EXPLANATORY STATEMENT

Issued by the Authority of the Parliamentary Secretary for Climate Change and Energy Efficiency

Carbon Credits (Carbon Farming Initiative) Act 2011

Carbon Farming (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning) Methodology Determination 2012

Background

The *Carbon Credits (Carbon Farming Initiative) Act 2011* (the Act) enables the crediting of greenhouse gas abatement in the land sector. Greenhouse gas abatement is achieved by either reducing or avoiding emissions or by removing carbon dioxide (CO_2) from the atmosphere and storing it as organic carbon in soil or plants.

Abatement activities are undertaken as offsets projects. The process involved in establishing an offsets project is set out in Part 3 of the Act. An offsets project must be covered by and undertaken in accordance with a methodology determination.

Subsection 106 (1) of the Act empowers the Minister, by legislative instrument, to make a determination known as a methodology determination. The purpose of a methodology determination is to establish procedures for estimating abatement (emissions reductions and sequestration) and requirements for monitoring, record keeping and reporting on abatement by Carbon Farming Initiative (CFI) projects which apply the method.

A methodology determination must meet the offsets integrity standards set out in section 133 of the Act and the other eligibility criteria set out in section 106 of the Act. The Minister cannot make a methodology determination unless the Domestic Offsets Integrity Committee (DOIC) has endorsed the proposal under section 112 of the Act and advised the Minister of the endorsement under section 113 of the Act. The DOIC is an independent expert panel established to evaluate and endorse proposed methodologies.

Application of the Methodology Determination

The *Carbon Farming (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning) Methodology Determination 2012* (the Methodology Determination) sets out the detailed rules for implementing and monitoring a project under the CFI to reduce methane (CH_4) and nitrous oxide (N_2O) released by fire into the atmosphere through the use of strategic early dry season fire management across savannas in the tropical north of Australia, in areas which receive more than 1000 mm long-term average annual rainfall.

Project proponents wishing to implement the Methodology Determination must make an application to the Clean Energy Regulator (the Regulator) and meet the eligibility requirements for an offsets project set out in subsection 27 (4) of the Act. These requirements include compliance with the rules set out in the Methodology Determination.

Offsets projects that are undertaken in accordance with the Methodology Determination and approved by the Regulator can generate Kyoto Australian Carbon Credit Units (ACCUs) that can be sold to:

- Australian companies that must pay the carbon price established under the Clean Energy legislation;
- overseas entities that pay a carbon price; and
- businesses in Australia and overseas wanting to offset their own carbon pollution.

Public consultation

The methodology was developed by the Department of Climate Change and Energy Efficiency (the Department) in collaboration with CSIRO, the North Australia Indigenous Land and Sea Management Alliance and Charles Darwin University.

The methodology proposal was published on the Department's website from 25 May to 30 June 2011 for public comment. Stakeholders and members of the public who asked to be listed on the Carbon Farming Initiative mailing list maintained by the Department were notified of the public consultation period. Nine submissions were received including three classed as confidential that were not published on the Department's website.

Determination Details

The Methodology Determination is a legislative instrument within the meaning of the *Legislative Instruments Act 200*3.

The Methodology Determination commences retrospectively from 1 July 2010.

Subsection 12 (2) of the *Legislative Instruments Act 2003* provides that, for a legislative instrument to have effect before the date it is registered, it must not adversely affect the rights of any person or impose a liability on any person in respect of anything done or not done before the date of registration. The Methodology Determination does not offend against these requirements. Retrospective application confers a benefit in that it allows persons to apply for and generate Australian Carbon Credit Units in circumstances where they would not normally be eligible to apply.

Details of the Methodology Determination are at Attachment A.

A Statement of Compatibility prepared in accordance with the *Human Rights (Parliamentary Scrutiny) Act 2011* is at Attachment B.

Attachment A

Details of the Methodology Determination

Part 1 Preliminary

1.1 Name of Methodology Determination

This section provides that the name of the Methodology Determination is the *Carbon Farming (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning) Methodology Determination 2012*.

1.2. Commencement

This section provides that the Methodology Determination commences retrospectively from 1 July 2010.

Subsection 122 (3) of the Act provides that if a methodology determination is made on or before 30 June 2012, the determination may be taken to have come into force at the start of 1 July 2010.

Because this Methodology Determination operates on a full calendar year basis, offsets projects under the Methodology Determination will need to commence after the conclusion of the late dry season that ends on 31 December 2010.

1.3. Application

The effect of paragraph 106 (1) (a) of the Act is that a Methodology Determination must be expressed to apply to a specific kind of offsets project. This section of the Methodology Determination explains that the instrument applies to an agricultural emissions avoidance project which uses strategic early dry season fire management to reduce the emissions of CH_4 and N_2O from fires in areas of savanna in Australia that receive more than 1000 mm long-term average annual rainfall.

The abatement activity involves the application of a regime that uses strategic early dry season fire management to reduce the risk and extent of late dry season wild fires. This will shift the seasonality of savanna burning from predominantly late dry season to predominantly early dry season, leading to a net reduction in fuel consumed and area burnt and a corresponding reduction in CH_4 and N_2O emissions released by fire.

The Methodology Determination only applies to CH_4 and N_2O emissions released by fire. The CO_2 released by the fire is taken to be reabsorbed by the landscape in the next growing season.

