**The Mount Alexander Sustainability Group Work Program 2022-2024  
in support of the Warrarrack Initiative – Towards ZNET 2030**

**Mount Alexander Sustainability Group (MASG)**

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# Executive summary

The current strategic objective of Mount Alexander Sustainability Group (MASG) has been to achieve zero net emissions (ZNET) for the Mount Alexander Shire (MAS) by 2030, or at least as close to 2030 as possible. This objective has:

1. determined our activities;
2. determined our funding objectives; and
3. influenced the design of our policy advocating initiatives.

The current status of MASG activities and the work program over the next two years or so is determined by the decisions made over the past six to eight years in pursuit of the ZNET 2030 objective. This report:

1. outlines the current work plan activities;
2. the quantitative role they could play in reducing MAS emissions; and
3. when considered together, their role in contributing towards a strategic plan that produces a plausible pathway to ZNET 2030 for MAS.

## E.1 The Warrarrack Initiative

If MAS is to be successful in developing an actual pathway towards ZNET it needs far more than a plausible plan. It means that the decisions of 1,050 businesses and 8,500 households, or 9,550 decision-making units, will have to be coordinated to join and maintain the ZNET 2030 pathway. This is a very tall order. To do this the entities, such as MASG, must combine in a community-wide grouping supported and, from time to time, led by Mount Alexander Shire Council (MASC) to achieve the resourcing, leadership and influence to join and maintain the ZNET pathway.

This is what the Warrarrack Initiative is which MASG has been part of developing over the past two years. The Warrarrack Institute represents the ZNET Community Transition Plan and its enabling administrative and decision-making structures. This paper, therefore, outlines how MASG current and immediate future activities can contribute to the Warrarrack Initiative.

The MASG’s current and immediate future includes the following.

## E.2 The bioenergy facility

Bringing the MASG sponsored bioenergy facility at the Don KR meat processing facility in Castlemaine to completion. MASG is currently working with investors to bring the project to financial closure and the appointment of an organisation to undertake construction. It is planned for construction to commence in the second half of 2022. When completed the plant will reduce MAS emissions by 65,850 tonnes of CO2(e) for MAS and 88,500 tonnes of CO2(e) for the wider region.

## E.3 Electrification and retrofit activities

At the centre of any pathway to ZNET are activities associated with electrification and energy efficiency enhancements. That is, a ZNET ready status, substituting gas and coal using equipment for electricity using appliances, is a key component of any ZNET pathway. Emissions will be zero from the ZNET ready electricity using equipment when the purchased electricity supply is 100 per cent renewable. Emissions will also be reduced by retrofitting households to make them more energy efficient.

Accordingly, for the next two years the MASG retrofitting project will trial retrofitting and electrification strategies so that, if successful, the program can be rolled out for generating to the MAS community.

MASG will advocate for a Council led component of the Warrarrack Initiative that will drive the rollout by influencing the decisions of 8,500 households to take every opportunity for electrification.

## E.4 The Mount Alexander Shire Business ZNET Ready Strategy

Over the next two years MASG will advocate for a business led component of the Warrarrack Initiative to influence and coordinate the decisions of 1,050 businesses to take every opportunity for electrification and energy efficiency gains. The components of the strategy are outlined below in this report. The effectiveness of community-based tragedies to reduce emissions depends on their ability to harness community pressure and the desire of individual decision-makers to be and be seen to be part of that community and be valued by the community. If this is achieved the decision-makers will be willing to accept a lower discount rate in their investment decisions and therefore be willing to invest more earlier and therefore be willing to have a larger actual impact on reducing emissions than what would otherwise have been the case. As far as environmental objectives are concerned the bottom line of community engagement is to change decision makers from accepting a three year payback to accepting a ten year payback.

To achieve a ZNET 2030 in MAS should not be a too difficult task. In the business sector just 30 businesses are responsible for over 60 per cent of a business emissions.

## E.5 The Regenerative Agriculture Program

Over the last three years MASG has been engaged in supporting regenerative agriculture activities. The most important component of regenerative agriculture activities, from the MASG perspective, is soil carbon, the change in farm land use and livestock management practices to increase the carbon content of the soils. That is, draw down of CO2(e) from the atmosphere. Over the next two to three years MASG will use a recently acquired grant to trail soil carbon techniques which, if successful, will be rolled out to additional farms which will make a very significant contribution to MAS reaching ZNET and a vital contribution for MAS ready ZNET by 2030.

## E.6 Mount Alexander Shire CO2(e) emissions

This report profiles estimates of MAS emissions by industry and household sectors from 1997 to 2020. Table E.1 summarises the estimates. The headline emissions estimate for 2019, the 2020 ending December year is discounted because of the impact of COVID-19 on the economy, is 283,000 tonnes of CO2(e). Twenty-one per cent of the emissions come from the household sector and, therefore, 79 per cent from the industry sector. The ZNET ready emissions are the 37 per cent of the total. That is the emissions that come from purchased electricity. The gas sector represents 18 per cent of emissions. Agriculture land use emissions represent 17.3 per cent of the total, while waste emissions represent 6.5 per cent of the total.

|  |  |  |
| --- | --- | --- |
| **Table E.1 Mount Alexander Shire CO2(e) emissions, 2019** | | |
|  | **‘000 tonnes** | **Per cent of total** |
| Purchased electricity | 105.8 | 37.4 |
| Gas | 45.8 | 16.2 |
| Petroleum | 49.9 | 17.6 |
| Other stationary (coal) | 2.5 | 0.9 |
| Industry – fugitive | 11.7 | 4.1 |
| Waste disposal | 18.5 | 6.5 |
| Agriculture land use | 48.9 | 17.3 |
| **Total** | **283.0** | **100.0** |
|  |  |  |
| Households | 59.4 | 21.0 |

## E.7 The pathway to ZNET 2030

The ZNET pathway developed in this report extends to 2036 based on a reasonable trade-off between emissions reduction and the cost of emissions reduction. That is, the programs which MASG is currently trial developing, or advocating for, will not fully achieve their objectives until well into the 2030s. However, this does not necessarily rule out MASG achieving ZNET status by 2030, as Table E.2 indicates.

The potential contribution of each of the MASG activity areas to achieving the ZNET target is delineated in the table. The highlight is that the bioenergy facility and the regenerative agriculture program together, have the potential to achieve just over 50 per cent of the reduction in emissions to achieve ZNET.

Sixty thousand tonnes of the emissions comes from the assumption that political pressure will force the State Government to increase its electricity renewable energy target from 50 per cent by 2030 to 60-62 per cent. If the Victorian Government fails to do this and maintains the existing target, then 60,000 tonnes of savings will be reduced to 45,000 tonnes of savings.

There will still be a shortfall of 45,000 tonnes of emissions. One way that this could be offset would be for the State to adopt a 100 per cent renewable target by 2030. However this is likely to be infeasible given the amount of additional investment that would have to be mobilised. A local initiative which could potentially be exploited would be an additional bioenergy facility. However, the impact of the second plant on MAS emission reductions would be less than the first facility because a significantly larger share of the waste streams to supply the plant would have to be sourced from outside the MAS. Nevertheless, it would still make a significant contribution.

MAS has the opportunity to be the first or, at the very least, to be one of the few LGAs in Australia to genuinely achieve ZNET 2030 without using inappropriate emission accounting techniques. The reason for this is an agricultural sector that is, small on the national scale, but balanced in terms of MAS’s actual population and the opportunity of a bioenergy facility which again is relatively small, but large in terms of the population of the region and balanced in terms of the available waste streams within the regional boundary. What has to be done from now on in is for the community leadership through Council to use MAS renowned high level of social capital to achieve ZNET objectives.

|  |  |
| --- | --- |
| **Table E.2 The ZNET pathway: Outcomes, 2030** | |
| Total emissions (‘000 tonnes of CO2(e)) | 283 |
| Retrofit and electrification of gas(a) | -14.7 |
| Electric vehicles and renewable fuels | -11.6 |
| Increased electrification electricity demand net of small-scale solar generation expansion(a) | 6.2 |
| Bioenergy facility | -62.9 |
| Regenerative Agriculture Program | -84.0 |
| Land use changes | -11.0 |
| Second bioenergy facility or equivalent in biofuels | -44.8 |
| Victorian Government – Renewable Electricity Policy(b) | -60.0 |
|  |  |
| **Net** | **0.0** |

*Notes:* (a) At 2019 emission standards for purchased electricity.  
 (b) Estimated as the net balancing item.

## E.8 The cost of failure

The final chapter explores the impact of world warming scenarios on the living standards of MAS households. A 4oC warming scenario would increase the cost on the average household, from insurance costs, repairs, taxes, lost real income from productivity decline, higher food costs, etc. so that real expenditures on the goods and services they now consume would fall by:

$8,000 by 2040 (8.3)  
$12,500 by 2050 (13.0)  
$20,700 by 2075 (21.9)  
$35,000 by 2100 (36.5)

In brackets is the percentage decline in living standards from 2020 levels.

That is, runaway climate change will reduce 2020 living standards for the average MAS households by 8 per cent by 2040 and 37 per cent by 2100.

However, well before 2100 the Australia we now know would become unrecognisable as hundreds of millions, perhaps running into the billions, will be forced to migrate from lands that will become uninhabitable as a result of low levels of agricultural productivity and water availability in search of lands that are more liveable.

# 1. Background and the Policy framework

The core objective of the Mount Alexander Sustainability Group (MASG) is to facilitate the Mount Alexander Shire (MAS) to reach Zero Net Emission (ZNET) status as quickly as possible and preferably by 2030. MASG, over the last two years, has been a member of the committee developing a ZNET transition plan which has been renamed the ‘Warrarrack Initiative’.

This document outlines the activities that MASG will undertake over the next two to three years in support of the ZNET objective. Each activity will be analysed in terms of:

1. how it will work;
2. resource requirements;
3. funding sources; and
4. strategic role in MAS reaching ZNET.

This work plan will, therefore, also explain the practical steps MASG will undertake in support of the Warrarrack Initiative.

MASG for the last eight years has been working towards ZNET 2030 for the Mount Alexander Shire. This document outlines how the various activity streams of the MASG will make very significant contributions to MAS achieving ZNET by 2030.

