all vegetation growth over that period. The changes to the FullCAM Guidelines will ensure this issue does not reoccur.

Table 2.4: Length of modelled pre-project regeneration, reported NFMR CEAs, February 2019

	Greater than 10 years	Greater than 15 years	Greater than 20 years	Greater than 25 years	Total number of CEAs
Number	245	106	54	1	288
Proportion	85%	37%	19%	0%	100%

Source: Clean Energy Regulator, 2019.

Fire in the NFMR baseline

To calculate net abatement under the NFMR method, proponents are required to deduct the baseline carbon stocks from the estimated carbon stocks in the regenerating forest. Therefore low baseline carbon stocks allow greater net abatement to be credited. One way of lowering the baseline carbon stocks in the NFMR method is by including fire in the baseline scenario. Modelling management fire and windrow and burn events (collectively referred to in this report as 'planned fires') in the baseline scenario reduces the baseline amount by approximately 50 per cent.

Section 4.12(5) of the NFMR method states that:

> [i]f documentary evidence shows, to the satisfaction of the Regulator, that fire was used to suppress regrowth on land on the same pastoral property as the CEA, fires of the type and frequency specified in the FullCAM Guidelines may be included in the default baseline management event scenario.

To give effect to this provision, the FullCAM Guidelines previously provided that:

> If project proponents can demonstrate that fire was used to suppress regrowth on land that is part of the same pastoral property as the CEA then:
>
> - a management fire event may be added occurring 7 years after each regeneration event; and
> - a windrow and burn fire event may be added occurring 6 months after each clearing event.

Analysis undertaken on behalf of the Committee using National Accounts data suggests the frequency of fire in NFMR CEAs has been overestimated by projects in the baselines, potentially leading to forward- and/or over-crediting of affected NFMR projects. The analysis found that, between 1972 and 2016, 25 of the 37 registered NFMR projects (registered as of the time the analysis was run) were affected by fire. However, all of the projects that had reported at the date of the analysis (February 2018) had modelled fire suppression in their baseline. This discrepancy could be attributable to a number of factors, including detection and compliance issues. The Regulator has an active compliance program in relation to the method that covers this matter. The Committee suggests continued attention be given to the issue to ensure it is resolved appropriately.

In addition to this issue, the fire suppression provisions in the method and the FullCAM Guidelines have allowed proponents to model planned fires in the baseline scenario across all CEAs on a property, regardless of whether planned fires occurred within each CEA. If proponents can demonstrate that fire was used to suppress regeneration on land on the same pastoral property as the CEA, fire suppression could be modelled in the baseline across 100 per cent of the CEAs under the project. However, an analysis of the existing NFMR projects conducted using National Accounts data found that only seven per cent of the area under NFMR projects was recorded as having experienced fire events over the period 1972 to 2016 (see Table 2.5 below).

During the course of the review the Committee highlighted its concern that the fire modelling provisions did not provide for conservative project crediting. In response to the Committee's concern, the Department amended the NFMR FullCAM Guidelines to limit the type and frequency of fires that may be included in the default baseline management event scenario. Where proponents cannot demonstrate that management fire has been used within the applicable CEA in the time since the last clearing event, they are restricted in terms of the type and timing of baseline fire modelling permitted.

The Committee is satisfied the amendments to the FullCAM Guidelines are a sufficient interim measure to mitigate this aspect of the risk of forward- and/or over-crediting for new projects, but notes a method variation is needed to provide a more comprehensive solution to the problem. The Committee recommends that the method be varied to ensure management fires are only modelled in a CEA where there is clear evidence such fires have occurred in the CEA in the time since the last clearing event. The extent of the modelled fires should also reflect the extent of the actual proven management fire events. For example, if the historic management fires affected only 50 per cent of the CEA, the modelled event should be confined to 50 per cent of the CEA.

Table 2.5: Area burnt inside and outside NFMR and HIR project areas from 1972 to 2016 as detected by the National Accounts fire extent layers*

	Projects burnt (% of all projects)	Unit	Total area	Total area burnt	Number of times area burnt				
					1	2	3	4	5
Inside HIR project areas	62 (29%)	%	100	2.3	2.2	0.1	0.0	0.0	0.0
		Ha	3,989,007	93,320	89,622	3,698	0	0	0
Outside HIR project areas*		%	100	8.2	6.0	1.5	0.5	0.1	0.0
		Ha	46,597,854	3,826,141	2,809,623	685,295	228,181	61,389	20,174
Inside NFMR project areas	25 (68%)	%	100	7.2	6.1	1.1	0.0	0.0	0.0
		Ha	349,130	24,970	21,212	3,757	0	0	0
Outside NFMR project areas*		%	100	7.8	5.8	1.4	0.5	0.1	0.0
		Ha	50,237,875	3,894,488	2,898,147	686,474	228,304	61,389	20,174

Source: National Accounts fire extent layers 1972–2016 and HIR and NFMR project area locations as at February 2018 (National Accounts dataset 2018). *Outside area refers to the remainder of the area within National Inventory tiles SG55 and SH55 not within a project area of the given method.

Finding 8

The NFMR method requires regeneration to be modelled in FullCAM from a date that corresponds with the establishment of forest potential within the CEA. The method also requires the land not to contain forest cover at the date of the commencement of the project. Together, these two requirements were intended to ensure the modelled regeneration provides a reasonable estimate of actual pre-project regeneration and does not reach a level corresponding to a forest (as defined by the method) prior to the date of project commencement.

However, under the NFMR method and FullCAM Guidelines, it was previously possible to model regeneration commencing as far back as the day after the last comprehensive clearing event, regardless of how long ago that may have occurred. This could result in an incongruity, where proponents are credited on the basis of modelled regeneration that should have attained forest cover yet the method prohibits the land from containing forest cover. In most cases, the practical consequence of this occurring is that projects would be forward-credited.

In December 2017, the NFMR FullCAM Guidelines were amended to limit the modelling of pre-project regeneration to a maximum of 14 years for new projects. However, subsequent analysis by the CSIRO indicated that NFMR CEAs should typically attain forest cover after reaching five tonnes of carbon per hectare (in tree and debris pools), which corresponds to 8–11 years of unhindered regeneration under FullCAM modelling for applicable areas. In response, the FullCAM Guidelines were amended again in March 2019 to limit the modelling of pre-project regeneration to 10 years for new projects.

Two other issues were identified with the FullCAM Guidelines. Firstly, they did not contain an express mechanism requiring proponents to reflect suppression or slowing of regeneration in the modelling. Both factors could potentially enable proponents to model higher levels of abatement by project commencement than has occurred and should be possible if the land meets the method's eligibility requirements. Secondly, they allowed proponents to model planned fires in the default baseline without evidence that such fires had occurred in the past in the relevant CEAs. To address these issues, the FullCAM Guidelines have been amended to:

- provide a mechanism to model suppression factors in future offsets reports
- restrict the type and timing of fire events that can be modelled for new projects in the absence of direct evidence for the applicable CEA.

The method should be varied to provide a more comprehensive solution to the issues associated with planned fires. However, the amendments to the FullCAM Guidelines are a sufficient interim solution.

Recommendation 6

The Government should vary the NFMR method to limit the modelling of planned fires in the baseline to evidenced fire events that occurred in the relevant CEA after the last comprehensive clearing event.