A project can only be approved as an offsets project if it is a specified offsets project (that is, it is on the positive list), and is not an excluded offsets project (that is, it is not on the negative list), as specified in the Regulations, and meets the criteria for declaration established by subsection 27 (4) of the Act. A summary of the positive list and negative list is available on the Department's website at www.climatechange.gov.au, and includes burning of savanna areas greater than 1 km^2 during the early dry season. Burning of patches of savanna of less than 1 km^2 in area is commonly undertaken as asset protection and is not on the positive list.

1.4 Definitions

This section defines a number of terms used in the Methodology Determination. Terms used in this statement that are also used in the Methodology Determination have the same meaning as given in the Methodology Determination:

Act means the *Carbon Credits (Carbon Farming Initiative) Act 2011*.

annual fire map means a fire map which shows fire scars for a calendar year for each vegetation class in the project area.

baseline period means the period of 10 years mentioned in subsection 3.19 (1) or 3.19 (2) of the Methodology Determination, whichever is applicable to the project.

coarse fuel means twigs and dead branches of not less than 6 mm in diameter and not more than 50 mm in diameter.

data waypoint means a point within a project area where information is collected.

early dry season means the months in a calendar year that are not the late dry season.

early dry season (EDS) burning means a fire or prescribed burn which occurs in the early dry season.

fine fuel means grass, leaf litter, bark and small twigs of less than 6 mm in diameter.

fire map means a geospatial map in raster format which shows the presence and absence of fire scars within the project area by way of pixels representing burnt or unburnt areas.

fire scar area means the spatial extent, within a project, that has been affected by fire.

fire scar means an area that has been burnt.

fire season means a season that is either the early dry season or the late dry season.

fuel load estimation period means the five years immediately prior to the baseline period.

greenhouse gas assessment boundary means the boundary specified under section 3.2 of the Methodology Determination.

GWP means Global Warming Potential.

heavy fuel means branches and logs of greater than 50 mm in diameter.

late dry season means the period, for a region, in a calendar year, determined in accordance with section 3.3 of the Methodology Determination.

monthly fire map means a fire map relating to one or more calendar months of a year.

Note: Monthly fire maps must also meet the requirements relating to format resolution and other matters set out in section 3.26 of the Methodology Determination.

NAFI means the North Australian Fire Information website.

Note: NAFI can be accessed at www.firenorth.org.au.

NGER Measurement Determination means the applicable determination made under subsection 10 (3) of the *National Greenhouse and Energy Reporting Act 2007* as in force from time to time.

NGER Regulations means the *National Greenhouse and Energy Reporting Regulations 2008,* as in force from time to time.

raster format means, for a map, the division of the map into a grid of pixels that can be coded according to characteristics of, or relating to, the area represented by the pixel.

registered greenhouse and energy auditor has the meaning given by the *National Greenhouse and Energy Reporting Act 2007*, as in force from time to time.

Regulations means the *Carbon Credits (Carbon Farming Initiative) Regulations 2011*, as in force from time to time.

savanna burning 1000 mm rainfall map means the map that shows the eligible land area under the Methodology Determination (above 1000 mm of rainfall).

Note: This map can be found at www.climatechange.gov.au.

seasonal fire map means a fire map relating to either the early dry season or the late dry season.

Note: Seasonal fire maps must also meet the requirements relating to format, resolution and other matters set out in section 3.27 of the Methodology Determination.

shrubs means living plants with a stem diameter of less than 50 mm at a height of 1.3 m.

strategic early dry season fire management is the planned and purposeful deployment of prescribed early dry season burns in combination with other natural and constructed barriers to stop the spread of fire.

vegetation map means a geospatial map in raster format which identifies the class and location of vegetation in the project area.

Note: Vegetation maps must also meet the requirements relating to format, resolution and other matters set out in section 3.25 of the Methodology Determination.

YSLB means the number of years since a pixel was last burnt.

Generally, where terms are not defined in the Methodology Determination, they have the meaning given by Section 5 of the Act and by the Regulations.

1.5 Interpretation

The purpose of this section is to clarify that references to sections, subsections and so on in the instrument are intended to refer to the relevant section, subsection or other part of the Methodology Determination, unless otherwise specified.

Part 2 Project requirements

2.1 Requirements that must be met for an offsets project to be an eligible offsets project

The effect of paragraph 106 (1) (b) of the Act is that a methodology determination must set out requirements that must be met for the offsets project to be an eligible offsets project.

This section of the Methodology Determination establishes where a project may take place and specifies the activities that must be undertaken for the project to be an eligible offsets project.

A project may only take place in an area which contains the specified vegetation type, and receives more than 1000 mm long-term average annual rainfall according to the CFI rainfall map. The project must manage fire through the use of strategic early dry season fire management in the project area. Indirect methods for reducing the area burnt and emissions released per unit area as a result of burning must not be used in the project area, such as the introduction of cattle to a project area. Cattle may be present in the project area, but numbers greater than usual must not be introduced.

Strategic early dry season fire management involves planning for, and implementation of, prescribed burning practices in the early dry season that reduce fuel loads and create more-or-less continuously burnt fire breaks in the landscape. For example, in the early dry season fire breaks may be burnt alongside roads or fence line corridors, or onto relatively moist fuels along water courses, to help reduce the risk of wildfire spreading in the late dry season. At a landscape scale, an effective fire break system created in the early dry season consists of a network of inter-linking burnt patches and corridors. There are several ways to undertake strategic early dry season fire management, including igniting fires from aircraft, from vehicles along the sides of roads and tracks, from boats on waterways, or while walking across country. The specific approaches used for undertaking strategic early dry season fire management including the location, timing and method will depend on landscape features within the project areas and local weather conditions, and are not prescribed in the Methodology Determination.