## 1.1 What is the Warrarrack Initiative?

The Warrarrack Initiative is outlined in a report prepared by the ZNET Community Transition Plan Steering Group supported by Mount Alexander Shire Council and Sustainability Victoria with MASG as a member.

The initial working title for the initiative was the “Mount Alexander Shire (MAS) ZNET Community Transition Plan”. From the beginning it was recognised that achieving ZNET would require the cooperation and coordination of the whole community, along with the complementary objectives of increasing community resilience to that part of climate change that now cannot be stopped. In order to create community cohesion in pursuit of these objectives the transition plan outlines those aspects of the community that need to be tapped and enhanced to achieve ZNET

To reflect the need to bind the community for the necessary cooperation and coordination to achieve objectives, the title of the transition plan was changed to the Warrarrack Initiative, using a local indigenous word for a silver wattle which contains a glue like binding agent.

## 1.2 Regional pathways to ZNET: The Policy framework

A region will reach ZNET status when, in accordance with standard greenhouse accounting rules, when it is a net zero CO2 emitter. However, up to now there are differing methodologies/pathways on how a region such as Mount Alexander Shire (MAS) can achieve ZNET with the major attraction being that they have been relatively painless and therefore, not surprisingly, not valid. There is only one plausible methodology and that methodology is one where emissions are reduced in a region when they are reduced. However as will be seen below this simply logic is often rejected.

### 1.2.1 What are the emissions of a region

Section two below provides estimates of CO2(e) emissions for MAS by industry and households using standard Greenhouse Gas accounting rules which uniformly applied across nations. The basic idea is that within a national regional boundary the accounting framework should capture all emissions by farms, mines, manufacturing businesses, all other businesses and households located within the boundaries of the nation or region. In general structures from where the emissions come from will be stationary. However some emissions will come from nonstationary elements mainly including motor vehicles or transport vehicles such as freight trucks and buses. However the same principle applies to nonstationary elements in that they are counted in the greenhouse accounts if their address of residence is also within the national or regional boundary.

### 1.2.2 One pathway to ZNET: Utility renewable capacity

In the past in Victoria councils have targeted a ZNET outcome by the instrument of attracting a utility scale renewable energy project within the regional boundary. However such a project would be connected to the grid with is output distributed throughout those regions connected to the grid. In greenhouse accounting terms the emissions content of purchased electricity from the grid is adjusted by the zero emission contribution of all renewable generating plants connected to the grid throughout all regions of the grid coverage. This leads to the logical outcome the region who adopts this strategy will be counting the total benefit of the renewable energy production while all other regions will be doing the same and if it’s a small region such as MAS where the share of the plant’s output in its purchased electricity will be small. That is, there will be double counting of the benefits of the plant.

It might be claimed that at the very least the region is making a contribution to the overall emission reductions of the grid catchment which for simplicity will be taken to be Victoria. Even this will not be correct because of the policy regime applied by the Victorian government to promote the construction of renewable energy capacity. The Victorian government as a policy framework of achieving 50 per cent renewable energy contribution to the electricity grid by 2030. To do this the main policy instruments the conducting of so-called reverse auctions whereby project proponents bid on the basis of a required electricity price for the project to proceed and if it’s low enough project will be accepted which means that if the market price in future years falls below the bid price the government will top of the difference and if the market price is above the bid price the government will receive the additional revenue. Before each auction the government will make it calculation of the additional capacity that each to be initiated over the next year or so if the ultimate renewable energy target is to be achieved. Under this regime if a council does take steps to secure a utility renewable project all that will happen is that the government will exclude that capacity requirement from its next auction. Net additional renewable energy capacity would be zero.

### 1.2.3 A second pathway to ZNET: Purchasing Power Agreements (PPAs)

Related to the first strategy is the adoption of Purchasing Power Agreements or PPAs to achieve ZNET. This has the benefit of not requiring a plant within the regional boundaries. All that is required is to enter into a price agreement with a particular project somewhere in the grid catchment and agree to play a retail price that may well be above market but will have the benefit of allowing the project to proceed. Again, this has all the problems associated within boundary utility scale renewable strategy plus the additional negative of probably increasing the real cost of electricity to customers with no benefit in real emissions reduction. This is because projects initiated by PPAs have the risk that they will crowd out large-scale more efficient projects from the government’s reverse auction process leading the customers associated with the PPA a higher cost of electricity than what otherwise would have been the case. A waste of resources that could have been devoted to more effective ways of reducing emissions, such as within region business or household subsidies for investment in equipment, that would result in an emissions reduction, or a key element in this paper for achieving ZNET 2030 investing in soil carbon activities within the regional boundary.

### 1.2.4 A third pathway to ZNET: Purchasing carbon units

A third pathway to ZNET by regions, that is the governing units, is to purchase carbon certificates of some form expressed in dollars per tonne of CO2 emissions whether revenues are available for entities that are eligible to claim carbon certificates against their forgone emission reductions. In Australia ACCUs represent such a certificate issued by the Clean Energy Regulator. In this case the purchase of such certificates will finance projects which will reduce emissions such as soil carbon farming and waste to energy projects. However these emissions reductions will be credited to the region where financing is applied not the region which is the source of finance. So again a region which is the source of finance will claim the credit for the emission reductions while the recipient of the finance will also claim the credit which across regions will involve a double counting of emission reductions. The logic behind this would be similar if the location of the financial institution which gave financing for an emission reduction project was credited with the resulting emissions reduction.

Clearly purchasing carbon units is a superior strategy to PPA’s because it will result in emissions reductions in Victoria if that is where the ultimate financing is allocated however not in the region which is the source of the funds. In terms of an individual region such as MAS if purchasing carbon units was considered a desirable instrument than to also claim credit at the regional as well as the state-level the units should be allocated to local entities via setting the up of local certificates scheme.

For all practical purposes this status will only be achieved when a 100 per cent, or near 100 per cent, renewable energy (mainly electricity) is available and can be applied generally. The availability of 100 per cent renewable energy source to a local region is beyond the control of a local region since it depends on decisions made at the state and national government levels. Currently, MAS is locked into a 50 per cent renewable electricity source by 2030 given current Victorian Government targets.

However, what a region can do is influence the local decision-making entities so that their decisions create a pathway to ZNET ready status, that is, the eradication of the use of non-renewable energy sources in the region and maximum drawdown potential is exploited in land use given the size of MAS agriculture sector emissions. When a 100 per cent or near to, renewable energy source is available ZNET ready status will be translated into a ZNET outcome.

This is a technical proposal anchored in empirical facts, science and real world constraints. Therefore the problem to be solved and therefore the need for innovation must also be able to be described in more technical terms compared to the general statements above.

As noted above there is only one way to reduce local emissions towards ZNET and that is to reduce local emissions and the instruments to do this are straightforward.

### 1.2.5 The instruments in the pathway to ZNET

The instruments of CO2 reduction include:

1. elimination of production of high CO2 intensive activity;
2. replacement of equipment/structure (part) using a high CO2 intensive energy type with equipment/structure (part) a lower CO2 intensive (preferably zero CO2 content) energy type;
3. replacement of equipment/structure (part) using a given energy type with equipment/structure (part) using less of the same energy type with no change in outcomes for heating/cooking intensive power etc.;
4. undertaking activities/production within a region which results in the drawdown of CO2 from the atmosphere;
5. exploiting any opportunity to establish renewable energy production to be used within the regional boundaries; and
6. changed behavior to reduce energy requirements.

For (ii), the most important component is electrification. That is, the substitution of equipment/structure (part) using other forms of energy (gas, petroleum, etc.) for equipment/structure (part) that uses electricity. The Victorian Government has a target that 50 per cent of electricity will be zero carbon, that is, from renewables, by 2030. The UK Government target is 100 per cent zero carbon electricity by 2035. The indicative pathway developed in the paper assumes that the current Victorian target for 2030 is brought is increased to 60-62 per cent.

This means that a core target for a regional ZNET strategy would be 100 per cent electrification of non-electricity energy equipment when technologies are available for this purpose. This is now the case. From a wide range of equipment using non-electricity energy there are non-electricity using alternatives, with the most important being heat pump technologies, which are, at least on a through life basis, more cost effective than the traditional non-electricity using equipment alternatives. This competitive advantage can only be expected to increase significantly over the coming decade. When a region reaches its 100 per cent electrification target it can be considered to be ZNET ready. Emissions which cannot be eliminated by electrification may still be positive.

In order to change the emission/energy using characteristics of structures only part of the structure will need to be modified. This activity is designated as retrofitting.

## 1.3 Influencing the investment decision – the key to joining and maintaining a ZNET pathway

It is apparent from the above list of instruments to reduce emissions that the major vehicle channel for emission reductions would be to influence the decisions around new additions or replacement of equipment or built structures. These decision are part of the investment decision. In general the energy using component of an investment decision will be part of that decision. For installed capital stock, that is the cumulative total of past investment decisions, sometimes depending on the technology, the energy using component can be replaced without replacing the totality of the investment in which the energy using component is embedded. However in many instances the energy using component can only be replaced by replacing the totality, or at least a substantial part, of the investment in which the energy using component is embedded. The greater the share of the original investment decision that has to be replaced to achieve ZNET ready status the greater the cost will be per unit reduction in CO2 emissions.

## 1.4 High discount rates, the investment decision and the role of community-based emission reduction strategies

It has been known for many years that just because a technology is cost competitive on a through life costs compared to alternatives, it does not mean it will be adopted on a significant scale. The classic case demonstrating this is that for incandescent light bulbs. As the technology for significantly more energy efficient alternatives developed over the past 30 years products emerged that had significantly lower through life costs (that is, taking into account the through life electricity usage). However the higher up-front costs of these products compared to the incandescent light bulb was a major obstacle to their take-up. The problem was only solved when incandescent bulbs were banned by regulation.

The same situation currently exists for a number of electricity using technologies that can displace the use of gas and petroleum including heat pump technologies in particular, which are important in many areas for displacing non-renewable energy use. Many of these technologies have or soon will have a large through life cost advantage over the current non-renewable energy using alternatives, but like the globes have a significantly higher up-front capital cost.

