Flinders Island Sustainability Plan:

Greenhouse Gas Minimisation Plan
Final Report

Prepared for:	Flinders Council
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transport infrastructure | community infrastructure | industrial infrastructure | climate change





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Executive Summary

Flinders Council has contracted pitt&sherry to assist in developing a comprehensive Sustainability Plan for the municipality. This paper documents current and expected future greenhouse gas emissions on Flinders Island. It then turns to key opportunities to reduce those emissions, for example through changed waste management practices, fuel efficiency, fuel switching and carbon sequestration. A separate Renewable Energy Plan has been prepared reviewing opportunities to reduce emissions in the power generation sector on Flinders Island.

Following site visits and analysis using national accounts factors and local activity data, greenhouse emissions for the island appear to be dominated by agriculture and land use change emissions. The scenario for current and future emissions expected in a 'business as usual' scenario to 2030 is displayed Table ES1 below.

Table ES1: Flinders Island Greenhouse Gas Emissions: Business As Usual Scenario

BAU (Gg CO_2-e)	2011	2015	2020	2025	2030
Electricity Generation	3.0	3.1	3.4	3.8	4.1
Vehicles	5.0	5.0	5.0	5.0	5.0
Shipping	1.6	1.6	1.6	1.6	1.6
Air travel	1.1	1.1	1.1	1.1	1.1
Industrial processes	0.7	0.7	0.7	0.7	0.8
Waste	0.7	0.7	0.7	0.7	0.7
Agriculture	46.3	46.7	47.8	49.7	52.7
LULUCF	0.0	10.5	10.5	10.5	10.5
Total	58.4	69.3	70.8	73.1	76.5

(LULUCF = land use, land use change and forestry) *Source: pitt&sherry*

By way of comparison, per-capita emissions on Flinders Island excluding agriculture were around 13.5 t CO_2-e/person in 2011. This is just over the Tasmanian average, excluding agriculture, of 12.9 t/capita (2009) but well below the Australian average figure, excluding agriculture, of 21 t/capita (2009). It is important to note that while the LULUCF emission figures are high in the BAU scenario they represent small and realistic changes in land areas.

Two levels of response, based on practicality and economics, were proposed in the Consultation Paper. These are the "simple" and "extensive" scenarios. Importantly these were combined with the primary scenario for renewable energy (identified in the associated Renewable Energy Report) to create two future pictures for the island. These are summarised below and discussed in more detail in Chapter 5.

The "simple" abatement strategy (in terms of using well understood and proven technologies) assumes the following:

- Stationary energy generation changes according to the renewable energy plan (assumed to be 98% renewable in this scenario estimation)
- Clearing of forests for pasture continues
- Full biodiesel production at the abattoir occurs – but with indeterminate use
- Use of electric cars and light transport to replace all small vehicle use is maximised
- Waste separation occurs at the tip

The "extensive" abatement scenario includes the above but adds:

- Cessation of clearing of forested land in any form
- Use of the biodiesel for heavier transport modes
- Installation of full pyrolysis (not necessarily for biogas) for landfill waste
- Installation of aerobic waste water treatment devices (AWT's) on all house or other sewers
- Negotiation to ensure the existing plantations are not harvested

The report analyses the effect of these strategies on the BAU scenario as well as two stepped up growth scenarios based on the Renewable Energy Plan values.

Following provision of the discussion paper on this issue various forms of community feedback were received as part of the consultation process. Accepting the community feedback and focussing on non-agriculture emissions, and assuming that deforestation is either non-existent or halted provides the following picture of meaningful changes available to the island community. Table ES2 shows the effect of the two levels of actions as a percentage of the BAU as it would be in 2030.

Table ES2: Flinders Island: BAU – Effectiveness of Abatement Measures

2030	BAU	simple	reduction	extensive	reduction
Electricity	4.1	0.1	31%	0.0	31%
Vehicles	5.0	3.4	12%	0.4	35%
Shipping	1.6	1.4	1%	0.1	11%
Air travel	1.1	1.1	0%	1.1	0%
Industrial processes	0.8	0.0	6%	0.0	6%
Waste	0.7	0.4	2%	0.2	4%
Total	13.3	6.2	53%	1.8	87%

The order of priority and effect for abatement activities suggested by the table above is:

1. Implement the renewable energy plan (31%)
2. Implement changes to the vehicle fleet firstly by altering as much as possible to electric passenger vehicles (12%)
3. Arrange biodiesel substitution for on-island vehicles, boating and for island shipping (24% plus 10%)
4. Support changes to abattoir waste management (6%)
5. Separate waste at the tip for full burning (2%)
6. Alter planning scheme to require AWT's (2%)

The measures 2 and 6 are dependent on the renewable energy plan, i.e. they cannot achieve their effect independently.

There appear to be limited options available to cost effectively abate air travel and agricultural emissions at this time, other than 'offsets', some of which may need to be secured off-Island. Offset for air travel would add another 1.1Gg or 8% reduction to the baseline in Table ES2.

We additionally note that if the "extensive abatement" measures were implemented, non-travel, non-agriculture related emissions fall to low levels even with the alternative scenarios of stepped up population and economic growth.

1. Background and Context for the Project

1.1 Background

Flinders Council has contracted pitt&sherry to assist in developing a comprehensive Sustainability Plan for the municipality. The Sustainability Plan has two key components:

1. A Renewable Energy plan, including a community supported vision to enable Flinders Island to reduce its reliance on diesel generated energy and see a substantial shift to the use of renewable energy; and
2. A Greenhouse Gas Minimisation Plan, including opportunities to reduce or offset greenhouse gas emissions by improving carbon sequestration opportunities, biodiversity enhancements and waste management practices.

This document focuses on Flinders Island greenhouse gas emissions and the possibilities for their reduction.

1.2 Purpose

This document is designed to set out:

- The key sources of greenhouse gas emissions on Flinders Island, along with their underlying drivers
- How those emissions are expected to evolve over the period to 2030
- What options are available for minimising those emissions

It is intended that this document will:

- Provide a useful, factual resource for consultations with the community and Council
- Help the community develop a shared vision for sustainability and greenhouse gas minimisation

The three key sections of this report are:

1. A summary and analysis of the greenhouse gas emissions on Flinders Island by sector
2. Projections for future emissions under a business-as-usual and alternative, faster economic growth scenario
3. An overview of key emission reduction options

2. Why Focus on Greenhouse Gas Emissions?

2.1 Climate Change

The overwhelming majority of the world's climate scientists believe that it is *unequivocal* that the Earth's climate is changing, with *very high confidence* that the primary cause of these changes is man-made (or anthropogenic) emissions of a range of greenhouse gases from two major activities – burning fossil fuels and land clearing – along with other activities.[1]

[Note that the terms in italics have defined meanings which may be found in the reference at footnote 1. Broadly *unequivocal* implies that there is no reputable scientific or statistical argument that this is not occurring. *Very high confidence* indicates that the scientific and statistical evidence is such that it is a degree of certainty well in excess of the normal bounds required for scientific evidence of a cause/effect relationship.]

CSIRO reports that the global average surface temperature rose 0.74 degrees in the last century. While this may not sound like a large change, effects already recorded from this temperature increase include a reduction of 10 to 15 per cent of Arctic ice. In the last 40 years there has been a 40 percent decline in the average snow depth at the start of October in the Australian Alps. Snow and glacier melt, along with thermal expansion of the world's oceans, is contributing to an annual rate of sea level rise currently around 3.1 mm/year. [2]

The concentrations of the main green house gases (GHGs = carbon dioxide or CO_2, methane, nitrous oxides) in the atmosphere have all risen dramatically since the industrial revolution commenced in the 1700s. The burning of coal, oil and natural gas, are the largest contributors to increased CO_2 concentrations, while land clearing and agricultural activity has been the largest contributor to increased methane and nitrous oxide concentrations[3]. It is considered *very likely* that these increases in GHG concentrations have caused the majority of the temperature rise recorded over the last 100 years.[4]

In response, the international community has articulated a desire to limit warming to 2 degrees above pre-industrial levels, in the hope that climate change impacts will be manageable, however there is no legally binding treaty in place to give effect this aspiration.[5]

Global temperature rises of up to 1.5 degrees as early as 2030 are likely to be unavoidable given that GHG concentrations are still rising. It is thought that a limit of around 450ppm in CO_2 concentration is necessary to have at least a 50% chance of keeping temperature increases within 2 degrees of pre-industrial levels. The International Energy Agency (IEA) recently restated warnings that substantial downward shifts in emission trends must start to occur in the next few years for this target to be hit. If this shift does not occur soon, a much more expensive, sudden and economically disruptive response would be required to keep within the 2 degree warming target[6].