2.4 Other integrity risks

In addition to the primary risks to the integrity of the two regeneration methods identified above, the Committee has also examined the other integrity risks it considers relevant to ERF methods.

Project emissions

Submissions from stakeholders proposed that the emissions from fuel use for projects are immaterial and, therefore, it is not necessary to account for them. The Department's analysis of a sample of project reports supports this, finding that emissions were on average less than 0.02 per cent of total project abatement, generally totalling a few tonnes of CO_2-e. The Committee notes that, in the absence of projects, there would likely be fuel use emissions from land management of at least similar magnitudes.

On this basis, the Committee recommends that the Government remove the requirement in both methods to account for the emissions from fuel use associated with regeneration projects. Doing so would reduce costs for proponents without affecting the integrity of abatement estimates. Proponents would still need to account for project emissions due to fire.

Finding 9

Evidence from existing projects indicates that emissions from fuel use associated with regeneration projects are not material.

Recommendation 7

The Government should remove requirements in the regeneration methods to account for emissions from fuel use.

Leakage

Some stakeholders have raised concerns that the emissions reductions achieved under projects may be offset by changes in activities that have been triggered by the projects (project leakage). One example is where a landholder commits to cease clearing on land under a project but then clears adjacent land or other land in their 'portfolio' that would not have been cleared in the absence of the project.

Analysis undertaken by the Department using National Accounts data did not find any evidence of material project leakage. The Department examined vegetation cover data from a sample of 71 projects for indications of leakage since regeneration under projects commenced. This included looking at the levels of non-woody vegetation, sparse woody vegetation and forest cover in project exclusion areas (areas of non-implementation within the project area) to determine whether there were any indications that clearing had occurred within them.

Only two of the 71 projects examined showed a clear decline in sparse woody vegetation and/or forest cover from one year to another that did not appear to correlate with trends in the surrounding landscape. It is unclear whether this decline was due to clearing, tree dieback or some other disturbance event. Some projects showed small declines in woody vegetation (sparse vegetation or forest cover) in the exclusion areas but these were not of magnitudes that suggested broad-scale clearing had occurred. Given that project exclusion areas often comprise thousands of hectares, it is possible that smaller clearing events may be masked by broader area trends.

While the Department's analysis did not find evidence of material project leakage, it is not conclusive. It is possible that leakage has occurred but it has not been detected because of data or method limitations. The potential for project leakage should continue to be monitored.

Non-permanence

The Act requires all ERF carbon sequestration projects to maintain carbon stores for either a 100-year or a 25-year permanence period. The Act applies a 20 per cent discount to the number of credits issued to projects electing a 25-year permanence period. The discount reflects the potential cost to the Government of replacing lost carbon stores, where vegetation on project land is not maintained after the end of their permanence period. The Act allows for legislative rules to specify an alternative discount number.

Clearing woody vegetation for pastoral use is common in the regions where most projects have been undertaken. States have legislation to manage clearing of native vegetation but some project land does not have clearing restrictions. As mentioned above, research suggests that, in Queensland where most land clearing occurs, the longer the time period since the last clearing event, the less likely the land will be cleared again (Butler and Halford 2016). However, there remains a significant risk that some vegetation that regenerates under these methods will be cleared, and the carbon no longer stored, after the end of a 25-year permanence period.

In light of this risk, the Committee recommends the Department consider increasing the permanence discount. The Committee notes similar risks apply for other sequestration methods and suggests the Government should also reconsider the discount for those methods.

Proponents have sought the flexibility to be able to transfer projects from a 25-year permanence period to a 100-year permanence period, which could enable projects to receive the full amount of credits generated for offsets reports submitted after the transfer. The Committee suggests this proposal could provide an opportunity to mitigate some of the risk associated with a 25-year permanence period.

The Committee notes that there is an increased risk of forward- and/or over-crediting for projects with a 25-year permanence period. If projects with a 100-year permanence period regenerate at a slower rate than the modelled rate, continued vegetation growth beyond the 25-year crediting period would help meet the gap over time. However, if projects with a 25-year permanence period have slow growth and the vegetation is cleared at the end of the permanence period, actual abatement may not reach the amount credited. The improvements discussed in section 2.3 will help address this risk.

The Committee also notes that, irrespective of the length of the permanence period, proponents may choose to not comply with obligations to maintain vegetation during the permanence period. The Act deals with this risk by providing for requirements to relinquish ACCUs and penalties for non-compliance.

Finding 10

Vegetation in regeneration projects with a 25-year permanence period may be cleared after 25 years, where legally allowed. To offset the potential cost to the Government of replacing carbon stores where this occurs, a 20 per cent discount is applied to credits issued to the projects. A higher discount may be needed to address the risk of clearing after the end of the permanence period. Allowing proponents to transition from a 25-year permanence period to a 100-year permanence period could also help mitigate this risk.

Recommendation 8

The Government should undertake analysis to determine whether to revise the discount applied to credits issued to regeneration projects with a 25-year permanence period. The Government should also consider allowing proponents to transition from a 25-year permanence period to a 100-year permanence period.

3 Broader considerations

The Committee's primary task in reviewing methods is to consider their continued compliance with the offsets integrity standards but the Committee also considers broader matters in providing advice to the Minister. While it is beyond the scope of the review for the Committee to examine these issues in detail, the Committee considered the different views received through public consultation and suggests some areas for further consideration by Government.

3.1 Environmental and socio-economic outcomes

During the consultation period the Committee received extensive stakeholder feedback on the environmental and socio-economic outcomes from implementing the regeneration methods, as discussed below.

Environmental outcomes

Stakeholder comments on the environmental outcomes resulting from regeneration projects focused on fire risk and biodiversity. The Committee found significant differences in the way stakeholders perceive potential outcomes for biodiversity in regeneration projects.

- Some viewed the native vegetation species often grown under HIR and NFMR projects as woody weeds that reduce biodiversity and encourage pest species. They consider the clustering of projects in southwest Queensland and northwest New South Wales to exacerbate the issue. There was particular concern about an increase in mulga (*Acacia aneura*), which some maintained can approach closed crown cover when mature that reduces light penetration and understory growth, leading to lower biodiversity. Some of those who shared this perspective advocated selective thinning (or even fodder harvesting) to create more open areas (see section 3.3).
- Other stakeholders pointed out that current projects regenerating mulga are only partway through the growth cycle and as regenerating areas become more mature over time, natural mortality occurs (self-thinning) which leads to increased understory growth and diversity. Supporters of this view maintain that while the process to return project areas to a long-term equilibrium state will take time, it will ultimately result in healthier land. Several stakeholders have said projects are already improving biological diversity.

The Committee notes some scientific literature suggests converting land to the types of vegetation common in regeneration projects can have negative effects on biodiversity (see for example Waters et al. (2017) and Le Maitre et al. (2011)), while other studies indicate there can be benefits (Peeters and Butler 2014; Bradshaw et al. 2013).

A few stakeholders expressed concern that project areas may be more susceptible to fire particularly in areas where projects are occurring in high-density, creating contiguous areas of relatively homogeneous vegetation, with consequent risks to stored carbon, biodiversity and agricultural infrastructure and production. Data and understanding of historical fire risk and the impacts of management practices on fire frequency are incomplete but there is evidence that strategic grazing, selective thinning and prescribed burning may help to mitigate the risk of intense fire.