The estate record clearly indicates that if up-front capital cost of a ZNET ready technology is higher, even though through life costs are lower, it will not be selected in the replacement/new investment decision.

In technical terms, the problem is that business can use far too high discount rates in the investment decision. That is, they use discount rates which put far too high a value on a dollar of income today compared to a dollar of extra income in a year’s time. The project, therefore, will directly aim to reduce this discount rate in the investment decision process by information on the costs of climate change, and community and business peer pressure.

A the centre of the Warrarrack Initiative there has to be community engagement which mobilises community pressure on individual decision-makers to do the right thing and be recognised for doing the right thing and, therefore, receive the recognition of being a worthwhile member of the community to lower the discount rates in their decision-making process.

Therefore, a core operational strategy for the Warrarrack Initiative will be:

1. to contact each business enterprise;
2. outline the technological choices available to them in current or future decisions; and
3. use community and peer pressure (what other enterprises have already committed to) to persuade them to commit to the ZNET ready solution.

As far as environmental objectives are concerned the bottom line of community engagement is to change decision makers from accepting a three year payback to accepting a ten year payback.

# 2. Mount Alexander Shire: CO2 emissions 1997-2020

## 2.1 Introduction

This section outlines:

1. MAS CO2 emissions by broad sector;
2. The CO2 emissions that have to be eradicated to be ZNET ready;
3. The number of decision-making entities in MAS; and
4. The quantum of investment that has to be influenced over the next two decades to be ZNET ready circa the mid-2030s.

The emission data was prepared at the 86 two digit ANZSIC industry level which was aggregated to 19 industry ANZSIC one digit category for presentation purposes. The methodology of estimation is outlined in the Appendix to this Chapter. It would be noted that the emission estimates exclude emissions from land use changes such as from reducing or increasing the flora coverage in the Shire.

## 2.2 Mount Alexander Shire CO2(e) emissions by category and industry sector

Tables 2.1(a) and 2.1(b) summarise the data in Appendix 2A. The focus of this paper will be on the 2019 calendar year not 2020. This is because the 2020 estimate is impacted by COVID-19 which results in a significant fall in emissions that will, in all probability not be sustained, with recovery from the pandemic. Secondly, it is based on extrapolations from data collected from the first half of the calendar year.

For 2019 the estimated total emissions for MAS is 283,000 tonnes. For 2020, the estimate is 268,000 tonnes, corrected for COVID-19 impacts the estimate would be likely to be nearer 280,000 tonnes.

The category of emissions in Table 2.1(a) follows the categories from the Victorian Greenhouse Gas Accounts. The totals for industry and households in Table 2.1(a) equals the sum of the eight emission categories given above. For example, for 2019 the total of the eight categories of emissions from purchased electricity to non-metallic minerals is 215,600 tonnes which equals the sum of industry and household emissions, or 156,200 tonnes from industry plus 59,400 tonnes from households. The industry by 1-digit ANZSIC industries and household breakdown for each category of emissions is given in Appendix A.2. Thus, from Table 2.A.1, total household emissions in 2019 from purchased electricity is 22,600 tonnes, or from Table 2.A.1(b), 21.3 per cent of total purchased electricity emissions. An array of useful information can be obtained from the use of the tables in Appendix 2.A. For example, if the 2019 household emissions from purchased electricity is 22,600 tonnes, then for 2019 this would represent 22,600/59,400, or 38 per cent of total household emissions. The data structure presented here would represent the minimum information required for the design of plausible ZNET pathway/strategy.

In terms of the outcomes by 2019, 37 per cent of total MAS emissions are from purchased electricity and 16 per cent are from gas, giving a total of 151,000 tonnes. This outcome, in terms of absolute emissions, has been more or less stable since 2009. That is, the growth in population and industry output has offset the saving in emissions from the increase in the share of renewable electricity production in total purchased electricity output. Total petroleum use, from Table 2.1(a), either from direct industry use or as a transport use, comes to 50,000 tonnes in 2019 or 17.6 per cent of the total, which also has been relatively stable over the years, implying that steady incremental gains in new car fuel efficiency has been offset by population growth.

Other stationary energy emissions, coal etc. is relatively small, contributing less than 1 per cent to total MAS emissions in 2019 and is on a downward trend. Heavy industry future emissions, mainly from the use of gas, are also less than 1 per cent of total emissions. As MAS has no oil and gas mining industry so fugitive emissions from this source are zero. Fugitive emissions from the non-metallic mineral industry averaged around 5,000 tonnes to 2016, or approximately 2 per cent of total emissions, before exhibiting a noticeable upward trend since due to the expansion of output for this industry.

Public and private sector waste emissions in 2019 totalled 18,500 tonnes, or 6.5 per cent, of the total while agriculture land use emissions, from pastoral and cropping activities, was just under 50,000 tonnes in 2019, or 17.3 per cent of the total.

In terms of the contribution coming from the individual 1-digit ANZSIC industries in 2019, 60 per cent was generated in the manufacturing sector with a further 28.4 per cent coming from the agriculture, construction, retail trade, transport and public administration and safety industries, for a total contribution of just under 90 per cent from these industries.

It should be noted, from Table A.2.2, that the total agriculture emissions of 9,100 tonnes in 2019 are in addition to the agriculture land use emissions. The Table 2.2(a) emissions for agriculture represents the inputs of fossil fuels (electricity, gas and petroleum) to support the pastoral and cropping activities.

## 2.3 Mount Alexander Shire emissions – ZNET ready and non-ZNET ready status, 2019

Current purchased electricity can be classified as being ZNET ready. That is, emissions from this source will decline to zero once a 100 per cent renewable electricity source is available. In 2019, purchased electricity emissions are 106,000 tonnes and total emissions are 283,000 tonnes, giving a total of 177,000 tonnes which would be classified as non-ZNET ready emissions and, therefore, would be the main focus of policy in converting to ZNET ready status.

In terms of industry emissions, that is, emissions excluding households, waste and agriculture land use emissions from Table 2.1(a), total industry emissions in 2019 were 156,200 tonnes. While from Table 2.A.1(a), total industry purchased electricity emissions across the 19 1-digit ANZSIC industries sum to 83,200 tonnes, giving a total of 73,000 tonnes of emissions which are not ZNET ready.

## 2.4 Businesses by size and CO2(e) emissions

In order to develop an efficient ZNET strategy it is necessary to have at least a rough estimate of CO2(e) emissions by business size. This would allow the adopted strategy to correctly prioritise resource allocation in terms of the CO2(e) reduction effort.

How many businesses are there in MAS? Table 2.3 separates the number of business entities into four categories. They are sole traders, small enterprises of between 1 and 19 employees, medium enterprises of between 20 and 199 employees and very large enterprises of greater than 199 employees. The number of business entities are by 1-digit ANZSIC industries.

The highest number of business entities are for sole traders with 1,037. However, many of the sole traders will work from home where their emissions will be credited to the household sector. Hence, column two in Table 2.3 adjusts the data in column one by excluding estimates of the sole traders not working from home. This leaves 447 not working from home with the majority concentrated in the agriculture and construction industries.

Table 2.4 combines the adjusted sole traders with small enterprises to create the categories of businesses, namely small, medium and large to give a total of 1,050 businesses, or 447 sole traders and 603 enterprises. Table 2.3 uses the employment range for each enterprise type to estimate the share of each industry’s business category of total industry emissions. From the table, the structure of emissions varies considerably across the ANZSIC industries. For some industries the small businesses dominate, as for the rental, housing and real estate services, while for others, such as manufacturing, the medium and large enterprises dominate.

The first column of Table 2.4 profiles industry non-ZNET ready emissions in 2019 of 73,000 tonnes across the 19 industries with 60 per cent of emissions generated in the manufacturing industry. In the table these emissions are then distributed to the small (including sole traders), medium and large businesses. In total 1,020 small businesses generate 38 per cent of non-ZNET ready emissions at 30 tonnes per business, while 30 medium/large businesses generate 62 per cent of non-ZNET ready emissions at 1,500 tonnes per business. At the centre of a MAS ZNET strategy would be a focus on these 30 businesses and especially the 6 businesses in the manufacturing sector with average emissions of 6,300 tonnes per business for non-ZNET ready emissions.

## 2.5 Mount Alexander Shire emissions – Sniff test

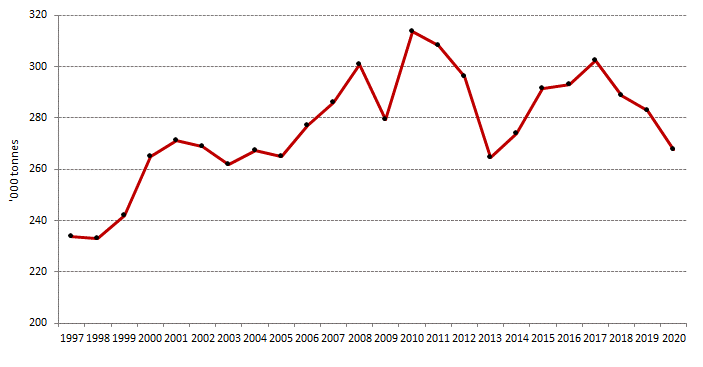
The CO2 estimates given above are just that, estimates. Although arguably the best estimates possible given the available data short of a prohibitively expensive survey of energy use in the Shire.

Given this, a reasonable ‘sniff test’ would be to compare the rate of total MAS emissions to gross regional product plus household disposable income to the same ratio for Victoria. The expectation would be that if there are any differences in the ratio the differences could be explained. However the differences between the ratios could be reasonably large depending on whether Victoria or MAS possesses a greater share of energy intensive industries.