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[1] IPCC, Summary for Policymakers of the Synthesis Report of the IPCC Fourth Assessment Report, 2007.

[2] http://www.csiro.au/en/Outcomes/Climate/Understanding/Climate-is-changing.aspx

[3] http://www.csiro.au/Outcomes/Climate/Understanding/Humans-Changing-Climate/Atmospheric-greenhouse-gas-exceeds-pre-industrial-levels.aspx and http://www.science.org.au/reports/climatechange2010.pdf , page 10

[4] http://www.science.org.au/reports/climatechange2010.pdf , page 11

[5] http://climatecommission.gov.au/wp-content/uploads/4108-CC-Science-WEB_3-June.pdf, page 18

[6] http://www.iea.org/Textbase/npsum/weo2011sum.pdf, p. 2

It is misleading to think of climate change as a gradual and gentle warming – perhaps something to be welcomed in the cooler parts of the globe. Climate change is primarily manifesting itself as an increased frequency and severity of extreme climate events such as droughts, heatwaves, bushfires, storms and floods.
For example, the *Climate Futures for Tasmania Report on Extreme Events* notes that extremely wet days will increase by around 25% in NE Tasmania, with what is now a 1-in-200 year rainfall event becoming a 1-in-20 year event by 2085. Heat waves are also expected to become more frequent, with the number of hot days doubling or tripling in some regions of Tasmania. On Flinders Island, hot 'tropical' nights are expect to rise from almost none at present to some 20 per year by the end of this Century[7]. At the same time, long term and more gradual changes such as sea level rise, glacial melt and changes in average temperatures will have significant impacts on urban settlements, agriculture, fisheries, the dispersion of pest and diseases (termites, cane toads, viruses, fungal diseases of cold-weather fruits, etc) and other impact vectors.

Climate change will impact on economic infrastructure – such as ports, coastal cities, water storages, roads and bridges – as well as on natural systems such as beaches, fisheries, forests and ecosystems. The latter may well spillover into additional economic impacts in sectors such as tourism.

The erosion of coastal areas through sea level rise may affect many properties by the sea. Alterations in rainfall patterns are expected to be as much as a reduction by a factor of 2 in some sites and an increase by a factor of 2 in others. Inland the recent erosion of roads in Queensland floods is one example of what can happen when infrastructure is subjected to conditions for which it was not designed.

Worldwide there are regions where the potential challenges are far greater, such as the low lying islands of the Pacific that may be lost altogether.

2.2 Emissions Sources

Globally, there are three human activities responsible for approximately equal proportions of greenhouse gas emissions, although the shares vary considerably from place to place. These are:

- Electricity production
- Transport
- Agriculture/land clearing

Electricity production is generally through the burning of fossil fuels (Flinders Island uses diesel for almost all its electricity generation at present, however following the conduct of this study, on April 23, a new wind generation tower was erected that will change the island's electricity generation impacts). Transportation systems around the world use close to 100% fossil fuels. Agriculture and land use change are sometimes a surprise. In agriculture, ruminants (cows, sheep) produce large amounts of methane in their digestive processes, and methane is a potent greenhouse gas with 23 times the 'global warming potential' (GWP) of CO_2. Deforestation and related land use changes also contribute significant greenhouse gas emissions globally. The key drivers of these changes include agriculture and the expansion of human settlements.

Other important emissions globally include synthetic or industrial gases such as sulphur hexafluoride (SF_6) and a range of CFCs and HCFCs. Generally these are by-products of industrial processes.

[7] This Report is available from: http://www.dpac.tas.gov.au/__data/assets/pdf_file/0014/151412/CFT_-_Extreme_Events_The_Summary.pdf

2.3 Carbon Accounting

For the purposes of effective comparison, the different greenhouse gases are usually assessed and reported as their ability to warm the earth relative to the effect of carbon dioxide.

This is called a 'carbon dioxide equivalent' and abbreviated CO_2-e. Quite unsurprisingly carbon dioxide (CO_2) is equal to one CO_2-e. Other greenhouse gases, such as methane from landfills or other sources, or industrial gases such as SF_6, are much more potent greenhouse gases that CO_2. For example SF_6 has a global warming potential (GWP-assessed over 100 years) 22,800 times greater than CO_2.

Under carbon accounting conventions, biologically produced carbon dioxide from living entities (including humans, livestock, plants, etc), and also from wastes produced by them (including in landfill) is NOT counted as an 'anthropogenic' (human-caused) emission (and therefore attracts no carbon pricing liability, for example). However, where such processes produce methane (e.g. from anaerobic conversion of green wastes in landfills), these methane emissions ARE counted and may attract a carbon price liability. The conventions are important for the accounting of greenhouse gas emissions on Flinders Island.

2.4 Carbon Pricing

Carbon Pricing to Commence in 2012

The Australian Government has decided to place a price on greenhouse gas (GHG) emissions. Its purpose is to signal clearly that such emissions are damaging, and also to create a financial incentive for their reduction. The carbon pricing mechanism[8] will commence from 1 July 2012.

Organisations with significant GHG emissions (25,000 tonnes CO_2-e or more per year) are required to report their emissions under the National Greenhouse and Energy Reporting System (NGERS). Reporting organisations that are also liable under the carbon pricing scheme must buy and surrender sufficient permits to cover a defined range of emission sources ('facilities') – for most councils this is their landfill site. The landfill on Flinders Island, however, falls well below the emissions threshold and is therefore not liable under the carbon pricing scheme. For liable entities, a permit is required for each tonne of carbon dioxide equivalent emitted.

The scheme starts with a fixed price: each permit will cost $23 in 2012 and this will rise annually for two years by a set amount. In July 2015, a cap on the number of permits to be issued will be imposed and the price for each permit will be set by the market. The number of available permits will depend on emissions reductions targets at the time, but it is likely that it will be less than the total emissions of the organizations participating in the scheme in 2014. This 'cap' will create competition among organizations to buy sufficient permits to cover their emissions, and it is the demand for the available permits that will determine their price from 2015 onwards. However, from 2015, organisations will also be able to buy internationally available permits, which may be available at a lower price, to cover up to 50% of their liability.

While the carbon pricing scheme only applies directly to large emitters (such as power stations and large industrial facilities), these entities will pass on their carbon costs in the form of higher prices for their products and services. In this way, the wider population will also contribute to paying the carbon price whenever they consume those carbon-intensive products and services.

[8] Note that mechanism is not a tax, as sometimes described in the media.

The only way to reduce exposure to these indirect carbon costs is to reduce your consumption of carbon intensive products and services, including by substituting low- or zero-carbon alternatives for them (e.g., renewables-based electricity instead of fossil-fuel based electricity).

Specific Carbon Pricing Effects on Flinders Island

At present there are no facilities on Flinders Island that will be required to purchase permits, as none pass the threshold limit (25,000 tonne CO_2-e per annum). The effects of carbon pricing on Flinders Island will therefore be indirect, but nevertheless significant, arising through increased prices for carbon intensive products and services including transport fuels, steel, cement and fertiliser. Initially, price increases for these materials are likely to be modest, but they are also expected to ramp up through time as emissions permits become more scarce. As noted in the separate Renewable Energy Plan Paper, the carbon pricing scheme will increase the cost of generating electricity from diesel, and this would be expected to flow through to higher electricity prices on the Island, subject to a decision of the Tasmanian Government to pass this cost on.

Other indirect effects may include changed travel and tourism patterns, as air travel in particular involves significant greenhouse gas emissions, and this will be impacted by the carbon price.

2.5 Why Reduce Emissions on Flinders Island, and How Much?

By reducing its emissions of greenhouse gases, Flinders Island will contribute in a small but direct way to what must be a global effort to limit the concentrations of greenhouse gases in the atmosphere to a safe level. In addition, as noted above, emissions will incur a cost mid-2012, and this will create an additional financial incentive to reduce emissions for many activities (but not all).

While it is not necessary to eliminate greenhouse gas emissions entirely, it is the case that the Intergovernmental Panel on Climate Change (IPCC) recommends that developed countries reduce their emissions by 80% - 95% by 2050: that is a very substantial reduction indeed. This recommendation reflects the greater ability of developed countries than developing countries to take action. It also recognises the reality that emissions in rapidly developing countries will continue to grow for some time yet, on the back of rapid population and economic growth.