A number of submissions to the review advocated increased collaboration with regional NRM bodies to more closely align project management with NRM objectives. The Committee notes carbon service providers have developed an industry code of conduct, which provides for consulting regional NRM bodies and other stakeholders when planning projects. The Committee also notes the Department, NRM bodies and carbon service providers meet periodically to share information on planning and managing projects to support alignment with regional NRM objectives, including in relation to

biodiversity and fire. In addition, the Regulator has been sharing information with rural fire authorities to assist fire management.

The Committee has not seen evidence that would lead it to conclude the methods result in reduced biodiversity or an increased risk of fire events in project areas, relative to non-project areas. Vegetation in the regions of method uptake has been changing over many decades and concerns about an increase in woody vegetation predate the ERF. However, the lack of information on the environmental outcomes of regeneration projects, which are relatively new additions in a landscape context, poses a risk that requires further consideration. The Committee suggests the Department should consider adopting in future method variations additional requirements for regenerating vegetation to comprise a structure and mix of species representative of native vegetation in the region, as required by the Avoided Deforestation method.[13]

To assist future evaluations, the Committee supports stakeholder suggestions regarding the need for more information on fire and biodiversity outcomes, including in relation to the potential impact of climate change. The Department should continue to work with landholders, state and territory governments, NRM bodies and other relevant parties to obtain more information on these outcomes.

Socio-economic outcomes

Written submissions and discussions during the site visits conducted as part of this review included both positive and negative views on the outcomes of regeneration projects for landholders and the communities.

Landholders with regeneration projects emphasised the importance of the projects in providing a dependable source of income that enables them to diversify their activities and manage their land more sustainably. Some said they invest most of the carbon income back into the farm through measures such as fencing, improving water infrastructure and managing pests, and that these measures, with the prospect of a future income stream, have also assisted succession planning.

State and local government agencies in Queensland, New South Wales and Western Australia have acknowledged the potential economic benefits of well-managed carbon farming projects (MacTiernan et al. 2018; Local Land Services Western Region 2016; Carbon Market Institute 2017). They recognise carbon farming contracts provide an opportunity for proponents to diversify their income and further invest in their enterprise. The increased investment may lead to flow-on benefits for the regional economy, including by generating more jobs in areas such as building and fencing.

In contrast, some submissions to this review raised concerns that ‘absentee’ proponents may divert carbon farming revenue away from the region. A few stakeholders expressed concern that some landholders are destocking, leaving the vegetation to regrow and moving away from the area. They suggested such landholders are not maintaining property infrastructure such as fencing, increasing the risk of pests, weeds and fire for neighbouring properties. These stakeholders said income from regeneration projects is not being kept in the community, and that an increase in absentee landholders is reducing demand for local goods and services such as electricity, mail, groceries and stock transport, with flow-on impacts for remaining residents.

However, as noted by other stakeholders, people have left farming for reasons not associated with carbon projects, and this represents a regional challenge that started many years before carbon farming was introduced. Prior to the introduction of the Carbon Farming Initiative, in the 30 years to

[13] The *Carbon Credits (Carbon Farming Initiative—Avoided Deforestation 1.1) Methodology Determination 2015.*

2011 the number of farmers in Australia had reduced by 40 per cent (Australian Bureau of Statistics (ABS) 2012). In this context, some stakeholders considered that the income from carbon farming may provide an incentive to keep people on the land, and that those who have had to leave have been able to do so in better financial circumstances than if they had not had a carbon farming project.

Carbon service providers noted that there are very few regeneration projects involving absentee landholders, and in some cases these properties did not have owners or managers living on-site prior to registering the project. Even where landholders do not live on their properties, they visit periodically to manage the properties and retain the same responsibilities in relation to managing pests and fire risk. Nearly all regeneration projects involve managing pests and the carbon income makes this more affordable. One carbon service provider said that of the 76 projects in their portfolio, more land managers had returned to properties due to carbon farming than had left.

Although some stakeholders raised concerns that regeneration projects limit opportunities for grazing, the Committee heard most landholders with projects aim to manage their properties as productive farmland with the added benefit of storing carbon on part of the property, and most still run stock. Landholders suggested carbon farming is compatible with running livestock if managed appropriately through lower stocking rates and rotational grazing. Some landholders reported improved productivity (live weight gain) and also saw projects as an opportunity to improve the health of their soils, reduce pests and weeds and generally increase the sustainability of their farms.

Some landholders with HIR projects that have temporarily de-stocked properties plan to reintroduce stock later (some with changes to stocking rates) once the vegetation has recovered enough to support a sustainable level of grazing. This is permitted under s. 21(1) of the HIR method, which allows proponents that have elected to exclude livestock as their project activity to reintroduce grazing once a CEA attains forest cover.

While a well-run project can enhance a farming operation, people are still learning what projects mean for farm management. The Department and Regulator should continue to work with state and territory governments, NRM bodies and others to better communicate with potential proponents, buyers of properties and banks about the benefits and obligations associated with regeneration projects. The code of conduct for the Australian carbon industry is a positive development in this regard.

Some stakeholders have raised concerns that the requirement to maintain regeneration after projects can no longer generate credits (the permanence obligation) might reduce property values and adversely affect landholders and communities in future. In addition to obtaining more information on environmental outcomes, the Department should seek to better understand the longer-term economic implications of sequestration projects for regions of high uptake.

Finding 11

Well-managed regeneration projects have the potential to generate environmental and socio-economic benefits, including dependable new income that can be reinvested to improve farm productivity and environmental sustainability. However, there are varying stakeholder views on matters such as fire risk, biodiversity and broader economic outcomes. The Committee saw no evidence of adverse impacts arising from existing projects, but recognises that they involve long-term changes in land management, the full consequences of which may take some time to become apparent.

3.2 Method usability

Public submissions to the review included a range of comments regarding the practical implementation of the methods, including opportunities to simplify or clarify the requirements and increase uptake. Stakeholders also indicated they would like the Government to provide more opportunities to participate in vegetation projects under the ERF, either by amending the existing regeneration methods or developing new ones.

Accounting for spatial variability in vegetation growth under the HIR method

Some carbon service providers commented that the method requirement that CEAs fit within a circle of 1.5 km radius can result in large numbers of small CEAs, thereby increasing the time and cost involved in managing data and monitoring and auditing projects.

The HIR method's stratification provisions require proponents to select a location within each CEA as a model point. FullCAM estimates for a CEA use this model point. CEAs can have multiple parts, allowing modelling of non-contiguous areas with similar characteristics using the same events queue in FullCAM.

The model point location must be 'representative of the CEA' and 'as close as reasonably practicable to the centre of the CEA parts', though it need not lie within the CEA itself (HIR, s. 29). These requirements are designed to ensure accurate abatement estimates by limiting the potential for variability in vegetation growth in each CEA. A similar requirement applies to mixed species environmental plantings under the *Carbon Credits (Carbon Farming Initiative) (Reforestation by Environmental or Mallee Plantings—FullCAM) Methodology Determination 2014* (s. 3.3(3)(a)).