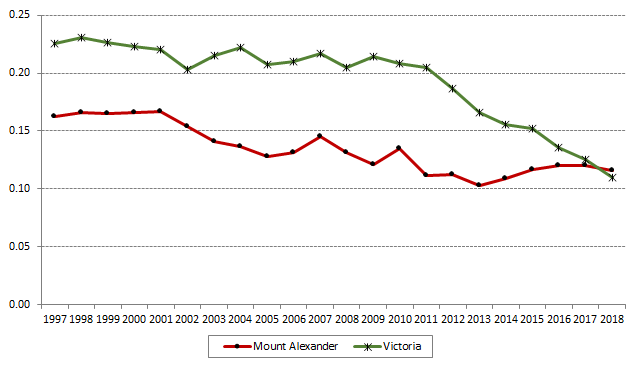
The comparison between the two ratios is given in Figure 2.2. In the mid-2000s the MAS ratio was significantly below the Victorian ratio. However, by 2018 the two ratios had converged. The explanation for the behaviour of the two series revolves around industrialisation or, more accurately, de-industrialisation. With the tariff phasedown over the 1980s and 1990s, MAS was subject to a high degree of de-industrialisation as large-scale textiles and metal fabrication capacity was either shut down or wound back to a fraction of its previous peak capacity. From Figure 2.2, the tail end of this de-industrialisation was still evident with, between 1999 and 2005, MAS emissions to the activity ratio falling from 0.16 to 0.13 with the Victorian ratio remaining stable. Since 2005 there has been a degree of re-industrialisation in MAS with the expansion of the meat processing facility.

By contrast, since 2005 Victoria has been subject to a significant de-industrialisation as the high exchange rate associated with the mining boom of 2005 to 2016 eliminated capacity in high energy intensive industries, such as chemicals, metal fabrication and, most important of all, the elimination of production in the motor vehicle industry.

**Figure 2.1: Mount Alexander Shire: Total emissions – excluding LULU (‘000 tones)**



**Figure 2.2: Mount Alexander Shire emissions versus Victoria – ratio of emissions to GRP plus household disposable income**



*Note:* The series ends in 2018 because it’s the last year that is available for the Victorian Greenhouse Accounts.

## 2.6 Mount Alexander Shire – Small-scale solar electricity generation

The last decade activity indicators for small-scale solar (SSS) installed in MAS are given in Table 2.5. Since 2011, the amount of SSS capacity installed in MAS has increased from 1.6 MW to 14.7 MW in 2020. Capacity per occupied dwelling has increased from 0.22 kW to 2.0 kW. As a result, the share of SS electricity supply in total MAS electricity demand has increased from under 2 per cent in 2011 to 13 per cent in 2019 and to a COVID-19 adjusted share in 2020 of approximately 16.6 per cent.

## 2.7 Mount Alexander Shire – Investment expenditure

Table 2.6 shows the recent investment expenditure profiles by component. Ignoring engineering construction expenditures because this type of expenditure has low direct emissions implications total investment expenditures that have to be directly influenced for ZNET ready status would be approximately $190 million. The relevant household expenditure would total $82 million while the business component would total $110 million.

In terms of electrification expenditures for business the relevant component he would be the replacement investment decision. For MAS the replacement investment component of total business investment would be approximately $75 million.

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| **Table 2.1(a) Mount Alexander Shire – CO2(e) emissions by broad category (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Purchased electricity | 96.3 | 101.1 | 103.4 | 109.4 | 115.4 | 119.0 | 109.0 | 111.9 | 107.6 | 114.5 | 121.3 | 133.2 | 103.7 | 108.5 | 104.1 | 110.2 | 90.0 | 105.1 | 114.5 | 116.8 | 119.4 | 113.3 | 105.8 | 99.0 |
| Gas | 43.1 | 43.0 | 42.6 | 41.9 | 44.1 | 41.9 | 38.3 | 38.0 | 35.0 | 35.8 | 37.9 | 43.4 | 44.8 | 50.1 | 49.7 | 46.1 | 46.5 | 43.0 | 41.2 | 39.7 | 45.1 | 45.4 | 45.8 | 44.6 |
| Petroleum direct industry use | 11.2 | 10.7 | 10.4 | 11.2 | 10.7 | 10.7 | 11.1 | 11.7 | 12.6 | 15.6 | 17.0 | 14.2 | 14.4 | 22.0 | 16.2 | 14.7 | 15.7 | 16.5 | 18.8 | 20.2 | 18.5 | 18.0 | 18.1 | 16.7 |
| Petroleum – transport | 27.2 | 28.9 | 30.6 | 32.5 | 34.4 | 34.6 | 34.4 | 35.5 | 35.0 | 32.4 | 30.6 | 32.2 | 33.4 | 37.7 | 46.2 | 40.2 | 38.1 | 36.3 | 36.0 | 37.5 | 33.9 | 32.6 | 31.8 | 25.4 |
| Other stationary energy | 3.3 | 4.1 | 4.4 | 6.2 | 5.4 | 0.2 | 5.8 | 4.1 | 3.5 | 3.0 | 2.9 | 1.6 | 10.9 | 23.5 | 14.5 | 4.7 | 0.4 | 2.2 | 6.2 | 2.4 | 3.0 | 1.1 | 2.5 | 2.3 |
| Heavy industry | 1.5 | 1.6 | 1.6 | 1.9 | 2.2 | 2.2 | 2.3 | 2.3 | 2.4 | 2.5 | 2.4 | 2.3 | 2.5 | 2.5 | 2.4 | 2.3 | 2.2 | 2.4 | 2.8 | 2.7 | 2.7 | 3.1 | 2.7 | 2.3 |
| Oil and gas production | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Non-metallic minerals | 4.1 | 3.8 | 3.7 | 4.3 | 4.1 | 4.4 | 4.2 | 4.3 | 4.1 | 3.9 | 4.1 | 5.2 | 5.8 | 5.5 | 5.7 | 5.7 | 5.1 | 4.6 | 4.9 | 6.6 | 7.8 | 7.5 | 9.0 | 13.3 |
| Total direct use by industry | 122.3 | 129.8 | 133.3 | 143.5 | 151.8 | 147.9 | 138.6 | 137.3 | 132.1 | 138.1 | 163.8 | 154.8 | 145.8 | 174.0 | 153.1 | 142.3 | 127.8 | 141.1 | 152.9 | 153.0 | 162.0 | 154.4 | 156.2 | 150.5 |
| Total households | 64.3 | 63.3 | 63.5 | 63.9 | 64.5 | 65.2 | 66.6 | 70.4 | 68.1 | 69.4 | 52.6 | 77.3 | 69.7 | 75.8 | 85.8 | 81.6 | 70.3 | 69.0 | 71.6 | 72.8 | 68.3 | 61.5 | 59.4 | 53.3 |
| Public and private waste disposal | 15.1 | 14.7 | 14.1 | 15.0 | 14.1 | 13.8 | 14.0 | 13.6 | 12.8 | 12.8 | 13.9 | 15.1 | 15.6 | 16.3 | 17.2 | 16.0 | 14.5 | 13.4 | 14.3 | 15.7 | 17.2 | 18.8 | 18.5 | 18.2 |
| Agriculture land use | 32.1 | 25.0 | 31.0 | 42.5 | 40.7 | 41.8 | 42.6 | 45.9 | 51.9 | 56.6 | 55.9 | 53.4 | 48.1 | 47.6 | 52.2 | 55.9 | 52.1 | 50.3 | 52.8 | 51.5 | 55.0 | 54.0 | 48.9 | 45.9 |
| **Total direct by industry and households** | **233.8** | **232.9** | **241.9** | **265.0** | **271.1** | **268.7** | **261.9** | **267.2** | **264.9** | **276.9** | **286.1** | **300.6** | **279.2** | **313.8** | **308.3** | **295.9** | **264.7** | **273.8** | **291.6** | **293.1** | **302.5** | **288.7** | **283.0** | **267.8** |

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| **Table 2.1(b) Mount Alexander Shire – CO2(e) emissions by broad category (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Purchased electricity | 41.2 | 43.4 | 42.8 | 41.3 | 42.6 | 44.3 | 41.6 | 41.9 | 40.6 | 41.3 | 42.4 | 44.3 | 37.1 | 34.6 | 33.8 | 37.2 | 34.0 | 38.4 | 39.3 | 39.9 | 39.5 | 39.3 | 37.4 | 37.0 |
| Gas | 18.4 | 18.5 | 17.6 | 15.8 | 16.3 | 15.6 | 14.6 | 14.2 | 13.2 | 12.9 | 13.2 | 14.4 | 16.1 | 16.0 | 16.1 | 15.6 | 17.6 | 15.7 | 14.1 | 13.5 | 14.9 | 15.7 | 16.2 | 16.7 |
| Petroleum direct industry use | 4.8 | 4.6 | 4.3 | 4.2 | 3.9 | 4.0 | 4.2 | 4.4 | 4.7 | 5.6 | 6.0 | 4.7 | 5.1 | 7.0 | 5.3 | 5.0 | 5.9 | 6.0 | 6.4 | 6.9 | 6.1 | 6.2 | 6.4 | 6.2 |
| Petroleum – transport | 11.6 | 12.4 | 12.6 | 12.3 | 12.7 | 12.9 | 13.1 | 13.3 | 13.2 | 11.7 | 10.7 | 10.7 | 12.0 | 12.0 | 15.0 | 13.6 | 14.4 | 13.3 | 12.4 | 12.8 | 11.2 | 11.3 | 11.2 | 9.5 |
| Other stationary energy | 1.4 | 1.8 | 1.8 | 2.3 | 2.0 | 0.1 | 2.2 | 1.5 | 1.3 | 1.1 | 1.0 | 0.5 | 3.9 | 7.5 | 4.7 | 1.6 | 0.2 | 0.8 | 2.1 | 0.8 | 1.0 | 0.4 | 0.9 | 0.9 |
| Heavy industry | 0.6 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.8 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.9 | 1.0 | 0.9 | 0.9 | 1.1 | 0.9 | 0.9 |
| Oil and gas production | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Non-metallic minerals | 1.7 | 1.6 | 1.5 | 1.6 | 1.5 | 1.7 | 1.6 | 1.6 | 1.5 | 1.4 | 1.4 | 1.7 | 2.1 | 1.8 | 1.8 | 1.9 | 1.9 | 1.7 | 1.7 | 2.2 | 2.6 | 2.6 | 3.2 | 5.0 |
| Total direct use by industry | 52.3 | 55.7 | 55.1 | 54.2 | 56.0 | 55.0 | 52.9 | 51.4 | 49.9 | 49.9 | 57.2 | 51.5 | 52.2 | 55.5 | 49.6 | 48.1 | 48.3 | 51.5 | 52.4 | 52.2 | 53.6 | 53.5 | 55.2 | 56.2 |
| Total households | 27.5 | 27.2 | 26.3 | 24.1 | 23.8 | 24.3 | 25.4 | 26.4 | 25.7 | 25.1 | 18.4 | 25.7 | 25.0 | 24.2 | 27.8 | 27.6 | 26.5 | 25.2 | 24.6 | 24.9 | 22.6 | 21.3 | 21.0 | 19.9 |
| Public and private waste disposal | 6.5 | 6.3 | 5.8 | 5.7 | 5.2 | 5.1 | 5.4 | 5.1 | 4.8 | 4.6 | 4.8 | 5.0 | 5.6 | 5.2 | 5.6 | 5.4 | 5.5 | 4.9 | 4.9 | 5.4 | 5.7 | 6.5 | 6.5 | 6.8 |
| Agriculture land use | 13.7 | 10.7 | 12.8 | 16.1 | 15.0 | 15.5 | 16.3 | 17.2 | 19.6 | 20.4 | 19.5 | 17.8 | 17.2 | 15.2 | 16.9 | 18.9 | 19.7 | 18.4 | 18.1 | 17.6 | 18.2 | 18.7 | 17.3 | 17.1 |
| **Total direct by industry and households** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |
| **Non-ZNET ready emissions – % of total** | 58.8 | 56.6 | 57.2 | 58.7 | 57.4 | 55.7 | 58.4 | 58.1 | 59.4 | 58.7 | 57.6 | 55.7 | 62.9 | 65.4 | 66.2 | 62.8 | 66.0 | 61.6 | 60.7 | 60.1 | 60.5 | 60.7 | 62.6 | 63.0 |