At the same time, Flinders Island can benefit from taking genuine action to minimise its greenhouse gas emissions. In addition to directly reducing carbon related costs, greenhouse gas minimisation will enhance:

- Branding as a clean and green produce exporter
- an environmentally responsible tourist destination
- Branding as a lifestyle destination possibly attracting a greater population and increasing the economic sustainability of the island
- Economic efficiency – containing costs, increasing competitiveness
- Risk management – such as the risk of rising prices for carbon intensive products and services through time

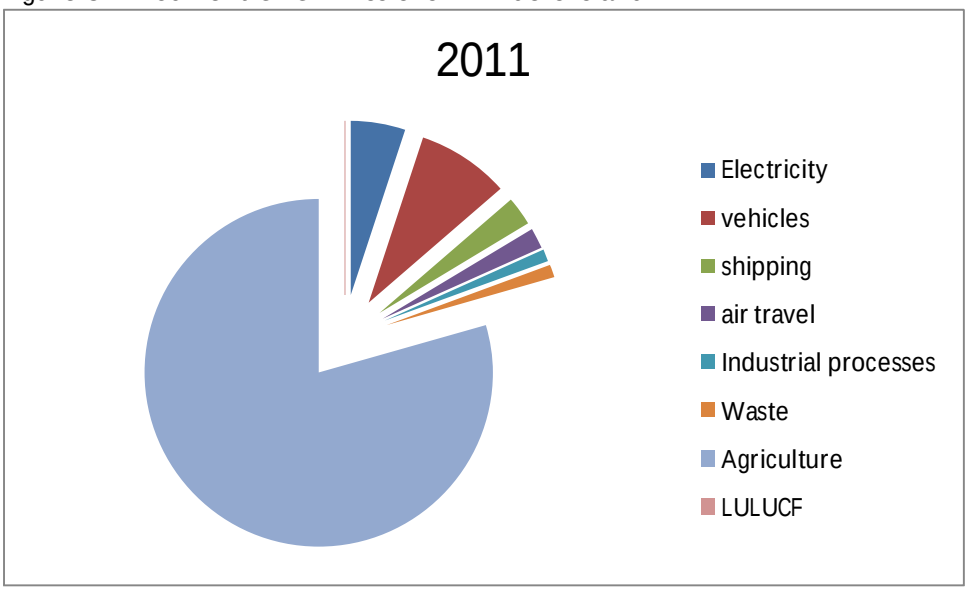
Essentially, greenhouse gas emissions can be reduced by reducing waste and by becoming more efficient in energy use, and also by switching to cleaner and renewable fuels. The steps involved in waste reduction and increasing efficiency almost always bring financial benefits additional to the emissions savings.

Energy efficiency can reduce energy bills, fuel efficiency brings lower fuel costs, while better waste management can improve amenity, air quality and reduce landfill problems, etc.

Flinders Island is one of the world's environmental jewels. Local minimisation of greenhouse gases will increase the sustainability – economically, socially and environmentally - of the Island, ensuring that current and future Islanders and visitors can continue to enjoy Flinders' clean produce and beauty.

Current Greenhouse Gas Emissions on Flinders Island
Current GHG emissions are estimated at 58Gg CO_2-e (or 58,000 tonnes), and are dominated by agricultural emissions (see Figure 3.1 below).

Figure 3.1: Current GHG Emissions: Flinders Island



Source: pitt&sherry

The high proportion of GHG emissions in the agricultural sector is not unusual for areas that have a large representation of cattle and sheep production.

The calculation methods and assumptions are detailed in the following sections.

2.6 Stationary Energy Emissions

Emissions from stationary energy have been estimated for electricity only. Small amounts of LPG are understood to be consumed on the Island but we have been unable to source reliable data on this consumption.

The vast majority of Flinders Island's electricity is produced using diesel generators, with small amounts contributed by wind and solar. The diesel combustion adds to atmospheric CO_2. We have used standard National Greenhouse Accounts (NGA) factors to calculate the emissions in CO_2-e from the diesel used for power generation.

Final electricity consumption (by end users) in FY 2011 was some 4,035 MWh and, after taking into account losses in the power lines (transmission losses), production of electricity was some 4,292 MWh. The diesel required to generate this can be calculated as 1.1 million litres, a figure that matches the actual usage. Greenhouse gas emissions from this use of diesel are 3.0 Gg CO_2-e p.a.

Other common sources of Stationary Energy emissions are natural gas and coal for the production of heat and steam. Our investigations indicate that neither is used in any significant quantity on the island.

2.7 Transport Emissions

Transport emissions were calculated for three different types of transport; vehicles, air travel and shipping. Each required a different approach. Each is reported separately as there are many interpretations of the role of these in greenhouse accounts. The latter two in particular may be viewed as outside the control of those on the Island. Technically they are known as 'Scope 3' emissions, while entities are generally accountable for their Scope 1 (direct) and Scope 2 (electricity consumption) emissions only. Setting that aside, we estimate total transport emissions are 7.7 Gg CO_2-e comprised of the following components.

2.7.1 Vehicle Transport Emissions

Transport emissions were calculated based on the number of vehicles registered across three categories; cars and station wagons; trucks, buses, vans, tractors and earth moving; and motorcycles.

Australian national values from an Australian Bureau of Statistics (ABS) study of transport trends (Survey of Motor Vehicle Use 9208.0, 12 Months ended 31 October 2007) were used to estimate usage. Of note is that average km travelled for these vehicle categories was available split into inter and intra state travel for all states, and as Flinders is an island the travel between states was excluded. Overall km travelled per vehicle were moderated to reflect the very high per capita ownership of vehicles on the island (1.67 per person vs. 0.67 nationally). This difference is not seen as unusual given the absence of public transport and the high level of agricultural activity on the island.

The final km travelled figure for each class was then split into proportions of diesel and petrol vehicles in each class. For motorcycles it was assumed all were petrol. For cars we have assumed 20% diesel. For trucks the petrol / diesel split was made using the national proportions of light vs. heavy rigid trucks in the national average fleet. For the purposes of simplicity it was assumed that the heavy trucks would be diesel and the lighter ones petrol (this assumption makes little difference to the overall GHG emission value).

Based on these mileage figures the fuel consumption in each class was calculated using Australian average fuel consumption figures from the same ABS report.

Total volume of fuel consumed for vehicles when calculated this way tallied with the estimate provided for whole of island supply – at 1.9 million litres. We are aware that the above figures include an indeterminate amount of fuel for boating activities – pleasure, commercial and fishing. Where the balance between diesel and petrol usage is similar to vehicle usage this will have no effect on the overall GHG emission figures.

Fuels consumed for transport have their own emissions factors in the National Greenhouse Accounts and these factors were used to calculate emissions in CO_2-e. Greenhouse gas emissions for vehicular transport are estimated at 5.0 Gg CO_2-e in 2011.

2.7.2 Air Travel Emissions (Passenger Travel to and from Island)

Air travel was estimated beginning with trip data in the Flinders Island Visitor Survey Report, 2009. This survey also provided information on tourist visits and length of stay for other calculations in this report.

For Sharp Airlines and other charters, the emissions generated from each flight per person were calculated using the Greenfleet calculator at www.greenfleet.com.au based on split between Launceston and Melbourne airports calculated from airport service reports provided in Council Agendas for the last year. To allow for short haul flights we assessed all private flights (9% of all flights) as if they were to Cape Barren.

Cape Barren trips were assumed to have half of the emissions of a trip to Launceston, consistent with the known high level of consumption on short haul flights.

Passenger sea transport (3% of all visits) was included in this section but was assigned zero emissions on a marginal cost basis – that being that ships were running anyway (and only) for freight purposes and that the effect of an extra passenger is undetectable.

Greenhouse gas emissions from passenger travel to and from the island therefore is represented by airline emissions that are estimated at 1.1 Gg CO_2-e p.a.

2.7.3 Shipping Emissions (Freight Transport to and from Island)

Tas Ports provided information on the number of ships visiting the island in the year for 2011. LD Shipping provided per round trip fuel usage values, further they indicated that usage was in the main independent of load level. Hence a single fuel figure was used for all trips.

These values were combined with the NGA emissions figure for diesel fuel usage. Greenhouse gas emissions from freight travel to and from the island are estimated at 1.6Gg CO_2-e p.a.