Carbon service providers suggested variability in vegetation growth rates in the main regions of method uptake is low, and that the objective can be achieved via a more efficient mechanism.

The Department analysed carbon sequestration estimates across selected projects and potential project areas in New South Wales and Queensland to test the sensitivity of FullCAM estimates of carbon abatement to changes in model point location. The analysis suggested there is low variability in modelled vegetation growth within the regions where most existing projects are located, which generally have an average annual rainfall of less than 600 millimetres. It showed more variability in regions further east, with average annual rainfall between 600 and 800 millimetres.

The Committee recommends the Department investigate whether HIR method requirements could be altered to improve efficiency while maintaining the integrity of abatement estimates in projects. Any alterations should take into account the potential for future projects to be undertaken in higher rainfall areas where vegetation growth rates could be more variable, and should be designed to manage the risks of allowing unrepresentative abatement estimates.

Stakeholders also suggested alternative mechanisms to account for spatial variability in vegetation growth rates at the same time as allowing for larger CEAs. These included the following.

- Enabling the public version of FullCAM to estimate sequestration at a fine spatial scale. This would enable proponents to estimate abatement across the area of a CEA rather than extrapolating from single model points.
- Modifying the public version of FullCAM to allow it to automatically select multiple model point locations across a large area. This would achieve a similarly representative allocation of model points through a less laborious process.

- Allowing aggregation of CEA parts into a single CEA providing they are not more than 250 metres apart, in line with requirements of the Avoided Clearing method. This would enable an increase in the size of CEAs.
- Allowing proponents to use the datasets underlying FullCAM (such as the Forest Productivity Index or maximum biomass layers) for initial stratification to delineate projects into CEAs with consistent vegetation growth rates.

The Committee notes that the Department's ongoing development of FullCAM may, in future, support alternative approaches to ensuring spatial variability in vegetation growth rates is appropriately accounted for in abatement estimates.

Finding 12

The HIR method requirement that CEAs fit within a circle of 1.5 km radius increases complexity and transaction costs. There may be lower-cost ways to appropriately account for the variability in sequestration rates across project areas. Any consideration of changes to the current requirement should take into account the potential for future projects to be undertaken in higher rainfall areas where vegetation growth rates and carbon carrying capacities are generally more variable. Careful thought should also be given to the need to ensure all abatement estimates are representative of the sequestration rates achieved across CEAs.

Recommendation 9

The Department should investigate whether the 1.5 km radius requirement could be altered or replaced so as to lower transaction costs while maintaining the integrity of abatement estimates.

Other areas for improvement

FullCAM

Submissions to the review stated FullCAM is appropriate for use in a modelled method but some also suggested areas for improvement in future updates.

One suggestion was to increase the number and distribution of sites for obtaining data used in determining the maximum potential biomass of regenerating vegetation. The Department has already done some work using new, advanced methods to recalibrate FullCAM's estimates of maximum above-ground biomass in forest and woodland regions, which will become available to the public through an update to FullCAM in 2019.

This work used the latest available science and data from the CSIRO, drawing on a sample of over 5000 data points (around 30 times the size of the original sample). The new data overall confirms the validity of FullCAM's current predictions for regenerating forests and provides increased confidence that the level of accuracy of estimates of carbon storage in these areas is acceptable.

Stakeholders also suggested the Department examine whether FullCAM could better account for factors that influence rates of regeneration and biomass accumulation at the project scale. Such factors might include the nature and extent of the soil seed bank, climate (particularly rainfall), and land management practices, including feral animal grazing pressures.

FullCAM already captures information about rainfall based on data collected from weather stations and interpolated at the scale of one kilometre. It would be challenging to reflect more specific data

on rainfall or other locally-relevant information in FullCAM due to the complexities of incorporating such detail in the model, as well as the limited available information on past management history and disturbances. There are also challenges with verification of such data sources, particularly where they are property-specific such as uncalibrated, private rain gauges. The Committee notes that each public release of FullCAM incorporates updated rainfall data.

The Committee notes the Department undertakes ongoing improvements to FullCAM, which could support some of the suggestions made by stakeholders, including those listed in section 3.3, at the same time as ensuring ongoing improvement in abatement estimates.

Improvements to the functionality of FullCAM could reduce time and labour costs for ERF proponents by reducing the number of steps involved in modelling abatement or by streamlining the replication of plots at different model point locations. The Department looks to integrate relevant new modelling capabilities into FullCAM and to couple these with improvements to remote sensing of vegetation cover change. The Committee notes the Department's ongoing improvements to remote sensing and modelling are subject to funding availability.

Guidance material

Several submissions suggested guidance supporting the methods could be improved to assist compliance with method requirements, improve efficiency and support increased participation. Stakeholder suggestions included:

- supporting consistent interpretation of 'forest potential' by providing additional guidance on how to quantify and verify it
- providing a technical guidance document covering: classifying vegetation; developing and validating vegetation maps; parameters to use for calculating abatement; monitoring weeds; and project management plans.

The Committee notes the Regulator guidelines will assist compliance with method requirements and that this will be further supported by revisions to the Mapping Guidelines being undertaken by the Department. The Department should consider providing further clarity through the methods and additional guidance material, where required.

CEA boundary requirements

The Committee heard suggestions the current HIR requirement to demarcate CEA boundaries no more than two metres from a tree stem is impractical. The purpose of the requirement is to ensure CEA boundaries are not extended to incorporate adjacent land at the margins that does not have forest potential. Earlier versions of the HIR method allowed an option of defining CEA boundaries using the edge of crown cover of the regeneration. This option was removed in the 2016 variation. The Committee notes the Department is considering whether method requirements could be clarified or additional guidance could be provided to improve practicality. The Committee also notes any implications for other vegetation methods with similar requirements will need to be considered.

3.3 Proposed new opportunities

During public consultation, the Committee received suggestions on ways to build on the existing methods to expand abatement opportunities in pastoral regions and encourage uptake by providing more flexibility in the way vegetation in projects can be managed. Suggestions included broadening the types of vegetation and management actions, and providing for alternative approaches to estimating abatement.

In addition, while the developments discussed in this report will enhance the integrity of the methods, the Committee believes more could be done, noting the potential for wider adoption (including in landscape systems with higher rainfall). The Committee acknowledges that adding or strengthening requirements to increase method integrity may involve a trade-off with increasing costs for proponents. To address this issue and support uptake, while maintaining scheme integrity, the Committee has also suggested some potential opportunities to increase the range of method options available to proponents of regeneration projects.

Some of the suggestions outlined below, if adopted, may be able to be incorporated as variations to the existing methods, while others are more substantial and would require development of new methods. The Committee notes the Department may consider these proposals when developing any variations to the existing methods or providing advice to the Minister on future priorities for method development.

Any assessment of these proposals should be informed by the offsets integrity standards and the method prioritisation questions the Minister considers when determining priorities. The questions cover: potential uptake of the activity and likely volume of abatement; commercial readiness of the activity; degree of certainty and cost of estimating emissions reductions (or sequestration enhancement); any potential for adverse social, environmental or economic impacts; and whether the activity could be promoted more efficiently through other measures. The Committee suggests the Department should also review these possibilities in light of technical considerations and implications for other methods.

Alternative methods

The Committee has identified three alternatives to the approaches used in current regeneration methods that warrant further analysis by the Department.