This abatement activity requires that reductions in the area burnt and/or emissions released from fire per unit burnt area (and the subsequent abatement generated) must be achieved by planned and purposeful deployment of prescribed early dry season burns in combination with other natural and constructed barriers to stop the spread of fire. Active extinguishment of fires may also be used.

In some instances late dry season burning within the project area may be appropriate to reduce the overall extent of wildfire and the Methodology Determination does not explicitly disallow fire management in the late dry season. Strategic fire management in the late dry season that reduces the area of a project that is burnt each year may generate abatement. However, project proponents cannot reduce burning within the project by creating fire breaks around the outside of the project area. This provision removes any incentive for poor fire management of neighbouring land, for example creating fire breaks around the project area by burning late in the dry season.

Part 3 Calculating carbon dioxide equivalent net abatement amount for a project

Under the Methodology Determination, abatement is calculated by calculating the annual emissions in the reporting period, and comparing this with average emissions during the baseline period. Annual emissions in both the baseline period and the reporting period are calculated using vegetation maps and fire maps.

The Methodology Determination uses fire maps to identify the extent of fires. This is called the fire scar area. Fires within the fire scar area do not, however, burn all the available fuel. A patchiness factor that estimates the proportion of fuel burnt is applied to determine the actual area of burnt fuel within a fire scar area. The fire scar area taking patchiness into account is called the area burnt.

The Methodology Determination uses vegetation maps to identify the different vegetation types within a project. Differentiating vegetation types within a project is required because different vegetation types generate different levels of emissions when they are burnt. The Methodology Determination also accommodates two different fire seasons – early dry season and late dry season. Differentiating fire seasons is required because fires in the different fire seasons generate different levels of emissions.

Total emissions from fire in a project are calculated by determining how many hectares of each vegetation type are burnt in each fire season and multiplying this area by several values that take the variation in emissions in each vegetation type and season into account.

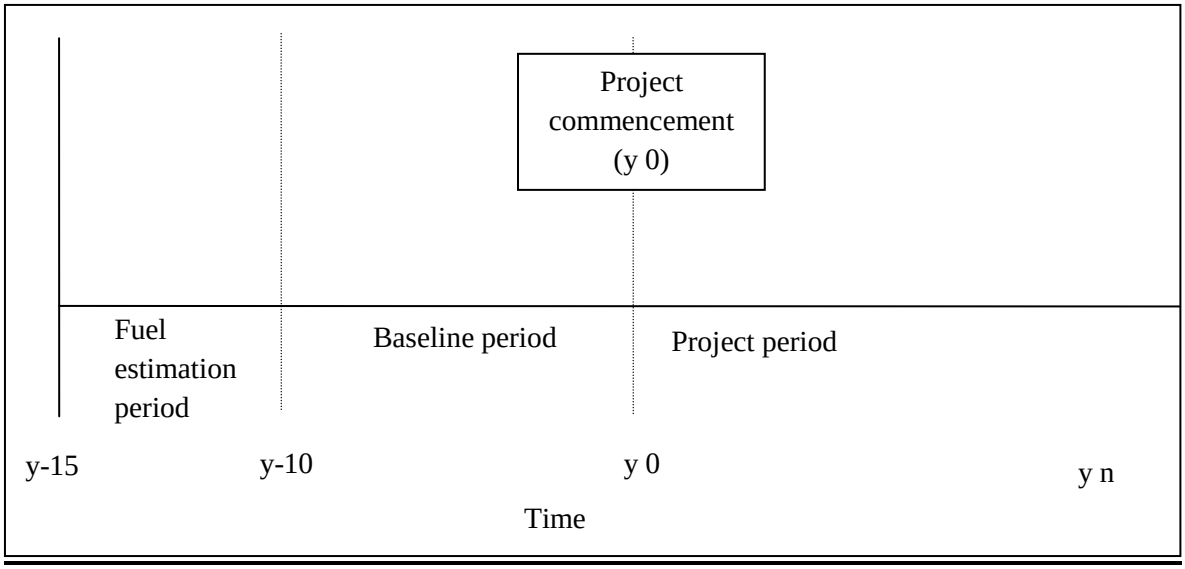
The baseline period is the 10 years preceding project commencement. A fuel estimation period is also required to determine the fine fuel loads in the earliest first five years in the baseline period. The different periods are shown below.

Defining phases of projects

For projects applying the Methodology Determination the following convention is applied to define various time periods:

- the fuel estimation period is from between one and five years prior to year 10 of the baseline period;
- the baseline period is from zero to 10 years prior to the project commencing; and
- the project period is from project commencement (year zero) to project completion (year n).

This is represented graphically below.



Division 3.1 Preliminary

3.1 General

This section sets out the requirements for performing the calculations set out in this Part of the Methodology Determination.

Subsection 3.1 (2) clarifies that the calculations in this Part apply to a single calendar year. If the reporting period is longer than one calendar year the calculations in this Part must be performed for each calendar year and then summed to obtain total abatement for the project area within the reporting period for whole calendar years.