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| **Table 2.2(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 9.6 | 8.9 | 8.6 | 8.6 | 7.2 | 6.5 | 7.7 | 8.4 | 8.6 | 10.6 | 3.5 | 10.7 | 10.1 | 10.3 | 10.0 | 11.9 | 10.6 | 11.7 | 14.0 | 13.3 | 11.2 | 10.1 | 9.1 | 9.4 |
| Mining | 2.1 | 1.9 | 1.2 | 1.7 | 1.5 | 2.2 | 1.9 | 2.1 | 1.5 | 1.9 | 6.3 | 5.3 | 17.2 | 47.5 | 20.8 | 0.7 | 0.4 | 0.4 | 1.5 | 2.2 | 1.8 | 1.4 | 2.0 | 1.0 |
| Manufacturing | 76.2 | 80.0 | 82.6 | 88.5 | 95.1 | 93.0 | 74.5 | 72.3 | 67.7 | 71.8 | 70.7 | 81.4 | 69.3 | 65.9 | 68.8 | 71.2 | 66.3 | 75.2 | 82.1 | 85.4 | 101.3 | 96.0 | 94.1 | 95.5 |
| Electricity, Gas, Water and Waste Services | 0.4 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 2.1 | 1.8 | 2.0 | 2.3 | 2.9 | 4.0 | 2.8 | 2.5 | 2.4 | 2.3 | 2.0 | 1.2 | 2.1 | 1.4 |
| Construction | 1.8 | 2.1 | 2.4 | 3.4 | 3.8 | 3.4 | 3.9 | 3.9 | 4.4 | 5.5 | 0.1 | 3.9 | 3.3 | 4.5 | 4.1 | 3.5 | 3.6 | 4.4 | 4.6 | 3.9 | 4.2 | 3.7 | 5.1 | 4.6 |
| Wholesale Trade | 0.9 | 1.2 | 1.4 | 1.5 | 1.4 | 1.0 | 1.3 | 1.3 | 1.4 | 1.1 | 1.4 | 0.9 | 0.9 | 1.0 | 1.2 | 1.4 | 1.1 | 1.2 | 1.3 | 1.0 | 0.9 | 0.6 | 0.8 | 0.9 |
| Retail Trade | 3.8 | 4.3 | 4.5 | 4.9 | 5.5 | 5.3 | 6.1 | 6.4 | 6.2 | 6.8 | 4.0 | 9.1 | 7.5 | 7.2 | 7.1 | 7.4 | 5.7 | 5.6 | 6.1 | 6.2 | 5.3 | 5.4 | 5.8 | 5.1 |
| Accommodation and Food Services | 1.9 | 2.2 | 2.8 | 2.8 | 3.0 | 3.1 | 3.7 | 4.4 | 3.6 | 3.5 | 0.5 | 3.8 | 3.1 | 2.9 | 3.3 | 4.0 | 3.3 | 3.8 | 4.7 | 4.8 | 4.1 | 4.4 | 4.4 | 5.1 |
| Transport, Postal and Warehousing | 9.5 | 11.6 | 11.7 | 13.2 | 14.4 | 14.6 | 16.5 | 16.5 | 16.2 | 13.5 | 31.6 | 13.5 | 11.8 | 10.9 | 12.1 | 13.2 | 12.9 | 12.0 | 9.7 | 7.5 | 8.1 | 9.3 | 10.0 | 7.5 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.3 | 0.4 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.3 | 0.6 | 0.5 | 0.4 | 0.5 | 0.6 | 0.4 | 0.5 | 0.7 | 0.7 | 0.7 | 0.8 | 0.7 | 0.6 |
| Financial and Insurance Services | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 1.5 | 0.3 | 0.2 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| Rental, Hiring and Real Estate Services | 3.4 | 3.7 | 4.0 | 4.1 | 4.0 | 3.8 | 6.1 | 5.6 | 5.0 | 4.9 | 0.1 | 4.6 | 3.1 | 3.1 | 2.9 | 2.8 | 2.2 | 2.2 | 2.2 | 1.9 | 1.6 | 1.4 | 1.3 | 1.2 |
| Professional, Scientific and Technical Services | 0.8 | 1.0 | 1.0 | 1.2 | 1.4 | 1.1 | 1.6 | 1.5 | 1.4 | 1.8 | 2.2 | 1.9 | 1.5 | 1.6 | 1.7 | 1.9 | 1.4 | 1.7 | 2.3 | 1.9 | 1.6 | 1.2 | 1.5 | 1.3 |
| Administrative and Support Services | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.5 | 0.5 | 0.5 | 0.4 | 5.8 | 0.5 | 0.5 | 0.5 | 0.8 | 0.8 | 0.5 | 0.6 | 0.7 | 0.6 | 0.5 | 0.2 | 0.4 | 0.4 |
| Public Administration and Safety | 9.1 | 9.5 | 9.3 | 9.2 | 10.2 | 9.9 | 10.6 | 9.9 | 11.0 | 11.5 | 0.4 | 12.8 | 11.5 | 12.2 | 13.4 | 15.2 | 13.9 | 15.8 | 16.1 | 16.5 | 14.6 | 14.6 | 14.4 | 12.2 |
| Education and Training | 0.4 | 0.4 | 0.5 | 0.6 | 0.8 | 0.8 | 1.0 | 1.0 | 0.9 | 0.9 | 0.6 | 1.2 | 0.9 | 0.9 | 0.9 | 1.1 | 0.8 | 0.9 | 1.2 | 1.3 | 1.2 | 1.2 | 1.2 | 1.0 |
| Health Care and Social Assistance | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.1 | 1.1 | 0.2 | 1.5 | 1.6 | 1.5 | 1.4 | 1.4 | 1.1 | 1.4 | 2.1 | 2.4 | 2.1 | 2.1 | 2.4 | 2.3 |
| Arts and Recreation Services | 0.3 | 0.4 | 0.5 | 0.6 | 0.4 | 0.3 | 0.3 | 0.4 | 0.5 | 0.4 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Other Services | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.5 | 0.7 | 0.8 | 0.8 | 0.8 | 32.4 | 0.7 | 0.5 | 0.5 | 0.6 | 0.6 | 0.4 | 0.5 | 0.7 | 0.7 | 0.5 | 0.4 | 0.6 | 0.6 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** | **122.3** | **129.8** | **133.3** | **143.5** | **151.8** | **147.9** | **138.6** | **137.3** | **132.1** | **138.1** | **163.8** | **154.8** | **145.8** | **174.0** | **153.1** | **142.3** | **127.8** | **141.1** | **152.9** | **153.0** | **162.0** | **154.4** | **156.2** | **150.5** |