1. Expanded NFMR method covering regeneration that has already attained forest cover

Currently, around 360,000 ha of regrowth forest is cleared every year in Australia, most of which is for grazing purposes in arid and semi-arid regions (Department of the Environment and Energy 2018). The clearing of these forests and associated burning results in around 14 million tonnes of emissions each year (Department of the Environment and Energy 2018). The clearing also results in the loss of the ongoing sequestration that would have occurred if the forests had been allowed to continue to regrow. The economic returns from this clearing are often relatively low (Marinoni et al. 2012), suggesting there is an opportunity to capture low-cost abatement by incentivising the retention of these regrowth forests.

At present, the Avoided Clearing method is the only method that incentivises the retention of secondary forests. That method applies to areas with forest cover that have been cleared twice in the past and are able to be cleared now without restriction. Land is also only eligible if the project is registered within a six year window dictated by the age of the forest when it was last cleared. The stringency of these eligibility requirements has restricted the uptake of the method; as of March 2019, only three projects had been registered since its introduction in February 2015.

As the experience with the Avoided Clearing method has demonstrated, the primary barrier to the development of an effective method for these purposes is additionality; it is technically challenging to design rules that facilitate uptake while excluding regrowth forests that would not have been cleared in the absence of the incentive provided by the ERF.

The NFMR method is similar to the Avoided Clearing method in that it is intended to incentivise the retention of regrowing native vegetation that is likely to be cleared in the future. However, it only applies where the regeneration has not attained forest cover. As noted above, the method needs to

be varied to address a number of issues, including the basis for the application of the single clearing event test.

In the course of preparing the NFMR variation, the Committee suggests the Department should consider expanding its scope to include regeneration that has already attained forest cover. In seeking to address additionality risks, consideration should be given to the risk-based approach to eligibility proposed by Butler and Halford (2016) or a similar approach that uses variables such as vegetation type, time since clearing and suitability for pastoral development (e.g. slope) to exclude forests that are unlikely to be re-cleared.

Finding 13

The retention of secondary forests that would otherwise be re-cleared for agriculture can provide a significant and cheap source of abatement. At present, there is only one ERF method that incentivises the retention of secondary forests: the Avoided Clearing method. The stringency of the eligibility requirements under this method have restricted its uptake.

The NFMR method is similar to the Avoided Clearing method in that it is intended to incentivise the retention of regrowing native vegetation that is likely to be cleared in the future. However, it only applies where the regeneration has not attained forest cover. There is the potential to expand the scope of the NFMR method to include regeneration that has already attained forest cover.

Recommendation 10

The Department should consider expanding the scope of the NFMR method to include regeneration that has already attained forest cover. To address additionality risks, consideration should be given to a risk-based approach to eligibility or a similar approach that uses variables such as vegetation type, time since clearing and suitability for pastoral development (e.g. slope) to exclude forests that are unlikely to be re-cleared in the future.

2. Modelled method based only on the use of National Accounts data

Despite being designed with the intent of lowering transaction costs for proponents, the methods are reasonably complex, requiring a high level of technical skill, including in geographic information systems, to develop and implement projects. The complexity of the methods has arisen because of, among other things, the inherent variability of natural ecosystems, the need for processes to stratify and monitor projects, and the desire to maintain integrity while providing a degree of flexibility for proponents.

To help encourage uptake, a simplified version of the HIR method could be developed that relies exclusively on the use of National Accounts data. The method would be similar to the existing method, with tailored gateways at five-yearly intervals to ensure that progress towards forest cover is occurring in line with modelled biomass estimates. However, all stratification would be done using the latest National Accounts data and no supplementary remote sensing or field data would be required. Project stratification would need to be revised as National Accounts datasets are updated to ensure the project reporting reflects the improvements. To support this concept, detection of forest and sparse cover under the National Accounts would need to be strengthened.

Other streamlining options could be incorporated to further reduce complexity and the costs of project design and implementation. The integrity risks associated with a streamlined method of this nature could be managed with the use of uncertainty discounts applied to abatement estimates. This

type of approach could be designed as a standalone method or included as an option within a varied form of the HIR method.

Finding 14

The regeneration methods are reasonably complex, requiring a high level of technical skill to develop and implement projects. To reduce costs and help encourage uptake, a simplified version of the HIR method could be developed that relies exclusively on the use of National Accounts data for stratification. The method could be similar to the existing one, with tailored gateways at five-yearly intervals to ensure timely progress towards forest cover and uncertainty discounts to manage integrity risks.

Recommendation 11

The Department should scope the development of a simplified version of the HIR method that relies exclusively on National Accounts data for stratification and incorporates other streamlining options. This method could be designed as a standalone method or included as an option within a varied form of the HIR method.

3. Direct measurement method

It is often assumed proponents prefer model-based methods over measurement-based methods because they have lower transaction costs. In practice, this is not always the case. Some proponents prefer direct measurement methods, which they consider can potentially provide greater certainty about abatement estimates. The higher level of assurance about on-ground biomass estimates can be marketed to offset buyers, thereby enabling proponents to differentiate their projects and potentially obtain higher credit prices.

The data collected through direct measurement can also be valuable for commercial and other purposes, including as a product in its own right. A particular attraction of a direct measurement regeneration method is that it could significantly increase the available data on the biomass in regenerating forests in semi-arid regions and on the influence of different variables on regeneration rates, with new information used, for example, to improve FullCAM over time.

The major barriers to the development of a method of this nature are the method development costs and risk of low uptake. While methods can be expensive to develop, a direct measurement regeneration method could be developed using the measurement protocols and processes in the Avoided Deforestation method as a base, supplemented with the additionality provisions of a revised HIR method. Under the Avoided Deforestation method, abatement estimates are derived from allometric equations, which represent statistical relationships between characteristics such as stem diameter and biomass quantity. The equations need to be representative of the vegetation in a project. Trees in a project are measured to obtain data for calculations.

There is the prospect this type of regeneration method might not be widely used. However, during the course of the review a number of proponents expressed the desire to be able to access a direct measurement method. Given a method of this nature could be developed in part using the concepts from an existing method, and the potential demand and associated benefits, the Committee believes this option should be explored.

Finding 15

Some proponents prefer direct measurement methods over modelled methods, despite the higher transaction costs, because they consider direct measurement may provide greater certainty about abatement estimates. A direct measurement method is attractive as it might also provide valuable additional data on the biomass in regenerating forests in semi-arid regions and on the influence of different variables on regeneration rates. This could help improve national accounting.

Recommendation 12

The Department should consider the potential to develop a direct measurement HIR method.

Further suggestions

Stakeholders made the following specific suggestions regarding potential improvements to the regeneration methods.

- **Credit sequestration from increases in woody biomass in a wider range of vegetation types in response to changes in land management.** The proposal could provide for crediting of an increase in woody vegetation in areas that will never reach forest cover and in existing areas of forest that have been subject to suppression. Another aim of this type of activity would be to support long-term sustainability via improved landscape function.

  The Committee notes gaps in data on carbon storage and capacity to detect changes in carbon in response to management would need to be filled to enable crediting for these types of activities. The Committee considers determining the additionality of abatement from incremental increases in woody biomass would likely be more difficult than it is for step changes in vegetation cover.