2.8 Industrial Processes

The only significant industrial process identified on the island (outside of fuel usage above) is the disposal of abattoir waste. The current method of disposing of abattoir waste is an effective composting technique that uses a deep pit with layers of waste and organic material similar to operations on a well managed municipal landfill site. This process is recognised to result in anaerobic decomposition of the waste which produces methane as its primary output. Under normal circumstances this methane is partly degraded by biological and biochemical processes in the soil that caps the landfill, but the majority of it slowly escapes to the atmosphere.

Methane is a potent greenhouse gas. As noted earlier, it has 23 times the warming action of CO_2 and this is accounted for in the calculations for this component of the island's greenhouse account.

Production volumes and waste were based on the Flinders Island Meat Rendering Plant Project Proposal 2011 and follow up clarifications of some items of detail. Waste volumes were calculated and for quality assurance the assumptions were tested against national averages for sheep and cattle meat and waste volumes and national averages for live and carcass weights (ABS). The size of the known Flinders herd for both categories (sheep and cattle – AK Consultants Agricultural Profile Flinders Island Muncipality 2010) and the fate of the bulk of the herd (off island transport) were also checked to ensure that processing frequency and implied life span of the herd were all consistent with national norms for agriculture.

We are aware that there are other activities on the island that may contribute to industrial emissions. The normal mode of running these businesses does not make them a significant contributor to GHG emissions in comparison to the meat works.

The waste volumes identified were then used in the standard National Greenhouse and Energy Reporting System (NGERS) calculator for solid waste streams to provide a figure for methane production converted to CO_2-e.

Greenhouse gas emissions from industrial processes on the island are estimated at 0.7 Gg CO_2-e p.a.

2.9 Waste Emissions

Waste emissions (other than industrial waste mentioned above) were assessed in two components, the municipal landfill (solid waste) and emissions from sewerage. Total waste emissions are estimated at 0.69 Gg CO_2-e comprising the following.

2.9.1 Solid Waste Emissions (Municipal Landfill)

Our site visit to the municipal tip confirmed that the operation is sufficiently deep to be anaerobic and applicable to the emissions calculator. This means that, as noted for industrial waste, the operation of the landfill produces methane.

In the absence of specific data, national average volumes for waste production per person (ABS) were used. The waste volumes identified were used in the standard National Greenhouse and Energy Reporting System (NGERS) calculator for solid waste streams to provide a figure for methane production converted to CO_2-e using the default values for mixed municipal stream waste.

Greenhouse gas emissions from solid waste at the landfill on the island are estimated at 0.45 Gg CO_2-e p.a.

2.9.2 Sewerage Emissions

Sewage treatment on the island is almost entirely via septic tanks. Septic tanks operate anaerobically and produce methane.

For calculation purposes the number of visitors must also be included in the sewage load. Visitor nights identified from the above mentioned survey in 2009 were equated to a number of full time residents and added to the island population. The resulting equivalent full time resident numbers were used to estimate methane emissions in the standard National Greenhouse and Energy Reporting System (NGERS) calculator for waste water to provide a figure for methane production converted to CO_2-e.

Greenhouse gas emissions from sewage on the island are estimated at 0.24 Gg CO_2-e p.a.

By way of comparison it is worth noting that a single person's emissions resulting from septic tank processes for a year is equivalent to slightly more than two return airline trips to Launceston.

2.10 Agriculture Emissions

Calculation of agricultural emissions can be fairly complex and involve estimates for many different pasture types and crops in a large variety of climates and soil types. The IPCC, however, recognises that agricultural emissions are dominated by one major activity – digestion in ruminants. This is a form of digestion that produces methane. Methane and some nitrous oxide emissions (also a potent greenhouse gas) can also arise where the manure is concentrated as opposed to being spread relatively sparsely across grazing fields.

The IPCC calculation method therefore consists of these two components – enteric fermentation (digestion) in the animal itself and manure handling. Due to the predominance of grazing in the agricultural makeup of Flinders we chose this method. Using a Tier 1 approach under the IPCC calculation method we selected factors for methane production from enteric fermentation per animal and factored in the herd sizes for Flinders from the AK report mentioned earlier.

Greenhouse gas emissions from agriculture on the Island are estimated at 46Gg CO_2-e p.a., a figure that substantially dwarfs other emissions sources, with exception of (one-off) land use changes, as discussed below.

2.11 Land Use, Land Use Change and Forestry (LULUCF) Emissions

LULUCF emissions mainly arise when forests are cleared. Any form of standing woody mass, be it forests or some other plant type, when cleared and allowed to decompose over time will add to the CO_2 in the atmosphere.

There are a number of subtleties where the land use is changing from one form of forestry to another or from one form of crop to another. Even management protocols such as fertilising routines and irrigation have the power to alter the standing stock of carbon in or above the soil. For our purposes though the more subtle changes will have little impact, as the agricultural landscape is dominated by grazing. The significant change to be accounted for on Flinders is deforestation.

Flinders' forest carbon content was assessed using the national standard Reforestation Modelling Tool (formerly National Carbon Assessment Tool or NCAT) as 0.35 Gg CO_2-e per hectare. Provision is made for future clearings in future scenarios below.

In the current year we have estimated LULUCF emissions as zero as a result of zero known land clearing. This however does not mean that LULUCF is a minor component of emissions for Flinders Island. For each hectare of native forest cleared there are 0.35 Gg CO_2-e produced. Taken in context – the average area swept by a pivot irrigator is 25 Ha, representing 8.75 Gg CO_2-e for a single clearing. The potential for effect on the Island's carbon account is extremely large.

The Island also contains 252 Ha of predominantly pine plantation, that has 0.21 Gg CO_2-e per hectare. This is not currently being harvested but it is ready for harvest. When done, this will be accounted as a one-off release of 53 Gg CO_2-e.

3. Emissions Projections to 2030

3.1 Key Assumptions

We have projected emissions to 2030 on the basis of three scenarios. These scenarios differ in the assumptions made on changes to population, energy consumption, economic growth, change in agricultural activity levels and type, and significant tourism, residential or commercial development. The scenarios are summarised below and described in greater detail in the separate *Renewable Energy Plan*.

3.2 Business as Usual Scenario

This scenario assumes that observed trends on Flinders Island continue into the future. At the same time, 'business as usual' (BAU) occurs in regards to greenhouse gas management activities. Electricity continues to be produced from diesel gen sets for instance As a consequence greenhouse gas emissions are either the same or higher in 2030 as in 2011. (Note that at the time of engagement for this project the new wind generator was far from certain. Even the development application had not been lodged. We have therefore needed to treat the prior condition as BAU in order to produce modelled data for the renewable energy report and GHG report.)

The BAU scenario has minimal growth in population and tourist activity. This means that transport emissions are at the same level in 2030 as in 2011. Emissions from waste and industrial emissions are also flat.

Electricity demand however increases – as households and businesses continue the national trend to use more electricity for appliances, heating, etc.

The intensity of agricultural activity increases slightly, with a corresponding increase in emissions. This is due to one of our assumptions – that a slight amount of land clearing continues, and that this clearing will be used for grazing activities. Between now and 2030 this equates to an increase in farmed area of 1.0%.

The impacts of our BAU scenario assumptions on greenhouse gas emissions are summarised in Table 4.1 below:

Table 4.1: Flinders Island GHG Emissions to 2030: Business as Usual Scenario

BAU (Gg CO_2-e)	2011	2015	2020	2025	2030
Electricity	3.0	3.1	3.4	3.8	4.1
Vehicles	5.0	5.0	5.0	5.0	5.0
Shipping	1.6	1.6	1.6	1.6	1.6
Air travel	1.1	1.1	1.1	1.1	1.1
Industrial processes	0.7	0.7	0.7	0.7	0.8
Waste	0.7	0.7	0.7	0.7	0.7
Agriculture	46.3	46.7	47.8	49.7	52.7
LULUCF	0.0	10.5	10.5	10.5	10.5
Total	58.4	69.3	70.8	73.1	76.5