The start of the late dry season will vary across the north of Australia with the timing of the wet season. A single late dry season start date across the country will not accurately capture this variation. This issue is addressed by splitting the area where the Methodology Determination is applicable into a number of regions and calculating the start of the late dry season separately for each region. If the project area occurs across more than one region the calculations in this Part must be performed for each region and then summed to obtain a total abatement amount for the project area in each year of the baseline period and the reporting period.

The extent of the different defined regions and their respective start dates will be published on the Department's website at www.climatechange.gov.au each year in accordance with section 3.3.

Calculations must use a vegetation map, monthly fire maps for each month of each year of the fuel load estimation period, baseline period and reporting period that meet specified requirements.

Data used in all calculations must comply with the data collection requirements set out in Division 3.3 of this Part.

The results of calculations must be kept in tables collected in forms prescribed in Schedule 2 of the Methodology Determination. Form 1 contains tables recording all calculations which must be retained by the project proponents. Form 2 contains tables recording calculations

which must be included in an offsets report. These forms are intended to assist project proponents in recording the results of the manipulation of spatial data and undertaking the calculations required by the Methodology Determination.

Some of the calculations must use a factor or parameter which is specified in the NGER Measurement Determination, made under subsection 10 (3) of the *National Greenhouse and Energy Reporting Act 2007* as in force from time to time, and the *National Greenhouse and Energy Reporting Regulations 2008* (the NGER Regulations). The purpose of paragraph 3.1 (4) (d) is to clarify that if the NGER Regulations or Measurement Determination are amended during an offsets reporting period, the calculations done under this Part must use the factor or parameter prescribed in the NGER Regulations or Measurement Determination in force at the time the report is submitted or is required, whichever is earlier.

3.2 Greenhouse gas assessment boundary

This section describes the emission sources that need to be assessed in order to determine the total net change in greenhouse gas emissions resulting from a project abatement activity.

The emission sources which need to be taken into account when calculating abatement are:

- burning of flammable living and dead vegetation (fine, coarse and heavy fuels and shrubs) in the project area during the baseline period and project activity period; and

- fuel used to establish and maintain the project, for example for helicopters and other motor driven equipment or drip torches.

CH_4, N_2O and CO_2 emissions are included in the greenhouse gas assessment boundary, except for CO_2 emissions from burning, which are excluded because the CO_2 emitted is taken to be recaptured in vegetation during the next growing cycle.

A number of emission sources are excluded from the abatement calculations. Above and below ground biomass (living matter that either survives the fire or regrows) and soil carbon is excluded and because the use of fire management to reduce the spatial extent of late dry season fires has been shown to increase carbon sequestration in the landscape, the exclusion of these carbon pools from the greenhouse gas assessment boundary is conservative. Emissions from microbial pathways are excluded. A reduction in the frequency and spatial extent of late dry season fires results in more biomass being decomposed via microbial pathways, instead of being burnt by fire. Directing more biomass through the microbial decomposition pathway is likely to generate some emissions, for example from termite activity. CH_4 emissions from termite activity are excluded on the basis that quantification of these emissions is highly uncertain and N_2O emissions from termite mounds and microbial pathways are excluded on the basis that they are unaffected by changes in fire regimes.

3.3 The start of the late dry season

This section specifies how the start date for the late dry season will be determined.

The start of the late dry season varies across the north of Australia. To take this variability into account the Regulator will categorise the eligible land area applying under the Methodology Determination into a number of different regions.

Each year the Department will publish the start date of the late dry season for each year for each region and the start date for the late dry season for each year that could be used to calculate average baseline emissions for each region. The Department will also publish the method used to determine the regions and dates. This information will be accessible from the Department's website at www.climatechange.gov.au.

The start date of the late dry season must fall between 1 July and 31 August. If the Department applies the method and determines that the late dry season started before 1 July, 1 July will be taken to be the start of the late dry season. If the Department applies the method and determines that the late dry season started after 31 August, 31 August will be taken to be the start of the late dry season.

Where the data required to calculate the start of the late dry season is not available and the Department has not published an applicable start date, for example because there are persistent cloudy conditions, then the default start date for the late dry season will be 1 August, which is the date used in Australia's National Greenhouse Accounts.

The start of the late dry season must be recorded in Table 9.

Division 3.2 Calculations

This Division states how to calculate annual emissions. This process must be used to calculate annual emissions in both the baseline period and the project period.

The formulas for calculating CH_4 and N_2O emissions from savanna burning are provided in Equation A and Equation B below.

For CH_4

$$E_{CH_4} = M_{CH_4} \sum_{pk} \left(A_{pk} P_k \sum_{l} \left(EF_{pl} FL_{npl} CC_l \sum_{m} \left(S_m BEF_{klm} \right) \right) \right)$$	**Equation A**

For N_2O

$$E_{N_2O} = M_{N_2O} \sum_{pk} \left(A_{pk} P_k \sum_{l} \left(EF_{pl} FL_{npl} CC_l NC_l \sum_{m} \left(S_m BEF_{klm} \right) \right) \right)$$	**Equation B**

Where the subscript:

p denotes the vegetation class;
k denotes the fire season;
l denotes the fuel size class;
m denotes the fire severity class; and,
n denotes the number of years since the patch of land was last burned.