- **Credit sequestration from pasture improvements.** The existing methods do not provide for crediting of sequestration associated with improvements to grasslands. The proposal could support rehabilitation of degraded grasslands, or grassy woodlands. Providing for these types of activities would require development of a new method. Co-benefits of this activity could include improved productivity and resilience.

  The Committee notes this type of activity may not be feasible for an ERF method since it would require the capability to estimate changes in carbon stocks in grasslands and attribute those changes to management actions, and is dependent on whether substantial increases in carbon storage could be achieved and sustained over time. The Committee notes that scientific evidence and previous Departmental investigations found that carbon fluctuations in rangeland systems, particularly due to climate variability, could make it difficult to continue to build carbon stocks over time, and to maintain the carbon stocks. The Committee also notes that the opportunity for sequestration through pasture improvement is more in soil carbon than in pasture biomass and this is covered by the ERF soil carbon methods.

- **Remove the restriction on direct seeding and planting of native species.** The existing methods do not allow direct planting/seeding of native trees within regenerating vegetation. Allowing this as a supplementary management activity would be aimed at enabling establishment of forest cover in areas within CEAs that are not successfully regenerating naturally. It could also potentially promote more biodiversity of forest species.

On the other hand, the Committee notes planting or seeding trees could reduce landscape heterogeneity and biodiversity. If providing for planting or seeding in methods, the Department may need to consider:

  - how stratification would take into account differences in the growth of regenerating and planted vegetation and interact with method requirements for forest potential
  - emissions associated with supplementary management activities, to ensure all material emissions are accounted for in abatement estimates
  - requirements to ensure appropriate species mixes
  - minimising the risk of planting or seeding in areas that are not naturally forested.

- **Permit fodder harvesting.** The methods restrict removal of biomass from CEAs to avoid loss of sequestered carbon. Suggestions to allow fodder harvesting within CEAs indicated it would provide more flexibility for proponents during drought. The associated losses of carbon would need to be taken into account.

  The Committee cautions that allowing fodder harvesting would need to be considered against the conservativeness offsets integrity standard because any fodder harvesting in CEAs could reduce the potential for land in the CEA to attain forest cover.

- **Reduce restrictions on ecological thinning under the HIR method**. The HIR method currently allows selective damage or destruction of native vegetation only where it improves the growth or health of remaining native vegetation, and requires that biomass is kept in the CEA. The rationale for the proposal to ease restrictions on ecological thinning is to support improved growth of other vegetation (including fodder species, which would increase livestock carrying capacities). This proposal would also provide landholders with more flexibility in vegetation management (within any state and territory government restrictions on thinning).

  The Committee notes that allowing expansion of provisions for ecological thinning would also need to be considered against the conservativeness offsets integrity standard. The Committee questions whether existing provisions could be expanded in line with stakeholder suggestions without having negative impacts on vegetation growth and sequestration.

- **Allow use of controlled burns to manage biodiversity and regeneration.** It was suggested that in some land systems, strategic burning could help prevent large fires that cause losses of regenerating vegetation.

  The Committee notes that any reductions in carbon stores and emissions from strategic burning would need to be accounted for. The methods already require accounting for emissions from fires.

3.4 Risk sharing arrangements under the ERF

The development of carbon offset methods is complex, requiring measures to be designed to manage multiple risk factors in the absence of perfect information. The degree of complexity and uncertainty means method design errors are, to some extent, unavoidable. This has been illustrated with the regeneration methods. The methods were designed with the best available information and with the intent of promoting genuine abatement through the regeneration of native forests. While the methods have been successful in many respects, errors in their original design were identified through experience in their implementation, which require variations and other rule changes to uphold the integrity of the abatement associated with regeneration projects.

Where rule changes are deemed necessary to maintain integrity, there is a threshold question of whether they should apply to both existing and new projects, or only to new projects. Retrospective rule changes are almost always contentious because they generally disturb vested rights and interests, and can make actions that were lawful when taken subsequently unlawful. In the current context, there are two main reasons to oppose retrospective rule changes:

- they are likely to be seen as unfair by proponents of, and investors in, existing projects, who are likely to have commenced projects with an expectation the rules governing eligibility and crediting would not change (or would only change to the extent provided for in the original method)
- by creating uncertainty and undermining confidence in the stability of the rules, they could deter future participation in the scheme and thereby increase the economic cost of achieving Australia's mitigation targets.

On the other hand, the failure to correct method errors is likely to lead to forward- and/or over-crediting, where proponents receive credits for abatement that has not yet occurred (and may not occur). This is not only inefficient but it could threaten the reputation of the scheme as a whole and affect demand for, and the market value of, ACCUs generated by projects under the relevant methods, as well as under other methods.

Sections 126 and 127 of the Act were intended to protect proponents of existing projects from variations and revocations. These provisions provide that, where a method is varied or revoked, the previous method continues to apply to projects that were registered under the method prior to the variation or revocation. Some participants in the scheme believe these provisions provide blanket protection against any retrospective rule changes, regardless of how they are made. However, the Act provides other avenues by which retrospective rule changes can be made, including changes to the Rule and 'incorporated documents' (documents referred to in methods that influence crediting but do not form part of the formal method).

In its 2017 review of the ERF, the Climate Change Authority considered the need for changes to be made to the Act to accommodate improvements in methods. Relevantly, the Authority noted that 'ERF projects can have very long crediting periods and projects can continue to generate Australian Carbon Credit Units (ACCUs) even if changes are made to the original method'. Due to this, the Authority recommended that:

> … scheme participants be required to transition projects to new methods within two years of a method being varied, including for any changes to the way abatement is estimated.

During the course of the review, it has become evident to the Committee that there is a need for a more structured approach to the sharing of the risks associated with method errors between the government and proponents. An approach that places all method-related risks onto the government is unlikely to be sustainable and would encourage excessive conservativism in method design. Equally, an approach that results in proponents carrying all of the risks associated with method errors, and leaves them fully exposed to retrospective rule changes, would not be fair and reasonable and would deter participation.

There is a need for an approach that strikes an appropriate balance between the need for flexibility to address method errors to maintain high integrity, while also providing proponents with sufficient certainty to invest in projects. The Committee recommends the Government consider developing a framework for the sharing of the risks associated with method design errors between proponents and the Government that balances these competing needs.

Finding 16

The development of carbon offset methods is complex, requiring measures to be designed to manage multiple risk factors in the absence of perfect information. The degree of complexity and uncertainty means method design errors are, to some extent, unavoidable. There is a need for a risk sharing framework that strikes an appropriate balance between the need for flexibility to address method errors to maintain high integrity, while also providing proponents with sufficient certainty to invest in projects.

Recommendation 13

The Government should consider developing a framework for the sharing of the risks associated with method design errors between proponents and the Government.

4 Conclusion

The HIR and NFMR methods have successfully incentivised the uptake of a large number of regeneration projects that have made, and are likely to continue to make, an important contribution to meeting Australia's climate change targets. There are also substantial opportunities for the expansion of the activities covered by the methods to capture the low cost abatement opportunities associated with the regeneration and protection of native forest in semi-arid regions.