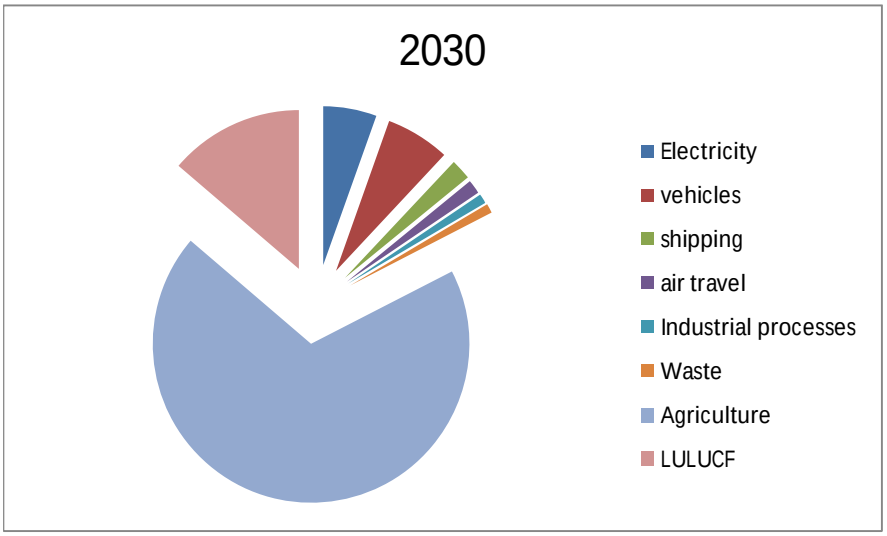
Source: pitt&sherry

Calculations for emissions under this scenario increase based on the following assumptions:

- As land is cleared the deforestation is added to the emissions
- The land is converted to pasture which supports increased grazing stock
- Grazing stock is increased proportionate to the existing grazing land area
- On-island abattoir processing increases proportionate to total stock
- Agricultural emissions increase due to increased number of stock with enteric fermentation

The breakdown of greenhouse gas emissions by key source is identified in the following chart, Figure 4.1.

Figure 4.1: Flinders Island, Breakdown of Expected GHG Emissions in 2030: Business as Usual Scenario



Source: pitt&sherry

While pie charts are instructive on proportions it is important to note that the full values should be viewed carefully. The values for indicative stages are provided in Table 4.1 above.

3.3 Faster Growth Scenarios

3.3.1 Scenario A

We have prepared two scenarios to illustrate the impact of faster economic and population growth on Flinders Island on greenhouse gas emissions. The key assumptions underpinning Scenario A include, first, a significant expansion in agricultural activity on the Island. We propose that from 2013 there are approximately 14 median sized pivot irrigators on the island which would constitute 0.9% of farmed area or ~ 400 ha only of irrigated land, for example, to enable an expansion of beef and lamb production for export. We then assume that the area under irrigation increases 5% every year to 2030. Our earlier analysis conducted for power consumption purposes for the renewable energy plan and using standard crop demand models for water usage indicated that winter crops require no irrigation, while summer crops will require around 9ML per hectare. A recent report to Council (August 2010 by Hocking et al.) indicates that this is the limit of availability per bore in some areas of Flinders (near Whitemark) because of the limiting nature of the water stores, however the report concludes that there is potential for limited large volume extraction for irrigation from other (eastern) areas.

This increase in agricultural activity increases emissions directly attributed to agriculture, but also to industry (the abattoir), electricity (pumping associated with irrigation) and transport.

We also assume that an additional 10 new houses are built annually, over and above those that are expected to be built under BAU. By 2030, this scenario implies that there would be some 624 houses[9] and 1,060 residents on the Island, compared with 532 houses and 905 residents under BAU. The new houses are assumed to be rated at 5 stars for energy efficiency as required under current Tasmanian law.

[9] We assume 1% per year of the existing housing stock is 'retired' (demolished or substantially upgraded).

The increased population and new housing stock increases emissions in every activity area:

- vehicle travel
- electricity
- shipping
- air travel
- waste at tip
- sewerage waste

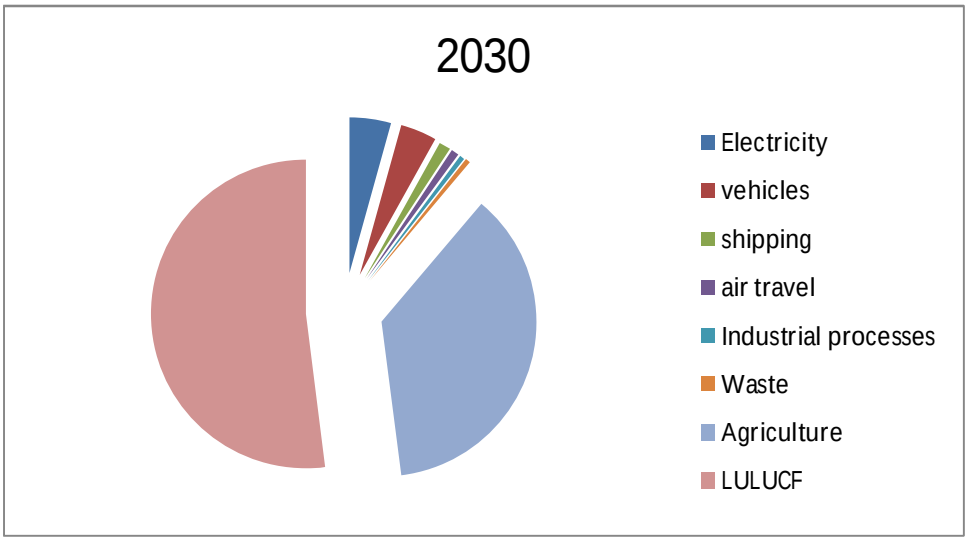
For Scenario A by 2030 the cumulative effects of the above assumptions are that emissions (without active management) will have grown to 155 Gg CO_2-e. The increases are shown in Table 4.2 below while the chart at Figure 4.2 illustrates the breakdown.

Table 4.2: Flinders Island GHG Emissions to 2030: Faster Growth, Scenario A

Scenario A (Gg CO_2-e)	2011	2015	2020	2025	2030
Electricity	3.0	3.9	4.7	5.7	6.7
Vehicles	5.0	5.3	5.6	5.8	5.9
Shipping	1.6	1.7	1.8	1.8	1.9
Air travel	1.1	1.2	1.2	1.3	1.3
Industrial processes	0.7	0.7	0.7	0.8	0.8
Waste	0.7	0.7	0.8	0.8	0.8
Agriculture	46.3	47.3	49.5	52.6	56.9
LULUCF	0.0	80.5	80.5	80.5	80.5
Total	58.4	141.2	144.7	149.2	154.7

Source: pitt&sherry

Figure 4.2: Flinders Island, Breakdown of Expected GHG Emissions in 2030: Faster Growth, Scenario A



Source: pitt&sherry

3.3.2 Scenario B

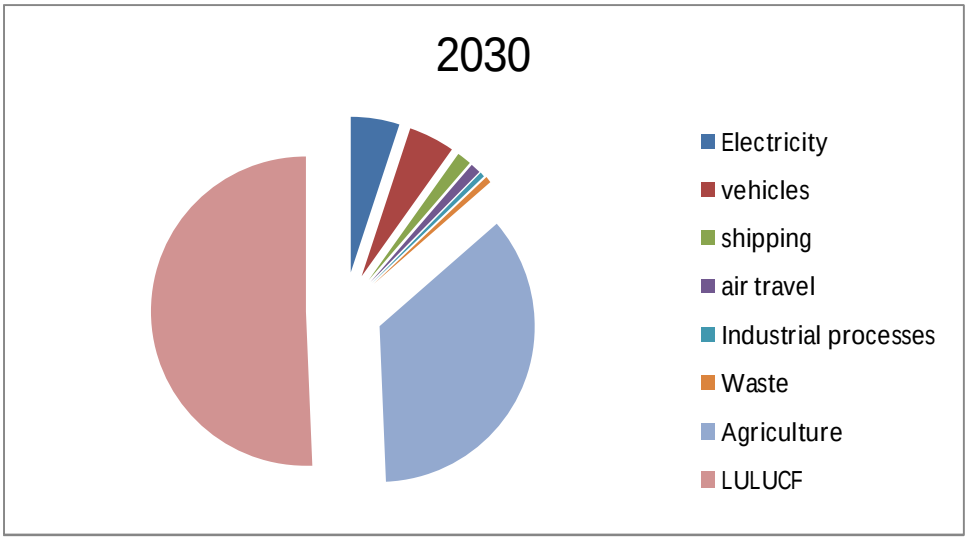
Scenario B makes the same assumptions as Scenario A with respect to stepped up agriculture production, but tests the impact of adding an additional 20 houses per year above those expected under BAU, along with the additional commercial sector demand this would pull through. In Scenario B, the total housing stock would reach 804 houses in 2030, while the population would be around 1,366 persons. There is a corresponding increase in emissions in electricity, transport, and waste. The cumulative effects of the above assumptions are that emissions will have grown to 159Gg CO2-e. The figures are shown in Table 4.3 below with breakdown illustrated in the chart at Figure 4.3.