The parameters are:

E_{CH_4} = emissions (Gg) of CH_4;

E_{N_2O} = emissions (Gg) of N_2O;

M = ratio of molecular mass (kg/mol) to the elemental mass;
A = fire scar area (ha);
P = patchiness;
EF = emission factor (% of fuel elemental content released in fire);
FL= fuel load (t dry matter ha^{-1});
CC = carbon content of fuel (grams of carbon per gram of dry fuel);
NC = elemental nitrogen to carbon ratio;
S = severity class (fraction of fires of severity class m in fire season k); and
BEF = burning efficiency.

The Methodology Determination provides a process involving the use of maps, Geographic Information System (GIS) software and spreadsheets to calculate emissions according to Equations A and B above.

Calculating annual emissions in the baseline period and the reporting period involves four steps. Each of these steps requires the use of a spreadsheet, a GIS or both. The steps are:

1. develop maps and calculate the fire scar area (GIS);

2. calculate annual fire emissions for the baseline and the project period (spreadsheet, GIS);

3. calculate the total annual project emissions (spreadsheet); and

4. calculate net annual greenhouse gas abatement (spreadsheet).

Each of these steps is the focus of one subdivision within Division 3.2 in the Methodology Determination.

Subdivision 3.2.1 Developing maps and calculating the fire scar area

3.4 Developing maps used to calculate emissions

This section describes the vegetation maps and fire maps that are required to underpin calculations to determine the fire scar area for a project. The detailed requirements for these mapping products are described in Division 3.3.

The required maps are:

- a vegetation map of the project area;

- monthly fire maps of the project area for each month of the calendar year for each year of the baseline period, the fuel load estimation period and the reporting period; and

- seasonal fire maps of the project area for the early and late dry seasons in each year of the baseline period and the reporting period, which must be developed from the monthly fire maps.

Using the vegetation map, the area of each vegetation class must be calculated in numbers of pixels for each vegetation class.

Monthly fire maps can be sourced from satellite products, for example the Moderate Resolution Imaging Spectroradiometer (MODIS) for calculating project emissions and the Advanced Very High Resolution Radiometer (AVHRR) for calculating baseline emissions. These fire maps can be sourced from the North Australian Fire Information Service (NAFI), available at www.firenorth.org.au/nafi.

Seasonal fire maps must be developed in accordance with section 3.27 and, if not sourced from NAFI, validated in accordance with section 3.28.

3.5 Calculating the fire scar area (A) in the early dry season and the late dry season periods for each vegetation class

This section specifies how to calculate the fire scar area in hectares. The fire scar area is the area of a project that is burnt without taking patchiness into account.

The fire scar area in hectares must be calculated for each year in the baseline period and for each year in the reporting period. This area must be calculated for each vegetation class and fire season.

The fire scar area must be calculated using GIS software and is achieved by overlaying the vegetation map for the project area with the seasonal fire maps. This process produces a raster map that allocates a vegetation class and a fire season value to each burnt pixel. Project proponents must convert the number of burnt pixels in the raster map into hectares using GIS software. The results must be recorded in Table 10 of Form 1 of Schedule 2 of the Methodology Determination.

Subdivision 3.2.2 Calculating annual fire emissions for the baseline period and the reporting period

This subdivision outlines the equations required to calculate the annual emissions of greenhouse gases in a single calendar year. These calculations must be made for each year of the baseline period and each year of the reporting period.

3.6 Calculating annual fire emissions

The annual emissions of greenhouse gases for the project area for each calendar year of the baseline period and the reporting period must be calculated by multiplying the area burnt by the potential emissions using Equation 1.

Sections 3.7 – 3.17 describe the data and calculations required prior to evaluating Equation 1. Section 3.18 describes the process for making the calculation described in Equation 1.

3.7 Calculating the area burnt

The area burnt is the fire scar area (described in section 3.5) taking patchiness into account. The area burnt is calculated by multiplying the fire scar area by a fraction that takes the patchiness of fires into account as shown in Equation 2.

Patchiness is the fraction of a fire scar area that is actually burnt in a fire. Patchiness varies for each fire season. For the early dry season patchiness is taken to be 0.107, and for the late dry season patchiness is taken to be 0.889. The result of the calculation of Equation 2 must be recorded in Table 11 of Form 1 and Form 2 of Schedule 2 of the Methodology Determination.

3.8 Potential emissions (Pe)

The potential emissions is a calculation of the quantity of emissions that would be released as a result of a fire on one hectare of a project for each greenhouse gas, and each vegetation class in each fire season.

Potential emissions must be calculated for each greenhouse gas according to each vegetation class and fire season because these variables have an effect on the emissions from fire. For example, a one hectare fire in an area of eucalypt open woodland in the early dry season releases different levels of emissions from a one hectare fire in an area of sandstone heath in the late dry season.

Equation 3 must be used to calculate the potential emissions of CH_4 and Equation 4 must be used to calculate potential emissions of N_2O. The results of these calculations must be recorded in Tables 17 to 20 and aggregated by fire season and vegetation class in Table 21 of Form 1 of Schedule 2 of the Methodology Determination.

The note shows how the calculations in Equations 3 and 4 are performed using the tables in which the results of preceding calculations and certain fixed parameters (constants) are recorded.

3.9 Burning efficiency (BEF)

The burning efficiency is the mass of combusted fuel that is volatilised in a fire. The burning efficiency varies with fire severity, fuel size class and fire season. The values for burning efficiency for each fuel size class and fire season, taking fire severity into account, are presented in Table 1 of the Methodology Determination.