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| **Table 2.2(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 7.8 | 6.8 | 6.4 | 6.0 | 4.8 | 4.4 | 5.5 | 6.1 | 6.5 | 7.7 | 2.2 | 6.9 | 6.9 | 5.9 | 6.5 | 8.4 | 8.3 | 8.3 | 9.1 | 8.7 | 6.9 | 6.6 | 5.8 | 6.2 |
| Mining | 1.7 | 1.5 | 0.9 | 1.2 | 1.0 | 1.5 | 1.4 | 1.5 | 1.1 | 1.4 | 3.8 | 3.5 | 11.8 | 27.3 | 13.6 | 0.5 | 0.3 | 0.3 | 1.0 | 1.4 | 1.1 | 0.9 | 1.3 | 0.6 |
| Manufacturing | 62.3 | 61.6 | 62.0 | 61.7 | 62.6 | 62.9 | 53.8 | 52.7 | 51.2 | 52.0 | 43.2 | 52.6 | 47.5 | 37.9 | 45.0 | 50.1 | 51.9 | 53.3 | 53.7 | 55.8 | 62.5 | 62.2 | 60.2 | 63.4 |
| Electricity, Gas, Water and Waste Services | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 1.3 | 1.1 | 1.4 | 1.3 | 1.9 | 2.8 | 2.2 | 1.8 | 1.6 | 1.5 | 1.3 | 0.8 | 1.4 | 0.9 |
| Construction | 1.4 | 1.6 | 1.8 | 2.4 | 2.5 | 2.3 | 2.8 | 2.8 | 3.3 | 4.0 | 0.1 | 2.5 | 2.3 | 2.6 | 2.7 | 2.4 | 2.8 | 3.1 | 3.0 | 2.5 | 2.6 | 2.4 | 3.3 | 3.1 |
| Wholesale Trade | 0.8 | 0.9 | 1.0 | 1.1 | 0.9 | 0.7 | 0.9 | 1.0 | 1.0 | 0.8 | 0.9 | 0.6 | 0.6 | 0.6 | 0.8 | 1.0 | 0.9 | 0.8 | 0.9 | 0.7 | 0.5 | 0.4 | 0.5 | 0.6 |
| Retail Trade | 3.1 | 3.3 | 3.4 | 3.4 | 3.6 | 3.6 | 4.4 | 4.7 | 4.7 | 4.9 | 2.4 | 5.9 | 5.2 | 4.1 | 4.7 | 5.2 | 4.5 | 4.0 | 4.0 | 4.1 | 3.3 | 3.5 | 3.7 | 3.4 |
| Accommodation and Food Services | 1.6 | 1.7 | 2.1 | 2.0 | 2.0 | 2.1 | 2.7 | 3.2 | 2.7 | 2.6 | 0.3 | 2.5 | 2.1 | 1.7 | 2.2 | 2.8 | 2.6 | 2.7 | 3.0 | 3.1 | 2.5 | 2.8 | 2.8 | 3.4 |
| Transport, Postal and Warehousing | 7.8 | 8.9 | 8.8 | 9.2 | 9.5 | 9.9 | 11.9 | 12.0 | 12.3 | 9.8 | 19.3 | 8.8 | 8.1 | 6.3 | 7.9 | 9.3 | 10.1 | 8.5 | 6.4 | 4.9 | 5.0 | 6.0 | 6.4 | 5.0 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.2 | 0.4 | 0.3 | 0.2 | 0.3 | 0.4 | 0.3 | 0.4 | 0.4 | 0.5 | 0.4 | 0.5 | 0.4 | 0.4 |
| Financial and Insurance Services | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.9 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| Rental, Hiring and Real Estate Services | 2.8 | 2.9 | 3.0 | 2.9 | 2.6 | 2.6 | 4.4 | 4.1 | 3.8 | 3.5 | 0.1 | 3.0 | 2.1 | 1.8 | 1.9 | 2.0 | 1.7 | 1.5 | 1.5 | 1.2 | 1.0 | 0.9 | 0.8 | 0.8 |
| Professional, Scientific and Technical Services | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.7 | 1.1 | 1.1 | 1.0 | 1.3 | 1.3 | 1.2 | 1.1 | 0.9 | 1.1 | 1.4 | 1.1 | 1.2 | 1.5 | 1.2 | 1.0 | 0.8 | 0.9 | 0.9 |
| Administrative and Support Services | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.2 | 0.4 | 0.4 | 0.3 | 0.3 | 3.5 | 0.3 | 0.4 | 0.3 | 0.5 | 0.6 | 0.4 | 0.4 | 0.5 | 0.4 | 0.3 | 0.1 | 0.2 | 0.3 |
| Public Administration and Safety | 7.4 | 7.3 | 7.0 | 6.4 | 6.7 | 6.7 | 7.7 | 7.2 | 8.3 | 8.3 | 0.2 | 8.3 | 7.9 | 7.0 | 8.7 | 10.7 | 10.9 | 11.2 | 10.5 | 10.8 | 9.0 | 9.4 | 9.2 | 8.1 |
| Education and Training | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.7 | 0.7 | 0.7 | 0.7 | 0.3 | 0.8 | 0.6 | 0.5 | 0.6 | 0.8 | 0.6 | 0.6 | 0.8 | 0.9 | 0.7 | 0.8 | 0.8 | 0.6 |
| Health Care and Social Assistance | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.8 | 0.1 | 1.0 | 1.1 | 0.9 | 0.9 | 1.0 | 0.8 | 1.0 | 1.4 | 1.6 | 1.3 | 1.4 | 1.5 | 1.5 |
| Arts and Recreation Services | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 0.2 | 0.2 | 0.3 | 0.4 | 0.3 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Other Services | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.6 | 0.6 | 0.6 | 19.8 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.4 | 0.3 | 0.3 | 0.4 | 0.4 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.3 MAS: Business entities and emission shares – 2019** | | | | | | | | | | | |
|  | **Sole trader** | | | **Small enterprises (1-19 employees)** | | **Medium enterprises (20-199 employees)** | | **Very large enterprises (over 199 employees)** | |  |  |
|  | **Number** | **Number adjusted** | **Per cent of emissions** | **Number of enterprises** | **Per cent of emissions** | **Number of enterprises** | **Per cent of emissions** | **Number of enterprises** | **Per cent of emissions** | **Number of enterprises** | **Number of businesses** |
| Agriculture, Forestry and Fishing | 165 | 85 | 6.5 | 74 | 62.8 | 3 | 30.7 | 0 | 0.0 | 77 | 162 |
| Mining | 3 | 3 | 4.3 | 6 | 95.7 | 0 | 0.0 | 0 | 0.0 | 6 | 9 |
| Manufacturing | 42 | 27 | 0.9 | 33 | 12.5 | (a) | (a) | 6 | 86.6 | 39 | 66 |
| Electricity, Gas, Water and Waste Services | 0 | 0 | 0.0 | 3 | 100.0 | 0 | 0.0 | 0 | 0.0 | 3 | 3 |
| Construction | 191 | 151 | 9.5 | 93 | 65.2 | 3 | 25.3 | 0 | 0.0 | 96 | 247 |
| Wholesale Trade | 19 | 7 | 6.5 | 18 | 93.5 | 0 | 0.0 | 0 | 0.0 | 18 | 25 |
| Retail Trade | 45 | 30 | 3.5 | 69 | 53.7 | 6 | 42.8 | 0 | 0.0 | 75 | 105 |
| Accommodation and Food Services | 20 | 4 | 0.9 | 51 | 99.1 | 0 | 0.0 | 0 | 0.0 | 51 | 55 |
| Transport, Postal and Warehousing | 39 | 14 | 4.6 | 26 | 95.4 | 0 | 0.0 | 0 | 0.0 | 26 | 40 |
| Information Media and Telecommunications | 13 | 3 | 3.9 | 11 | 96.1 | 0 | 0.0 | 0 | 0.0 | 11 | 14 |
| Financial and Insurance Services | 85 | 20 | 30.0 | 7 | 70.0 | 0 | 0.0 | 0 | 0.0 | 7 | 27 |
| Rental, Hiring and Real Estate Services | 105 | 20 | 52.9 | 4 | 47.1 | 0 | 0.0 | 0 | 0.0 | 4 | 24 |
| Professional, Scientific and Technical Services | 138 | 50 | 5.1 | 83 | 94.9 | 0 | 0.0 | 0 | 0.0 | 83 | 133 |
| Administrative and Support Services | 32 | 8 | 5.1 | 15 | 94.9 | 0 | 0.0 | 0 | 0.0 | 15 | 23 |
| Public Administration and Safety | 3 | 3 | 0.4 | 0 | 0.0 | 0 | 0.0 | 2 | 99.6 | 2 | 5 |
| Education and Training | 14 | 2 | 0.3 | 4 | 5.6 | 9 | 94.2 | 0 | 0.0 | 13 | 15 |
| Health Care and Social Assistance | 49 | 11 | 0.9 | 29 | 26.6 | 0 | 0.0 | 1 | 72.5 | 30 | 41 |
| Arts and Recreation Services | 39 | 4 | 4.3 | 8 | 95.7 | 0 | 0.0 | 0 | 0.0 | 8 | 12 |
| Other Services | 35 | 5 | 2.3 | 39 | 97.7 | 0 | 0.0 | 0 | 0.0 | 39 | 44 |
| **Total** | **1037** | **447** |  | **573** |  | **21** |  | **9** |  | **603** | **1050** |

*Notes:* Emission contribution is based on the employment distribution between the entities.  
 (a) Included very large enterprises.  
 na Not available.  
*Source:* Australian Bureau of Statistics.

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| --- | --- | --- | --- | --- | --- |
| **Table 2.4 Mount Alexander Shire: Direct industry CO2(e) emissions – Distribution of emissions by firm size** | | | | | |
|  | **Non-ZNET ready emissions (‘000 tones) – 2019** | | | | |
|  | **Non-ZNET ready emissions** | **Sole trader and small enterprises** | **Number of sole traders and small enterprises** | **Medium and large businesses** | **Number of medium and large enterprises** |
| Agriculture, Forestry and Fishing | 7.1 | 4.9 | 159.0 | 2.2 | 3.0 |
| Mining | 1.0 | 1.0 | 9.0 | 0.0 | 0.0 |
| Manufacturing | 43.9 | 5.9 | 60.0 | 38.0 | 6.0 |
| Electricity, Gas, Water and Waste Services | 0.7 | 0.7 | 3.0 | 0.0 | 0.0 |
| Construction | 5.1 | 3.8 | 244.0 | 1.3 | 3.0 |
| Wholesale Trade | 0.3 | 0.3 | 25.0 | 0.0 | 0.0 |
| Retail Trade | 0.7 | 0.4 | 99.0 | 0.3 | 6.0 |
| Accommodation and Food Services | 0.5 | 0.5 | 55.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 9.1 | 9.1 | 40.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.2 | 0.2 | 14.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.1 | 0.1 | 27.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.2 | 0.2 | 24.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.4 | 0.4 | 133.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.1 | 0.1 | 23.0 | 0.0 | 0.0 |
| Public Administration and Safety | 2.7 | 0.0 | 3.0 | 2.7 | 2.0 |
| Education and Training | 0.2 | 0.0 | 6.0 | 0.2 | 9.0 |
| Health Care and Social Assistance | 0.6 | 0.2 | 40.0 | 0.4 | 1.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 12.0 | 0.0 | 0.0 |
| Other Services | 0.3 | 0.3 | 44.0 | 0.0 | 0.0 |
|  |  |  |  |  |  |
| **Total industry** | **73.0** | **28.0** | **1020.0** | **45.1** | **30.0** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.5 Mount Alexander Shire: Small-scale solar indicators – 2010-2020 – year ending December** | | | | | | | | | | |
|  | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Megawatt capacity installed | 1.6 | 2.7 | 3.6 | 4.9 | 5.9 | 7.0 | 8.4 | 10.4 | 12.3 | 14.7 |
| Megawatt hours generated | 1588 | 3078 | 4301 | 5726 | 7606 | 8525 | 10355 | 12729 | 15112 | 18010 |
| Capacity factor | 0.11 | 0.13 | 0.14 | 0.13 | 0.15 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |
| Capacity per occupied dwelling – kilowatts | 0.22 | 0.37 | 0.48 | 0.66 | 0.80 | 0.94 | 1.13 | 1.40 | 1.66 | 1.98 |
| Small solar share of total electricity consumption | 1.7 | 3.3 | 5.3 | 5.9 | 7.4 | 8.3 | 9.4 | 11.5 | 13.2 | 17.6 |

*Notes:* The denominator in line 5 is the sum of purchased electricity plus solar generation.  
 The 2019 and 2020 line 5 data are estimates.