Table 4.3: Flinders Island GHG Emissions to 2030: Faster Growth, Scenario B

Scenario B (Gg CO_2-e)	2011	2015	2020	2025	2030
Electricity	3.0	4.1	5.4	6.7	8.1
Vehicles	5.0	5.6	6.4	7.1	7.6
Shipping	1.6	1.8	2.0	2.2	2.4
Air travel	1.1	1.2	1.4	1.6	1.7
Industrial processes	0.7	0.7	0.7	0.8	0.8
Waste	0.7	0.8	0.9	1.0	1.0
Agriculture	46.3	47.3	49.5	52.6	56.9
LULUCF	0.0	80.5	80.5	80.5	80.5
Total	58.4	142.0	146.8	152.4	158.9

Source: pitt&sherry

Figure 4.3: Flinders Island, Breakdown of Expected GHG Emissions in 2030: Faster Growth, Scenario B



Source: pitt&sherry

4. Greenhouse Gas Minimisation Opportunities

4.1 Overview

Following analysis, we have proposed two levels of reduction measures which are explained in more detail below. Generally the "simple" level of change uses established technologies within a framework that we expect would be practically and economically viable. The "extensive" changes involve more effort with greater inconvenience or cost involved. The components for individual sectors are explained in the following sub-sections.

4.2 Reducing Stationary Energy Emissions

These items are largely covered in the *Renewable Energy Plan*, but we can add the matters below.

We have assumed for simplicity that the predominant conversion to renewable energy will be 98% efficient under the "simple" GHG minimisation and that the "extensive" will involve 100% renewable using biodiesel for backup generation of the remaining 2%.

4.3 Reducing Transport Emissions

Vehicles

There are two major opportunities for reduction of transport emissions outside of reduction in transport itself.

The first measure is the conversion of as much of the fleet as possible to electric vehicles. Such vehicles would have very low emissions under the proposed *Renewable Energy Plan for Flinders Island*. This strategy would increase the demand for (renewable) electricity and, to the extent that this strategy is preferred, the additional demand will need to be factored into the Island's Renewable Energy Plan. However, given the relatively high landed cost of liquid fuels on Flinders Island, together with modest vehicle kilometres travelled and an increasing variety of electric vehicles at lower prices through time, this is likely to be an increasingly attractive abatement strategy.

The second option is the substitution of mineral diesel by biodiesel in trucks, agricultural machinery and cars. This may or may not be accompanied by an increased proportion of diesel engines in the fleet, but we would assume that this would naturally be the case. The substitution rate could be limited by the biodiesel production rate on Island, assuming this is done as part of the operations of the abattoir. However, the capacity is considerable and additionally the majority portion of the stock (going off the Island) could potentially be diverted to an expanded operation that includes biodiesel conversion and a rendering plant. It would also be possible to import biodiesel. Note that biodiesel may also be able to be used at the Whitemark power station, although some modifications might be required, such as separate biodiesel storage and handling facilities. This is discussed further in the *Renewable Energy Plan*.

Emissions from agricultural machinery can be minimised by following no-till farming practices, upgrading to fuel efficient tractors and other machinery. Furthermore it should be noted that biofuel crops, such as canola for biodiesel or sugar beet for ethanol, could be grown and processed into fuels on the island.

For the "extensive" scenario then we have assumed that, in addition to the replacement of petrol vehicles with electric, the remaining diesel emissions will be 90% replaced by biodiesel.

Air travel

More efficient aircraft may be developed over time, but this is not in the hands of the Council. Substitution of air travel by shipping is generally a more emissions efficient form of travel. However shipping is already proven not to be an economically viable alternative due to rostering and continuance issues. There is little that can be done in this area other than offsets, which are considered below.

Shipping

Shipping is in general one of the most efficient modes of transport (per tonne.km) that we have. Additionally the ships currently do not run except when there is close to a full load. It would seem that this is as efficient as it can be with current technology. Under the "simple" scenario we have assumed that 10% efficiency gains would happen through natural changes to the shipping stock.

For the "extensive" scenario we have assumed 90% of shipping diesel replaced by biodiesel.

4.4 Reducing Industrial Emissions

There currently exists a pre-feasibility level business plan for a rendering plant at the abattoir. This plan is focussed on use of fat outputs (tallow) for their own heat and power generation with export of excess electricity to the grid. While these are commendable aims, the proposal could benefit from detailed study of other options, specifically the production of biodiesel as a first pass, with rendering of the remaining product as a secondary application. Biodiesel has the advantage that it can be applied to a number of uses across the Island, on which many of the above mentioned measures rely.

We strongly support the further development of the Flinders Island Meat rendering plant proposal, noting the potential for significant economic as well as greenhouse gas emission reduction benefits for the Island.

For both the "simple" and "extensive" scenarios we have assumed that the current disposal method will be completely replaced with a combination of biodiesel production followed by rendering.

We have assumed that the volume of biodiesel required will not be limiting given the large agricultural capacity of Flinders relative to the population, however the current volume of waste produced by the abattoir is not sufficient to supply all of the island's diesel.

4.5 Reducing Waste Emissions

The primary reason for the greenhouse gas emissions from waste is anaerobic digestion. This can be minimised or avoided in the case of the municipal tip by the use of waste separation strategies to remove biodegradable waste from the landfill and treat it in different ways. These may include;

- Immediate combustion of biodegradeable waste
- Shredding of garden waste for ground cover
- Shredding of other waste and associated aerobic composting

Due to the small size of the waste stream it is unlikely that the latter two will ever be financially viable.

Immediate combustion is also difficult to perform on a small scale economically, but there is promise in various devices being developed such as micro-scale pyrolysis.

Viability of such systems usually is depended on efficient use of all outputs from the system. The difficulty for Flinders Island is to find a place to use both the heat and the electricity that might be generated. For the moment such devices remain largely unproven in an operating sense, even more so for financial viability. Economic viability of such a system has been assessed by one manufacturer (Terragon Waste). The system is proven elsewhere and not capital intensive, but it does require a full time attendant. The supplier has provided a marginally cash positive case calculated on an economic use of the heating (hot water) output. This is difficult to make viable for Flinders due to the dispersed nature of the housing – distribution of hot water is very difficult to make economical over any significant distance. We do not see the micro gasification option as likely given these constraints.

The most likely use of such waste is simply to burn it in a controlled incinerator. While this may seem wasteful, it is simple, relatively inexpensive and removes the methane burden.

We have assumed the "simple" scenario only – with a 70% reduction with either reuse or burning following separation of waste streams.

For sewage we do not believe it is viable to create a centralised sewerage system for reasons of distance, housing density and topography. While a centralised system enables controlled aerobic treatment the same can be done, and is done routinely, using proprietary technology aerobic water treatment systems (AWTS or AWT). These do require more technology and expense than the traditional septic but they are accepted standard modern technology in many municipal areas. Use of these to replace septics reduces the calculated emission to zero, but only when the electricity required to drive them is derived from renewable energy. Their recommendation therefore is based on the prior implementation of the renewable energy plan.

This assumption is in the "simple" scenario, there is no more extensive option canvassed.

4.6 Reducing Agricultural Emissions

The single biggest alteration that could affect the Flinders Island emissions would be to stop farming ruminants (cows and sheep) and to instead farm wallaby, imported kangaroo, or other non-ruminant species. Any proportion of this change would be beneficial. In the absence of such dramatic changes to farming practices there is little that can be achieved in open pasture areas – in feedlots cattle methane production can be reduced with various additives/alteration to the feedstock. This option is not available on open pasture.

What is likely to eventuate around or before 2030 however is the development of strains of cattle and sheep that are predisposed to having lower emissions. This is a subject of study already but is a measure that is somewhere down the track in terms of implementation. It is also worth noting that the likely level of effect is probably less than 20% of current emissions per head. For the "simple" scenario we have included this 20% reduction.

Barring these measures, restriction, or reduction of animal numbers is the only measure to take effect. We have not assumed any further reduction in an "extensive" scenario.

4.7 Reducing Land use, Land Use Change and Forestry Emissions

A reduction in land clearing (for farm expansion or for harvesting plantation) appears to be the only change that can be affected here. This may have a strong effect on the island emission profile but may be unsustainable in a cultural or economic sense.