3.10 Fuel load (FL)

The fuel load is the amount of fuel in tonnes per hectare for each fuel size class and each vegetation class. Calculating the potential emissions for CH_4 and N_2O requires a calculation of the fuel load present in the project area. The four fuel size classes used in the Methodology Determination are:

- fine fuel: defined as grass, leaf litter, bark and small twigs less than 6 mm in diameter;

- coarse: defined as twigs and dead branches greater than or equal to 6 mm and less than or equal to 50 mm diameter;

- heavy: branches and logs of greater 50 mm in diameter; and

- shrubs: defined as living plants with a stem diameter of less than 50 mm at a height of 1.3 m.

The fuel loads for coarse, heavy and shrub are given in Table 2 of subsection 3.8 (1). The fuel load for fine fuels varies depending on the recent fire history in a project area and must be calculated using project specific fire maps.

To calculate fine fuel loads, project proponents must assess the fire history of the project area in the five years prior to the year being analysed (the analysis year). This assessment must be done for every year in both the baseline and the reporting period. For example, to calculate the fine fuel load for the first year in a reporting period, project proponents must undertake analysis of the fire history in the last five years of the baseline period. This means that, to determine the average emissions in the 10 year baseline period, analysis of fire patterns must be undertaken for at least 15 years preceding project commencement.

Sections 3.11, 3.12 and 3.13 describe the process for calculating fine fuel loads.

3.11 Calculating years since last burnt for each burnt pixel

Fuel loads for fine fuels vary depending on the time since a piece of land was last burnt, i.e. the years since last burnt (YSLB). For example, if an area of land was exposed to fire one year ago the fine fuel load will be lower than a comparable area of land that was exposed to fire five years ago.

This section requires the project proponent to calculate the YSLB for each year in the baseline period and the reporting period. This must be done using GIS software.

The process for determining the years since last burnt for a single year requires analysis of the fire history in the five years prior to the analysis year. This process therefore requires the analysis of fire maps for six years, being for the analysis year and the five previous years.

The steps involved in calculating YSLB are:

1. aggregate the monthly fire maps into six annual (calendar year) fire maps showing each pixel as burnt or unburnt (paragraph 4 (a)) for the six years used in the analysis;

2. assign the year that the maps relate to as a value to all burnt pixels in each fire year and assign a zero value to all unburnt pixels and attach a name to each map using the convention specified in paragraphs 4 (b), (c) and (d);

3. generate five maps that show the difference in values between the analysis year and each of the other fives years by undertaking a standard grid operation in GIS software that takes the values from one map (in this case Gy) and subtracts the values in another map (in this case years Gy-1 to Gy-5) producing five maps (D-1 to D-5) (paragraphs 4 (e) and (f));

4. calculate the minimum value allocated to each corresponding pixel in each map and collate the results in a single map by performing a standard grid operation in GIS software that identifies the lowest value allocated to each corresponding pixel in each of the five maps (D-1 to D-5) and converts the values into a single map (paragraph 4 (g)); and

5. reclassify the values in the map to produce a single map with pixel values that show the years since last burnt in accordance with paragraphs 4 (h) and (i).

Steps one to five will need to be repeated for each year in the baseline period and each year in the reporting period and must use the five years preceding each analysis year. This process is applied slightly differently in the calculations for the baseline period and the project period.

To calculate annual emissions in the baseline period the fine fuel loads must be calculated for the first five years of the baseline (the years which are six to 10 years prior to the project commencement year) by analysing the years in the fuel estimation period to make up the required five years of fire history.

3.12 Calculating the frequency distribution of fire history

A frequency distribution of fire history must be calculated by overlaying the YSLB map determined in accordance with section 3.11 with the vegetation map to determine the number of pixels burnt in each vegetation class for each value of YSLB. The result must be recorded in Table 14 of Form 1 of Schedule 2.

A frequency distribution of each value of YSLB for each vegetation class must be produced and the results presented in Table 15 of Form 1 of Schedule 2.

3.13 Calculating the fuel load for fine fuels

The fine fuel load values must be calculated for each value of YSLB and vegetation class by multiplying the frequency distribution of values of YSLB shown in Table 15 with the fuel accumulation values shown in Table 3 of section 3.13, for each vegetation class. The results must be recorded in Table 16 of Form 1 of Schedule 2.

The total fine fuel load values for each vegetation class must be obtained by totalling the value of each row of Table 16 and recorded in Table 13 of Form 1 of Schedule 2.

3.14 Emission Factors (EF)

This section sets out the emission factors for CH_4 for each combination of vegetation class and fuel size class for use in Equation 3 and the emission factors for N_2O for each combination of vegetation class and fuel size class for use in Equation 4.

3.15 Carbon Content (CC)

This section sets out the carbon content for each vegetation class and fuel size class for use in Equations 3 and 4.

3.16 Nitrogen to Carbon Ration (NC)

This section sets out the nitrogen to carbon ratio for each fuel class size for use in Equation 4.

3.17 Converting the Molecular mass to Elemental Mass (M)

This section sets out the conversion factors to convert the value of emissions of CH_4 and N_2O from the molecular mass to the elemental mass for use in Equations 3 and 4.

3.18 Calculating the annual fire emissions in tonnes of CO_2-e

Subsection 1 of this section provides that the total annual emissions of each greenhouse gas in each fire season for each vegetation type must be calculated and the results recorded in Table 22 of Form 1 and Form 2 of Schedule 2.