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| --- | --- | --- | --- | --- | --- | --- |
| **Table 2.6 MAS capital expenditures ($cvm million)** | | | | | | |
|  | **2015-16** | **2016-17** | **2017-18** | **2018-19** | **2019-20** | **Cumulative indicative total 2021-2036** |
| New dwelling construction | 36.9 | 40.8 | 51.1 | 65.4 | 32.1 | 1018 |
| Dwelling renovation expenditure | 22.4 | 24.8 | 22.7 | 23.3 | 22.9 | 503 |
| Non-residential construction expenditure | 12.0 | 10.7 | 9.0 | 6.3 | 5.1 | 189 |
| Engineering construction expenditure | 24.7 | 26.8 | 32.5 | 28.7 | 26.4 | 631 |
| Total Business equipment investment | 95.4 | 98.0 | 102.0 | 106.0 | 104.2 | 2264 |
| Household equipment expenditures | 21.9 | 22.0 | 19.0 | 24.0 | 19.0 | 448 |
| Total ZNET related expenditures | 213.3 | 223.1 | 236.4 | 253.6 | 209.6 | 5052 |

*Note:* Excludes motor vehicles because not the focus of first and perhaps second stage.  
*Source:* NIEIR/ID LGA data base.

# Appendix 2A: Mount Alexander Shire CO2 emissions – Methodology and results

Given the data base, the methodology in deriving the emissions estimates is straight forward. The data base is the NIEIR/ID data base which is on over 300 LGA websites around Australia. The data base consists of industry outputs, value added, final demand allocations, etc. for the 86 2-digit ANZSIC industries as listed in Table 2.A.10. The data extends from 1991 to 2020.

The data base includes estimates of input-output flows for each of the 86 industries for each quarter/year. For industry *i* the input-output identity *i* is given by:

*ai,1,k x1,k + . . . . . . . . . . ai,86,k x86,k + hi,k + li,k + other = si,k*

1. Agriculture

6. Coal

7. Oil and gas

11. Petroleum products

26. Electricity

27. Gas distribution

29. Waste distribution

46. Road transport

47. Rail transport

48. Water transport

49. Air transport

50. Other transport

Taking the case of electricity. From the input-output framework total electricity demand in an LGA will be given by:

*86  
Ek = Σ ai,26,k xi,k + h26,k* (1)  
 *i=1*

Where:

*Ek* = Purchased electricity demand in LGA *k*.

The next step is to estimate equation (1) for all LGAs in Victoria for period *t*.

From the Victorian Greenhouse Accounts the purchased electricity emissions are known. Therefore, the first cut estimate of purchased electricity emissions in LGA *k* will be:

*n  
E1k = (Ek / Σ ek ) EEv*  
 *k=1*

Where *n* is the number of LGAs in Victoria and *EEv* equals Victorian CO2(e) in tonnes of emissions for a given year.

*E1k* is further refined by taking into account the relative small-scale solar effort in LGA *k* relative to the rest of Victoria.

The 86 industry emissions are then derived from:

*E1i,k = (ai,26,k . xi,k / s26,k) . E1k*

In the case of purchased electricity only, the *E1i,k* are further adjusted by known *k* control total from electricity sub-station data. For MAS, confidential data is used to adjust the *ai,26,k* and the *ai,27,k*.

The process is repeated for the other Victorian Greenhouse Account constructs as designated in the tables of this appendix.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.A.1(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Purchased electricity (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 3.2 | 3.1 | 3.1 | 3.0 | 2.7 | 2.5 | 3.0 | 3.4 | 3.0 | 3.3 | 3.4 | 3.8 | 3.5 | 3.4 | 2.9 | 3.6 | 2.4 | 3.2 | 3.1 | 2.1 | 2.1 | 2.4 | 2.0 | 2.1 |
| Mining | 0.8 | 0.7 | 0.5 | 0.7 | 0.6 | 1.1 | 0.5 | 0.5 | 0.4 | 0.7 | 2.1 | 2.6 | 5.3 | 15.3 | 7.3 | 0.3 | 0.1 | 0.2 | 0.5 | 0.9 | 0.9 | 1.0 | 1.0 | 0.5 |
| Manufacturing | 35.5 | 39.3 | 41.9 | 47.8 | 53.1 | 55.6 | 38.2 | 37.2 | 36.7 | 41.4 | 40.6 | 44.4 | 30.9 | 26.7 | 29.7 | 33.4 | 29.7 | 41.1 | 47.4 | 51.9 | 60.0 | 55.9 | 50.2 | 49.5 |
| Electricity, Gas, Water and Waste Services | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.9 | 1.5 | 1.6 | 1.8 | 1.9 | 2.6 | 1.5 | 1.5 | 1.5 | 1.8 | 1.4 | 1.2 | 1.4 | 0.9 |
| Construction | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.5 | 0.7 | 0.8 | 0.9 | 0.8 | 0.7 | 0.7 | 0.8 | 0.8 | 0.7 | 1.2 | 0.6 | 0.6 | 0.6 | 0.7 | 0.9 | 0.8 | 0.8 | 0.8 | 0.7 | 0.5 | 0.5 | 0.5 | 0.6 |
| Retail Trade | 3.4 | 3.8 | 4.0 | 4.4 | 4.9 | 4.8 | 5.6 | 6.0 | 5.7 | 6.2 | 2.7 | 8.5 | 6.8 | 6.4 | 6.3 | 6.6 | 5.2 | 5.1 | 5.5 | 5.6 | 4.6 | 4.8 | 5.1 | 4.5 |
| Accommodation and Food Services | 1.8 | 2.1 | 2.5 | 2.6 | 2.8 | 2.9 | 3.4 | 4.1 | 3.3 | 3.2 | 0.3 | 3.6 | 2.8 | 2.6 | 3.0 | 3.7 | 3.0 | 3.6 | 4.3 | 4.4 | 3.7 | 4.0 | 4.0 | 4.5 |
| Transport, Postal and Warehousing | 0.6 | 0.7 | 0.7 | 0.6 | 0.5 | 0.6 | 1.1 | 1.1 | 0.9 | 0.9 | 0.9 | 1.1 | 0.7 | 0.7 | 0.8 | 1.0 | 0.9 | 1.1 | 1.2 | 1.2 | 1.0 | 1.0 | 1.0 | 0.7 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.2 | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 0.3 | 0.4 | 0.5 | 0.5 | 0.5 | 0.6 | 0.5 | 0.4 |
| Financial and Insurance Services | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 1.4 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 |
| Rental, Hiring and Real Estate Services | 3.0 | 3.2 | 3.5 | 3.4 | 3.3 | 3.5 | 5.0 | 4.8 | 4.3 | 4.3 | 0.1 | 4.3 | 2.7 | 2.6 | 2.4 | 2.4 | 2.0 | 2.0 | 1.8 | 1.6 | 1.3 | 1.4 | 1.1 | 1.0 |
| Professional, Scientific and Technical Services | 0.5 | 0.6 | 0.7 | 0.7 | 0.9 | 0.9 | 1.1 | 1.1 | 1.0 | 1.3 | 2.0 | 1.6 | 1.1 | 1.1 | 1.2 | 1.4 | 1.1 | 1.3 | 1.5 | 1.4 | 1.1 | 1.2 | 1.1 | 0.9 |
| Administrative and Support Services | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 4.8 | 0.4 | 0.3 | 0.3 | 0.4 | 0.5 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 | 0.2 |
| Public Administration and Safety | 7.7 | 8.0 | 8.0 | 7.9 | 8.8 | 8.7 | 9.4 | 8.9 | 9.6 | 9.9 | 0.4 | 11.6 | 10.0 | 10.3 | 11.2 | 13.0 | 11.8 | 13.6 | 13.5 | 13.8 | 11.7 | 12.2 | 11.7 | 9.8 |
| Education and Training | 0.3 | 0.4 | 0.4 | 0.5 | 0.7 | 0.7 | 0.9 | 0.8 | 0.8 | 0.8 | 0.5 | 1.1 | 0.8 | 0.8 | 0.8 | 0.9 | 0.7 | 0.8 | 1.0 | 1.2 | 1.0 | 1.1 | 1.0 | 0.8 |
| Health Care and Social Assistance | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.8 | 0.1 | 1.3 | 1.3 | 1.2 | 1.1 | 1.1 | 0.8 | 1.1 | 1.6 | 1.8 | 1.5 | 1.7 | 1.8 | 1.7 |
| Arts and Recreation Services | 0.2 | 0.3 | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.3 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.2 |
| Other Services | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 | 0.5 | 18.4 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 |
| Households | 37.1 | 36.4 | 35.1 | 34.5 | 33.9 | 34.5 | 37.3 | 40.1 | 37.9 | 38.8 | 41.0 | 45.2 | 34.1 | 33.5 | 33.4 | 37.4 | 28.5 | 28.2 | 29.2 | 26.8 | 27.1 | 23.5 | 22.6 | 20.4 |
| **Total** | **96.3** | **101.1** | **103.4** | **109.4** | **115.4** | **119.0** | **109.0** | **111.9** | **107.6** | **114.5** | **121.3** | **133.2** | **103.7** | **108.5** | **104.1** | **110.2** | **90.0** | **105.1** | **114.5** | **116.8** | **119.4** | **113.3** | **105.8** | **99.0** |