One opportunity that may alter this somewhat is the opportunity to develop carbon farming credits for not clearing natural forest[10], however unless forested areas had evidentiary documented plans for such clearing in place prior to 2011 it is unlikely that they will be able to claim such. Future plans for the island may actually contain quite the opposite – larger scale clearing than is included in these scenarios.

We have not proposed any alteration to the land clearing in each scenario.

Carbon Farming/Offsets

Beyond reduction of land clearing it is worthwhile to consider the reversal of existing land clearance. Active pursuit of carbon farming using tree planting, for instance, is entirely possible on existing cleared land. However, it is worth noting that a formal claim for recognition of offsets may be difficult to substantiate. This is due to the nature of farm land on Flinders together with the rules of the Carbon Farming Initiative (CFI).

Carbon farming claims on land that receives over 600mm long term average rainfall per year is specifically excluded under the CFI. So while the reality is that carbon would be built up on such established forests (and the community could choose to add these as voluntary benefits to their carbon accounts) it would cross over these newly established national guidelines to do so.

Various hybrid approaches using the land are also possible – in areas that would not be contentious. One such approach is growing low grade woody mass and creating bio-char to be put back into the soil. This could be an on-going process, is specifically included as part of the CFI and, depending on scale, may result in a significant contribution to reducing the islands carbon footprint. There is currently no certification method for biochar soil carbon increases under the CFI and establishing the method is an essential first step. The likelihood of pursuing this avenue may be a subject for further community discussion, however it is a significant commercial undertaking and would be a measure amongst the "extensive" options.

There is currently a body of research in productivity increases and soil carbon through improved land management practices but soil carbon increases arising merely from the introduction of shelter belts on grazing land are not known. There is current work on the use of shelter belts in conjunction with other alterations of farming practices, specifically the reduction in stocking numbers of the adjacent protected pasture. The effect is gained (if it is substantiated over time, and this has not yet been achieved) by a very significant reduction in stock numbers that we believe would not be acceptable economically for Flinders Island. Soil carbon increases on land for crops is known, but contentious and gained through changes in tillage and fertilisation practices. This is not viable for Flinders as the percentage of land in crop on the island is exceedingly small and unlikely to change due to the land type (class 4-7). Community consultation additionally identified that there was no desire to change the form of industry on the island due to the effects on economic sustainability so it is difficult to propose a move away from grazing, especially given the class of land on Flinders.

[10] This is conducted under the Carbon Farming Initiative (CFI), one of the Federal Government's new measures as part of the carbon pricing scheme.

4.8 Quantitative Analysis of GHG Minimisation Opportunities

As a means of understanding the possibilities, we identify two differing greenhouse reduction scenarios that start from the Scenario A projection in Chapter 4.

The "simple" abatement strategy (in terms of using well understood and proven technologies) includes the following:

- Stationary energy generation changes according to the renewable energy plan (assumed to be 98% renewable in this scenario estimation)
- Clearing of forests for pasture continues
- Full biodiesel production at the abattoir – but indeterminate use
- Maximise use of electric cars and light transport to replace all small vehicle use
- Waste separation at the tip

The "extensive" abatement scenario includes the above with addition of:

- Cessation of clearing of any forested land for agriculture
- Use of the biodiesel for heavier transport modes
- Installation of full pyrolysis (not necessarily for biogas) for landfill waste
- Installation of aerobic waste water treatment devices (AWT's) on all house or other sewers
- Negotiation to ensure the existing plantations are not harvested

The emissions for BAU, "simple", and "extensive" emission reductions under the various scenarios are shown below.

Table 5.1: Flinders Island: Scenario A Greenhouse Gas Emissions: No Abatement

Scenario A - no abatement ($Gg\ CO_2$-e)	2011	2015	2020	2025	2030
Electricity	3.0	3.9	4.7	5.7	6.7
Vehicles	5.0	5.3	5.6	5.8	5.9
Shipping	1.6	1.7	1.8	1.8	1.9
Air travel	1.1	1.2	1.2	1.3	1.3
Industrial processes	0.7	0.7	0.7	0.8	0.8
Waste	0.7	0.7	0.8	0.8	0.8
Agriculture	46.3	47.3	49.5	52.6	56.9
LULUCF	0.0	80.5	80.5	80.5	80.5
Total	58.4	141.2	144.7	149.2	154.7

Source: pitt&sherry

Table 5.2: Flinders Island: Scenario A: Simple Abatement Measures

Scenario A "simple abatement" ($Gg\ CO_2$-e)	2011	2015	2020	2025	2030
Electricity	0.1	0.1	0.1	0.1	0.1
Vehicles	3.4	3.6	3.8	3.9	4.0
Shipping	1.4	1.5	1.6	1.6	1.7
Air travel	1.1	1.2	1.2	1.3	1.3
Industrial processes	0.0	0.0	0.0	0.0	0.0
Waste	0.4	0.4	0.4	0.4	0.4
Agriculture	37.1	37.8	39.6	42.1	45.5
LULUCF	0.0	80.5	80.5	80.5	80.5
Total	43.5	125.1	127.2	130.0	133.5

Source: pitt&sherry

Table 5.3: Flinders Island: Scenario A: Extensive Abatement Measures

Scenario A "extensive abatement" ($Gg\ CO_2$-e)	2011	2015	2020	2025	2030
Electricity	0.0	0.0	0.0	0.0	0.0
Vehicles	0.4	0.4	0.4	0.4	0.4
Shipping	0.1	0.2	0.2	0.2	0.2
Air travel	1.1	1.2	1.2	1.3	1.3
Industrial processes	0.0	0.0	0.0	0.0	0.0
Waste	0.2	0.2	0.2	0.2	0.2
Agriculture	37.1	37.8	39.6	42.1	45.5
LULUCF	0.0	0.0	0.0	0.0	0.0
Total	38.8	39.7	41.5	44.1	47.5

Source: pitt&sherry

We note that the "extensive abatement" option would see non-travel, non-agriculture related emissions fall to very low levels indeed, despite an assumption of continued population and economic growth.

As noted, there appear to be few options available to cost effectively abate air travel and agricultural emissions at this time, other than 'offsets' such as those produced under the carbon farming initiative. As noted above, such offsets may need to be secured off-Island to achieve certification. As an example though – disregarding the certification under the CFI – the offset of the entire air travel related emission for a year could be achieved by foresting an area of agricultural land on Flinders Island equivalent to 0.3Ha. This measure in any form is entirely swamped as long as land clearing is permitted to continue on island. If land clearing can be guaranteed to be halted then we suggest that both the shipping and air travel related emissions could be offset by working with Low Carbon Australia to forest a certifiable area in Australia.

4.9 Issues and Opportunities Arising from Consultation

Community consultation included written submissions, email and a community consultative meeting on the Island which was well attended.

Community consultation broadly supported the plan measures and focussed somewhat on understanding the detail. Some members expressed a clear desire for bold measures, others for caution while understanding the implications of measures. There appeared to be a clear understanding of the need to be able to exercise community control over the measures in order to make them viable.

The community meeting engaged in a discussion of boundary definition. Boundaries define areas of responsibility and in this case the doubtful boundaries are those for shipping and off-island transport where there was a broad acceptance that these issues were outside of the community's ability to create a meaningful effect.

Similarly the much greater (quantitatively) issue of control over agricultural emissions led to a discussion of the three pillars of sustainability – which includes a sustainable economy. This discussion led to a consensus view that agricultural emissions were outside the control of this plan and that effects in this area would need to be through broader cultural or technological change across Australia.

The responsibility for LULUCF emissions and possible carbon farming were similarly viewed as inside the economic sustainability umbrella and no radical concept for control of these was canvassed at the meeting.
In summary – with the possible exception of the inclusion of aerobic waste treatment systems (AWT's) on new installations – the consultation phase supported the measures as written.