While successful in many respects, and having additional promise, in the course of the review a number of integrity issues were identified. These issues have been adequately addressed for new projects through changes to the Rule and FullCAM Guidelines. On this basis, the Committee concluded the methods satisfy the offsets integrity standards.

The Committee stresses that, while a number of integrity issues were identified in the course of the review, the regeneration projects under the methods are in the relatively early stages of their permanence periods. While the Committee would expect more land in projects to have already attained forest cover, regeneration of native forest in semi-arid regions is variable and, in certain circumstances, can take a considerable period of time. The changes to the Rule and FullCAM Guidelines limit the extent of any integrity risks associated with these projects, ensuring the primary risk relates to forward- rather than over-crediting.

The Committee recommends the methods now be varied to incorporate the approaches embodied in the Rule, FullCAM Guidelines and Regulator's proposed guidelines, which would enhance the methods' integrity and promote greater consistency. At the same time, changes should be considered to reduce transaction costs and broaden the scope of the methods to encourage further uptake of projects. In the course of making these amendments, additional consideration should be given to the environmental and socio-economic outcomes of project activities.

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Appendix 1 Comparison of regeneration rates within projects and surrounding areas

Analysis undertaken by the Department, using data from the National Accounts Forest Monitoring Programme, compared vegetation cover in a sample of CEAs with surrounding 20 km 'buffer' zones. The buffer zones did not provide a like-for-like comparison with CEAs, as it was not possible to assess their forest potential within the scope of the analysis. The analysis was undertaken to identify possible integrity concerns with the methods rather than reach conclusions on integrity.

Although most projects only commenced 2–4 years ago, the projects used for the analysis had reported that regeneration commenced in 2010 or earlier, and on average in around 2000 for the NFMR method, giving an adequate timeframe over which to examine changes.

The main findings were as follows.

- Across 20 HIR projects in western New South Wales that commenced regeneration in 2010, the combined increase in sparse woody and forest extent from 2010 to 2017 was 13 per cent, compared to three per cent for the buffer areas.
- For the eight NFMR projects in New South Wales and Queensland examined, which commenced regeneration from 1998 to 2005, the combined increase in sparse woody and forest extent to 2017 was 18 per cent, compared to two per cent for the buffer areas.
- Both the CEAs and buffer areas appear to have responded similarly to climatic patterns, but with regeneration more pronounced within CEAs.

These findings did not raise obvious issues for the integrity of the methods.

The above-average rainfall years in western New South Wales and southwest Queensland from 2008 to 2010 appear to have stimulated declines in the proportion of area with non-woody vegetation and increases in sparse and forest vegetation for HIR projects. The trends continued up to about 2013–14 (solid blue lines in figures A1.1 and A1.2). Within NFMR projects, the proportion of non-woody area appears to have been decreasing ever since this rainfall period (solid blue lines in Figure A1.3).

Across both methods, forest area tends to increase at the expense of sparse area over the last three to five years analysed, suggesting the progression of sparse woody vegetation to forest, but less movement of non-woody land to the sparse cover category. The decline of non-woody land in CEAs is more pronounced than in the buffer areas adjacent to projects in all instances (shown with the blue dotted line), yet trends across all vegetation categories and areas appear similar, suggesting strong overarching climate impacts across the areas.

The buffer areas may contain land with no forest potential, and therefore do not provide for direct comparisons. As such, while CEAs have shown stronger regeneration than surrounding areas, it is not possible to conclude this is due solely to the activities implemented under the methods.

Figure A1.4 below contains a map of the area covered in the comparison.

Figure A1.1: Comparison of the extent of non-woody, sparse and forest vegetation from 2010 to 2017 detected within the CEAs of 12 HIR projects located within National Accounts tile SG55 that commenced regeneration in 2010 (268,110 ha), and the 20 km buffers surrounding those projects (8,767,832 ha)

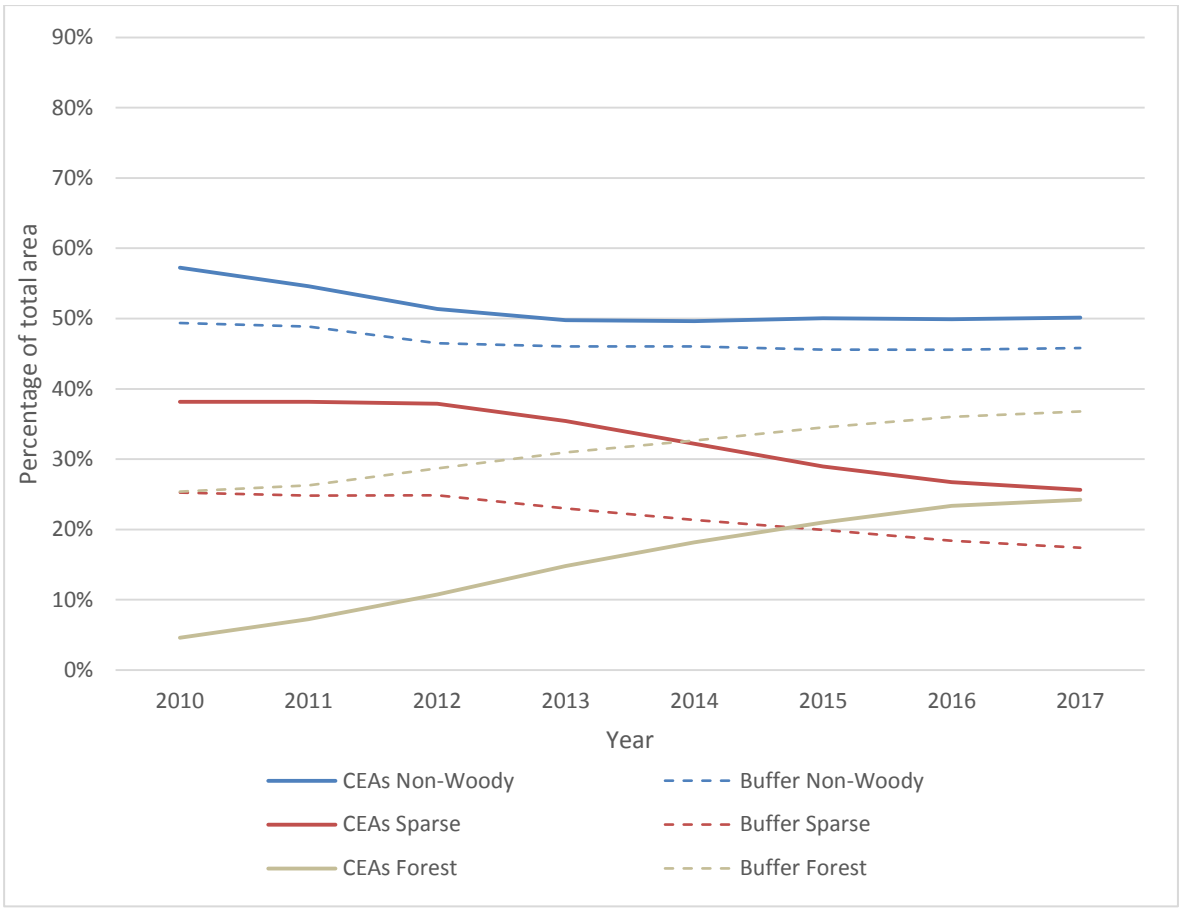


Figure A1.2: Comparison of the extent of non-woody, sparse and forest vegetation from 2010 to 2017 detected within the CEAs of 20 HIR projects located within National Accounts tile SH55 that commenced regeneration in 2010 (189 602 ha), and the 20 km buffers surrounding those projects (18,273,936 ha)