Subsection 2 explains how the calculation in subsection 1 is to be made.

Subsection 3 provides that the carbon dioxide equivalent (CO_2-e) of the total annual emissions must be calculated by multiplying the emissions amount for each greenhouse gas by the Global Warming Potential specified in regulation 2.02 of the NGER Regulations, as amended from time to time. The results of this calculation must be recorded in Table 23 of Form 1 of Schedule 2.

Subsection 4 provides the results for each gas must be combined to determine the total annual emissions of greenhouse gas in tonnes of CO_2-e, and the total recorded in Table 25 of Form 1 and Form 2 of Schedule 2.

3.19 Calculating average baseline emissions

This section specifies the process for identifying a project baseline as required under paragraph 106 (4) (f) of the Act.

A project's baseline will be the estimated average annual CH_4 and N_2O emissions from the project area in the 10 years immediately preceding commencement of the project. Where early dry season fire management has been implemented within the project area for a period of at least one year but no more than six years immediately prior to commencement of the project, the baseline emissions can be estimated as the 10 years preceding this period of fire management.

The average baseline emissions will be calculated by determining the average annual emissions in the baseline period. The process for calculating annual emissions is described in section 3.6.

The baseline period of 10 years is based on typical fire return intervals for relevant sites in the savannas. A 10 year baseline period will cover several fire cycles and provide a reliable baseline for estimating the emissions from project areas when fire is unmanaged or managed under a different management regime than that prescribed by this method.

The annual emissions in tonnes of CO_2-e each year of the project baseline and the average baseline emissions must be recorded in Table 24 of Form 1 and Form 2 of Schedule 2.

Subdivision 3.2.3 Calculating total annual project emissions

3.20 Calculating the emissions from liquid fuel used to establish and manage a project

The total emissions of greenhouse gases from fuel used to establish and manage an offsets project must be calculated for each fuel type and each greenhouse gas using Equation 6. This includes fuel used in transportation to manage fire in the early dry season and collect data in the field, and fuel used in drip torches to light fires.

The total emissions of greenhouse gases from fuel used to establish and manage an offsets project must be calculated using Equation 7 and recorded in Table 26 of Form 1 of Schedule 2.

Greenhouse gas emissions from fuel use must be estimated using the energy content factors and emission factors specified in Schedule 1 of the NGER Measurement Determination in force at the time the offsets report is submitted or was required to be submitted, whichever is earlier.

3.21 Calculating total project emissions

This section provides that the total annual CO_2-e emissions for an offsets project must be calculated using Equation 8 to be the sum of annual fire emissions (calculated under section 3.6) and emissions from fuel use (calculated under section 3.20). The results must be recorded in Table 27 of Form 1 of Schedule 2.

3.22 Calculating net annual greenhouse gas abatement

Paragraph 106 (1) (c) of the Act provides that a methodology determination must specify a method for calculating the CO_2-e net abatement amount for the project in relation to a reporting period.

The CO_2-e net abatement amount must be calculated by subtracting total project emissions from average baseline emissions using Equation 9.

The results of this calculation must be recorded in Table 28 of Form 1 and Form 2 of Schedule 2.

Division 3.3 Data Collection

3.23 Data collection

The effect of paragraph 106 (3) (c) of the Act is that a methodology determination may require the project proponent of an eligible offsets project to comply with specified record-keeping requirements relating to the project. A project proponent for an eligible offsets project who fails to comply with a record-keeping requirement relating to the project will have contravened a civil penalty provision (section 193 of the Act).

Subsections 3.23 (1) and (2) provide that the appropriate data must be collected in order to develop and validate the vegetation maps and fire maps in the manner specified in this Division.

Subsections 3.23 (4) – (6) provide that a record must be kept of the quantity of fuel used to establish and maintain the project for each reporting period. This is to allow emissions from fuel use for the project to be calculated.

3.24 Requirements for a vegetation map

This section provides that a vegetation map of the project area must have a vegetation class assigned to each pixel. To develop this map, project proponents must assemble available mapping products for vegetation structure and other appropriate ancillary land attribute information (eg soil type, foliage projective cover) for the defined project area and, where not already available digitally, convert all mapping sources into digital form appropriate for GIS assessment. At least one of the inputs to the vegetation map must be cloud-free satellite imagery with a minimum pixel size of 250m sourced within the three years immediately preceding project commencement.

The vegetation class assigned to each pixel of the map must be one of the four vegetation classes described in Table 1 of Schedule 1 of the Methodology Determination. These vegetation classes are:

- eucalypt open forest with tussock grass ground layer (EOF);
- eucalypt woodland, with tussock grass ground layer (EW);
- sandstone woodland with a mixed tussock and/or hummock (spinifex) grass ground layer (SW); and
- sandstone heath with a ground layer dominated by hummock grasses (spinifex) (SH).

3.25 Validation of a vegetation map

This section sets out the requirements for a vegetation map.

The vegetation map must be validated to be at least 80 per cent accurate overall at 1:100 000 scale to be acceptable for emissions accounting purposes.

Validation must be done using comprehensive ground-based and / or aerial-based stratified random sampling using information from independent waypoints. For projects over 10 000 km^2, at least 500 independent data waypoints must be used to refine the map, and a

further 500 independent data waypoints must be used to separately assess the accuracy of the vegetation map. For projects with areas under 10 000 km^2, 250 independent data waypoints must be collected for each purpose.