Opportunities / suggestions generally considered to be of merit at the consultation phase include

- Encouraging electric vehicle take up through
  - Electricity suppliers (via Tasmanian Government initiatives and/or price subsidies)
  - Council Information Program
  - Capital Incentive packages (less likely)
- The role of AWT's and the possibility that these could be part of all new installations on the island. This would be a simpler measure than enforcing change of existing installations and could be part of the "simple" or key opportunities.
- Council indicated support for the biodiesel initiative including assisting with import if there is a requirement for importing to make up quantities
- Reducing the winter residential heat load by mandating all new housing at 7 or 8 star rating (effective only for that proportion of housing that would use electric heating - this has spin off benefits for the renewable energy plan also)
- Reducing the winter residential heating load in established buildings via an energy efficiency drive for these older buildings (again effective for that proportion of houses that use electrical heating)

In a number of these opportunities there is a role for council policy changes. We understand that the council is at the start of a new planning scheme, however it is important to bear in mind that GHG effects are measured over decades. If measures need policy changes that cannot be implemented now, then over this time scale planning to include these measures in the next planning scheme is a significant and worthwhile aim.

5. Summary of Emissions and Measures

The Flinders GHG emission profile is dominated by forestry related and agricultural emissions that we would identify as predominantly outside the control of the community. While a number of scenarios are possible, this report has focussed on two greenhouse gas minimisation scenarios amongst several. The overall reduction is very significant in areas where the community exercises control, but can be less significant in other areas. There is considerable scope for management of those emissions within the community's control.

5.1 Effective Measures: Non-Agriculture Emissions Measures under BAU

Accepting the community feedback and focussing on non-agriculture emissions, and assuming that deforestation is either non-existent or halted provides the following picture of meaningful changes available to the island community. The table (6.1) shows the effect of the two levels of actions as a percentage of the BAU as it would be in 2030.

Table 6.1: Flinders Island: BAU – Effectiveness of Abatement Measures (units are in $GgCO_2e$ except for %age reductions)

2030	BAU	simple	reduction	extensive	reduction
Electricity	4.1	0.1	31%	0.0	31%
Vehicles	5.0	3.4	12%	0.4	35%
Shipping	1.6	1.4	1%	0.1	11%
Air travel	1.1	1.1	0%	1.1	0%
Industrial processes	0.8	0.0	6%	0.0	6%
Waste	0.7	0.4	2%	0.2	4%
Total	13.3	6.2	53%	1.8	87%

The order of priority and effect for abatement activities suggested from the table above is:

1. Implement the renewable energy plan (31%)
2. Implement changes to the vehicle fleet firstly by altering as much as possible to electric passenger vehicles (12%)
3. Arrange biodiesel substitution for on-island vehicles, boating and for island shipping (24% plus 10%).
4. Support changes to abattoir waste management (6%)
5. Separate waste at the tip for full burning (2%)
6. Alter planning scheme to require AWT's (2%)

The measures 2 and 6 are dependent on the renewable energy plan, i.e. they cannot achieve their effect independently.

Offset for air travel by planting forest would add another 1.1Gg or 8% reduction.

We are aware that these measures are mostly complex and represent a significant challenge. Item 1 is without doubt the most important. A 31% reduction is a significant achievement for any community. The easier wins, measures 4, 5 and 6, all relevant to waste management, represent smaller gains, but a total of 10% between them.

This combination (items 1, 4, 5 and 6) brings the aim to a 41% reduction, for measures that are technically, environmentally and economically feasible.

Items 2 and 3 are perhaps more challenging, for these we have identified significant grants and likely providers (Section 6.3).

Amongst the typical low hanging fruit are energy efficiency gains but for Flinders the implementation of the renewable energy plan means that energy efficiency in electrical installations will have little GHG effect.

5.2 Other Measures

A number of measures have been analysed and passed by in this work. The inclusion of micro auto gasification systems (MAGS) is certainly technically viable but will not be economically viable. The creation of offsets via carbon sequestration as biochar are technically viable but represent a significant commercial undertaking with no monetary return and a barrier to certification yet to be tested. The creation of other offsets using currently farmed land has a greater barrier to certification and, for shelter belts, is not yet validated in practice.

Energy efficiency drives mentioned in Section 5.8 may be of use, but for housing this will come into play only in the absence of implementation of the renewable energy plan. Vehicle efficiency is a topical issue but this has not been mentioned as it has its effect typically over time through market changes as vehicles are renewed.

5.3 Programs and Partners

The Australian Government runs a number of programs intended to contribute to the objective of reducing GHG emissions. Some of these programs, either in place or under development, are potential sources of funding for the implementation of some of the measures discussed in this report. These programs are briefly discussed under the sub-headings below.

Programs

Clean Technology Food and Foundries Program

This program provides grants to food and foundry manufacturers for investment in energy efficiency equipment and low-pollution technologies, processes and products. Funding will be provided from the current financial year through to 2016-17. Grants for businesses with less than $100 million in turnover are $25,000 to $500,000 with an applicant to grant funding ratio of 1:1.

The GHG reduction measures under investigation by the abattoir are likely to be eligible for funding under this program.

Cleaner Fuels grants scheme guide

This grant scheme encourages the manufacture and import of biodiesel. Producers and importers of biodiesel that meets the fuel standard may be entitled to a grant of 38.143 cents per litre.

This grant helps biodiesel compete on price with oil derived diesel and would potentially support on-island production.

The eligibility rules are somewhat complex, please see the information on the Australian Tax Office website at the link below for further information.

http://www.ato.gov.au/businesses/content.aspx?menuid=0&doc=/content/00128216.htm&page=1&H1

Ethanol Production Grant Program

This Commonwealth program provides grants of 38.143 cents per litre for the production of ethanol produced in Australia from locally derived biomass feedstock for use as a transport fuel.

In effect, this program is the ethanol specific equivalent of the biodiesel-targeting Cleaner Fuels grants.

Regional Development Australia Fund

Round 2 of this Commonwealth Government program opened to applications in November 2011 and are now closed. Round 3 will open in 2012. Funding is $0.5M to $25M. Projects over $5M need to have matching, non Australian government funding. Projects are assessed according to the individual merits of the project, but must be effective in one of more or the priorities below:

- Skilling Australia
- Lifting productivity
- Maximising the opportunity of broadband
- Sustaining our environment
- Social inclusion
- Water and energy efficiency

Tasmanian Forests Intergovernmental Agreement

Subject to final agreements, the Commonwealth Government will provide $120 million over a period of 15 years, including an initial payment of $20 million in 2011-12, to fund regional development projects which meet rigorous criteria for improving the productivity and income-earning capacity of the Tasmanian economy.
It is conceivable that proposals with employment and income benefits, as well as GHG reduction benefits, on Flinders Island would be eligible for funding.

Programs useful in the absence of the Renewable Energy Plan

The following programs would apply to GHG reduction in the absence of the renewable energy plan. They will clearly be significantly less effective than that plan.

Community Energy Efficiency Program (CEEP)

The Community Energy Efficiency Program is a merit-based Commonwealth grant program to provide matched funding to local councils and non-profit community organisations to undertake energy efficiency upgrades and retrofits to council and community-use buildings, facilities and lighting.

The first grants round has closed, further rounds are expected later this year. Council investment in improving the energy efficiency of their facilities is likely to be eligible for future grant rounds.

Energy Efficiency Information Grants (EEIG)

The Energy Efficiency Information Grants Program is a merit-based grants program established by the Commonwealth Government to assist industry associations and non profits provide practical, tailored energy efficiency information to small and medium enterprises and community organisations.

Council efforts to promote energy efficiency and conservation among Flinders' businesses may be eligible under this program. Round 1 has closed, further rounds are expected.

Partners

The benefits of particular GHG emission reduction measures will accrue to both the Flinders community as a whole and the particular entity implementing the reduction measure. This raises the possibility of partnerships between the Council, acting on behalf of the general community, and private organisations with control of the activity involving the measure.

Potential examples on Flinders of such partnerships are:

- Flinders Council – Abattoir. The Council could provide support to the abattoir's energy transformation plans.
- Flinders Council – Agricultural Producers. The Council could promote and support production of biodiesel crops and processing.
- Flinders Council – Biodiesel producers. The Council could provide the focus for import as the commercial entity if necessary for the purposes of securing and distributing the Cleaner Fuels Grant. It is more likely though that the council would be required to facilitate the change – working with retailers and wholesalers and promoting community acceptance. Biodiesel use in Australia is discussed on the Department of Resources Energy and Tourism (DRET) website which provides indications of three nearby producers (one in Tasmania and two in Victoria);

"There are currently around seven biodiesel producers in Australia: Biodiesel Producers Ltd, Vic; Smorgon Fuels Pty Ltd, Vic; Biodiesel Industries Australia, NSW: NQ & Pacific Biodiesel Pty Ltd, QLD; Macquarie Oil, Tas; Australian Renewable Fuels Ltd, WA and SA and Bioworks, WA."

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