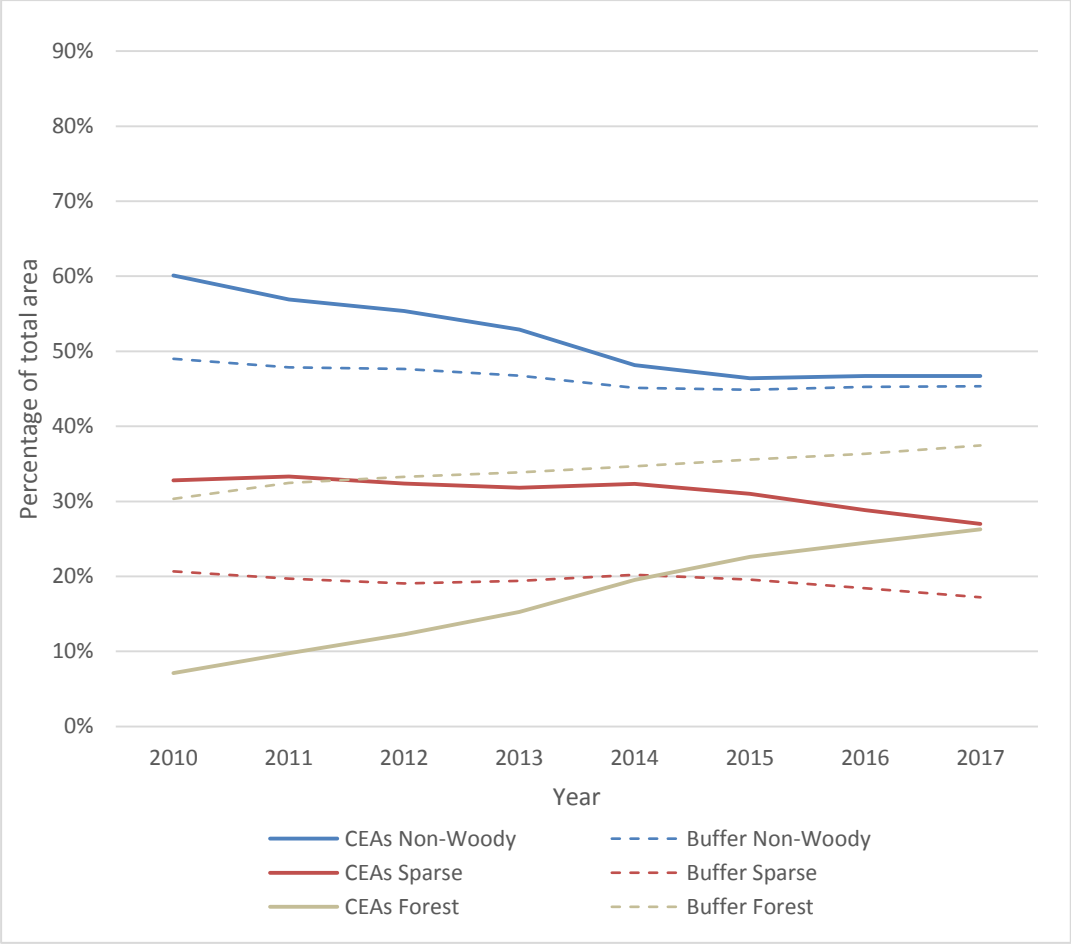
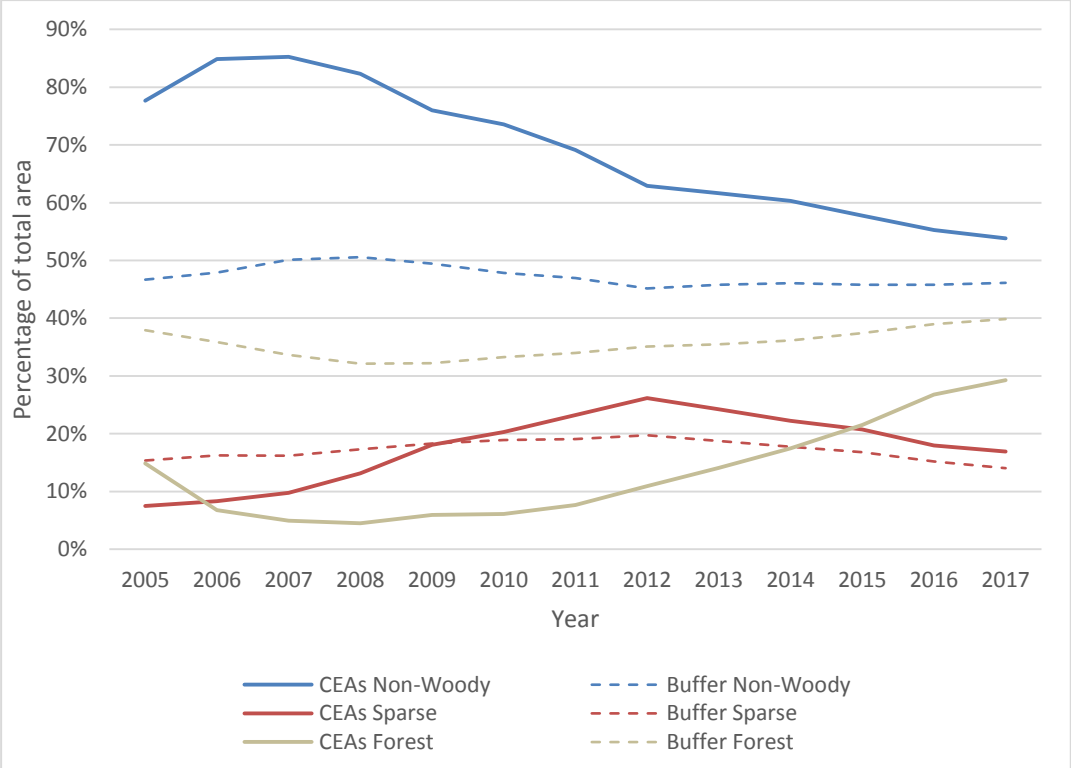


Figure A1.3: Comparison of the extent of non-woody, sparse and forest vegetation from 2010 to 2017 detected within the CEAs of eight NFMR projects located within National Accounts tiles SG55 and SH55 that commenced regeneration from 1998 to 2005 (48,527 ha), and the 20 km buffers surrounding those projects (6,326,156 ha)



Differences between activities

The assessment was complemented by testing for statistically significant differences in the levels of vegetation cover attained across the different activities implemented. It found only a statistically weak difference within HIR projects, where those projects nominating the ceasing of clearing as the project activity displayed moderately higher levels of sparse and forest extent in 2016 (64 per cent combined compared to 56 per cent; single-factor analysis of variance p value = 0.06, alpha = 0.05). Other factors tested for correlations or significant differences such as location and average annual rainfall did not appear to influence results.

Figure A1.4: Map showing the location of National Accounts tiles SG55 and SH55 within New South Wales and Queensland