Independent data waypoints must be of the order of one hectare in area to be congruent with the scale of the vegetation map. This data must be collected with reference to transects or a grid that samples all vegetation classes over the project area.

GIS software must then be used to validate the vegetation map. The independent data waypoints must be intersected with the vegetation map to derive a standard error matrix including errors of omission and commission. The data in the standard error matrix must be used to determine the accuracy of the map as a percentage.

This data should be used to improve the accuracy of the vegetation map.

3.26 Monthly fire maps

This section provides the requirements for a monthly fire map.

Subsection 1 provides that a monthly fire map which is used to calculate the baseline emissions of a project area must have a spatial resolution of no less than 1 km^2 per pixel.

Subsection 2 provides that a monthly fire map which is used to calculate project emissions for a project area must have a spatial resolution of no less than 250 m^2 per pixel.

Subsection 3 provides that fire maps for the baseline period, fuel load estimation period and the project period must be from a consistent time series and be derived from a single satellite product. The time series for the baseline period and the project period do not have to be consistent with each other.

Gaps in satellite products may be filled by supplementing fine scale products with coarser scale products. The note recognises that satellite products can contain gaps due to factors such as cloud cover or sensor failure and that these gaps can be filled with products of lower resolution.

3.27 Seasonal fire maps

This section provides for the development of an early dry season map and a late dry season map for each year of the baseline period and the reporting period.

Early dry season maps are developed by combining monthly fire maps for all months from January until the start of the late dry season into an early dry season map. Late dry season maps are developed by combining monthly fire maps from all months from the start of the late dry season until December into a late dry season map.

Seasonal fire maps used in relation to a baseline period or a reporting period must be of a consistent time series, be from a single satellite product, and be based on a time resolution of one month or less. The time series used to calculate the baseline period emissions, fuel loads and reporting period emissions do not, however, have to be consistent with each other.

3.28 Seasonal fire maps not sourced from NAFI

This section clarifies that the project proponent must ensure that seasonal fire maps that are based on maps which are not sourced from NAFI are validated by a registered greenhouse and energy auditor to be 80 per cent accurate overall for fire scars in the project area, at a 1:100 000 scale. It also sets out the requirements for validation.

Seasonal fire maps based on maps sourced from NAFI do not need to be validated.

Part 4 Monitoring, Record-keeping and Reporting Requirements

Division 4.1 General

4.1 Application

The effect of paragraph 106 (3) (d) of the Act is that a methodology determination may require the project proponent of an eligible offsets project to comply with specified requirements to monitor a project.

A project proponent for an eligible offsets project who fails to monitor a project in accordance with any monitoring requirements in the applicable methodology determination will have contravened a civil penalty provision (section 194 of the Act).

The monitoring, record-keeping and reporting requirements specified in this Part are in addition to any requirements specified in the Regulations.

Division 4.2 Record-keeping requirements

4.2 Records that must be kept

This section specifies the records that must be kept in relation to the project.

Division 4.3 Offsets report requirements

The Methodology Determination requires project proponents to submit:

- a report for the first reporting period; and
- ongoing reports for subsequent reporting periods.

4.3 Information that must be included in the first offsets project report

This section sets out the information that must be included in an offsets project report for the first reporting period.

4.4 Subsequent reporting periods

This section sets out information that must be included in the second and subsequent offsets project reports.

Attachment B

Statement of Compatibility with Human Rights

Prepared in accordance with Part 3 of the Human Rights (Parliamentary Scrutiny) Act 2011

Carbon Farming (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning) Methodology Determination 2012

This Legislative Instrument is compatible with the human rights and freedoms recognised or declared in the international instruments listed in section 3 of the *Human Rights (Parliamentary Scrutiny) Act 2011*.

Overview of the Legislative Instrument

The *Carbon Farming (Reduction of Greenhouse Gas Emissions through Early Dry Season Savanna Burning) Methodology Determination 2012* (the Methodology Determination) sets out the detailed rules for implementing and monitoring projects under the Carbon Farming Initiative to reduce methane (CH_4) and nitrous oxide (N_2O) emissions from fire across savannas in the fire prone tropical north of Australia.

The Methodology Determination involves the application of an early dry season burning (EDS) regime to reduce the risk and extent of late dry season (LDS) fires. This will shift the seasonality of burning from predominantly LDS to predominantly EDS fires, leading to a net reduction in fuel consumed and area burnt with a corresponding reduction in CH_4 and N_2O emissions.

Project proponents wanting to implement the Methodology Determination must make an application to the Clean Energy Regulator (Regulator) and meet the eligibility requirements set out under the *Carbon Credits (Carbon Farming Initiative) Act 2011*. Offsets projects that are approved by the Regulator can generate Kyoto Australian Carbon Credit Units that can be sold to:

- Australian companies that must pay the carbon price established under the Clean Energy legislation;
- overseas entities that pay a carbon price; and
- businesses in Australia and overseas wanting to offset their own carbon pollution.

Human rights implications

This Legislative Instrument does not engage any of the applicable rights or freedoms.

Conclusion

This Legislative Instrument is compatible with human rights as it does not raise any human rights issues.

Mark Dreyfus, Parliamentary Secretary for Climate Change and Energy Efficiency