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| **Table 2.A.1(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Purchased electricity (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 3.4 | 3.1 | 3.0 | 2.7 | 2.3 | 2.1 | 2.8 | 3.0 | 2.7 | 2.8 | 2.8 | 2.9 | 3.4 | 3.1 | 2.8 | 3.3 | 2.7 | 3.0 | 2.7 | 1.8 | 1.7 | 2.1 | 1.9 | 2.1 |
| Mining | 0.8 | 0.7 | 0.5 | 0.7 | 0.5 | 0.9 | 0.4 | 0.5 | 0.4 | 0.6 | 1.7 | 2.0 | 5.1 | 14.1 | 7.0 | 0.3 | 0.2 | 0.2 | 0.4 | 0.8 | 0.8 | 0.9 | 0.9 | 0.5 |
| Manufacturing | 36.9 | 38.8 | 40.5 | 43.7 | 46.0 | 46.7 | 35.0 | 33.3 | 34.1 | 36.1 | 33.4 | 33.3 | 29.8 | 24.6 | 28.5 | 30.3 | 33.0 | 39.1 | 41.4 | 44.4 | 50.3 | 49.4 | 47.4 | 49.9 |
| Electricity, Gas, Water and Waste Services | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.7 | 1.1 | 1.5 | 1.7 | 1.8 | 2.4 | 1.6 | 1.5 | 1.3 | 1.5 | 1.2 | 1.0 | 1.3 | 0.9 |
| Construction | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.6 | 0.7 | 0.7 | 0.8 | 0.7 | 0.6 | 0.7 | 0.7 | 0.8 | 0.6 | 1.0 | 0.5 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 | 0.8 | 0.7 | 0.6 | 0.4 | 0.4 | 0.5 | 0.6 |
| Retail Trade | 3.6 | 3.8 | 3.9 | 4.0 | 4.3 | 4.1 | 5.2 | 5.3 | 5.3 | 5.4 | 2.3 | 6.4 | 6.6 | 5.9 | 6.0 | 6.0 | 5.7 | 4.9 | 4.8 | 4.8 | 3.9 | 4.3 | 4.8 | 4.5 |
| Accommodation and Food Services | 1.8 | 2.0 | 2.5 | 2.4 | 2.4 | 2.4 | 3.2 | 3.7 | 3.1 | 2.8 | 0.2 | 2.7 | 2.7 | 2.4 | 2.9 | 3.3 | 3.4 | 3.4 | 3.7 | 3.7 | 3.1 | 3.5 | 3.7 | 4.5 |
| Transport, Postal and Warehousing | 0.6 | 0.7 | 0.7 | 0.5 | 0.5 | 0.5 | 1.0 | 1.0 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 0.9 | 0.8 | 0.9 | 0.7 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.2 | 0.4 | 0.4 | 0.3 | 0.4 | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 0.4 | 0.5 | 0.5 | 0.4 |
| Financial and Insurance Services | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 1.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| Rental, Hiring and Real Estate Services | 3.1 | 3.2 | 3.3 | 3.1 | 2.8 | 3.0 | 4.6 | 4.3 | 4.0 | 3.7 | 0.1 | 3.2 | 2.6 | 2.4 | 2.3 | 2.2 | 2.2 | 1.9 | 1.6 | 1.4 | 1.1 | 1.2 | 1.0 | 1.0 |
| Professional, Scientific and Technical Services | 0.5 | 0.6 | 0.7 | 0.7 | 0.8 | 0.8 | 1.0 | 1.0 | 0.9 | 1.1 | 1.7 | 1.2 | 1.1 | 1.1 | 1.1 | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 | 0.9 | 1.0 | 1.0 | 0.9 |
| Administrative and Support Services | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | 4.0 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| Public Administration and Safety | 8.0 | 8.0 | 7.7 | 7.2 | 7.6 | 7.3 | 8.6 | 8.0 | 9.0 | 8.6 | 0.3 | 8.7 | 9.6 | 9.5 | 10.7 | 11.8 | 13.2 | 12.9 | 11.8 | 11.8 | 9.8 | 10.8 | 11.1 | 9.9 |
| Education and Training | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.6 | 0.8 | 0.8 | 0.7 | 0.7 | 0.4 | 0.8 | 0.8 | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 | 0.9 | 1.0 | 0.9 | 0.9 | 1.0 | 0.8 |
| Health Care and Social Assistance | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.7 | 0.7 | 0.8 | 0.7 | 0.1 | 1.0 | 1.2 | 1.1 | 1.1 | 1.0 | 0.9 | 1.1 | 1.4 | 1.6 | 1.2 | 1.5 | 1.7 | 1.7 |
| Arts and Recreation Services | 0.2 | 0.3 | 0.4 | 0.4 | 0.3 | 0.2 | 0.2 | 0.3 | 0.4 | 0.3 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 |
| Other Services | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.4 | 15.2 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 |
| Households | 38.5 | 36.0 | 33.9 | 31.5 | 29.4 | 29.0 | 34.2 | 35.8 | 35.3 | 33.9 | 33.8 | 33.9 | 32.9 | 30.9 | 32.1 | 34.0 | 31.7 | 26.9 | 25.5 | 23.0 | 22.7 | 20.8 | 21.3 | 20.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| **Table 2.A.2(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Gas (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 1.0 | 0.8 | 0.8 | 0.8 | 0.7 | 0.6 | 0.6 | 0.7 | 0.7 | 0.9 | 0.0 | 0.9 | 0.9 | 1.0 | 0.8 | 0.8 | 0.8 | 0.8 | 1.2 | 1.1 | 0.9 | 0.8 | 0.6 | 0.7 |
| Mining | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 2.8 | 0.5 | 1.2 | 3.6 | 1.1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.1 |
| Manufacturing | 31.9 | 32.0 | 31.7 | 30.1 | 31.7 | 28.9 | 26.0 | 25.6 | 22.0 | 21.7 | 21.7 | 27.7 | 27.4 | 27.9 | 27.0 | 26.1 | 27.1 | 24.5 | 22.7 | 20.9 | 27.2 | 28.0 | 28.3 | 26.9 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.7 | 1.2 | 0.7 | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 |
| Construction | 0.2 | 0.3 | 0.3 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.6 | 0.0 | 0.5 | 0.4 | 0.5 | 0.4 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 |
| Retail Trade | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 | 0.1 | 0.4 | 0.4 | 0.5 | 0.6 | 0.4 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Accommodation and Food Services | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.0 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 |
| Transport, Postal and Warehousing | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.6 | 0.4 | 0.3 | 0.5 | 0.5 | 0.0 | 0.5 | 0.7 | 0.9 | 1.0 | 0.8 | 0.7 | 0.6 | 0.7 | 0.9 | 1.0 | 1.0 | 0.9 | 0.9 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 8.7 | 8.6 | 8.6 | 9.2 | 9.7 | 10.0 | 9.9 | 10.1 | 10.3 | 10.7 | 11.5 | 12.2 | 13.0 | 14.6 | 17.3 | 15.9 | 15.5 | 15.2 | 14.6 | 14.6 | 14.0 | 13.5 | 13.8 | 14.1 |
| **Total** | **43.1** | **43.0** | **42.6** | **41.9** | **44.1** | **41.9** | **38.3** | **38.0** | **35.0** | **35.8** | **37.9** | **43.4** | **44.8** | **50.1** | **49.7** | **46.1** | **46.5** | **43.0** | **41.2** | **39.7** | **45.1** | **45.4** | **45.8** | **44.6** |

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| **Table 2.A.2(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Gas (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 2.2 | 1.9 | 1.8 | 2.0 | 1.6 | 1.5 | 1.6 | 1.7 | 2.1 | 2.6 | 0.1 | 2.0 | 2.0 | 1.9 | 1.7 | 1.8 | 1.7 | 2.0 | 2.8 | 2.8 | 1.9 | 1.7 | 1.4 | 1.5 |
| Mining | 0.4 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 7.5 | 1.2 | 2.7 | 7.2 | 2.3 | 0.1 | 0.1 | 0.1 | 0.4 | 0.7 | 0.4 | 0.4 | 0.3 | 0.2 |
| Manufacturing | 73.9 | 74.5 | 74.5 | 71.8 | 71.8 | 69.0 | 67.8 | 67.5 | 62.8 | 60.7 | 57.2 | 63.7 | 61.0 | 55.7 | 54.4 | 56.7 | 58.2 | 56.9 | 55.1 | 52.7 | 60.4 | 61.7 | 61.8 | 60.2 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.5 | 1.5 | 2.5 | 1.7 | 0.8 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 |
| Construction | 0.6 | 0.6 | 0.7 | 1.1 | 1.2 | 1.2 | 1.2 | 1.2 | 1.5 | 1.8 | 0.1 | 1.1 | 0.9 | 1.0 | 0.8 | 0.6 | 0.7 | 0.9 | 1.0 | 0.9 | 0.8 | 0.8 | 0.9 | 0.8 |
| Wholesale Trade | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Retail Trade | 0.5 | 0.4 | 0.4 | 0.5 | 0.6 | 0.7 | 0.6 | 0.5 | 0.8 | 0.9 | 0.4 | 0.9 | 1.0 | 1.1 | 1.1 | 0.9 | 0.6 | 0.5 | 0.7 | 0.9 | 0.8 | 0.9 | 0.9 | 0.9 |
| Accommodation and Food Services | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 0.5 | 0.0 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.9 |
| Transport, Postal and Warehousing | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.6 | 0.6 | 0.0 | 0.5 | 0.4 | 0.4 | 0.4 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| Professional, Scientific and Technical Services | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 1.0 | 0.9 | 0.8 | 1.0 | 1.2 | 1.3 | 1.0 | 0.7 | 1.3 | 1.5 | 0.1 | 1.2 | 1.5 | 1.8 | 2.0 | 1.8 | 1.4 | 1.3 | 1.7 | 2.3 | 2.1 | 2.2 | 2.1 | 2.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Health Care and Social Assistance | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 2.6 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 |
| Households | 20.2 | 20.1 | 20.3 | 21.9 | 21.9 | 24.0 | 25.9 | 26.7 | 29.3 | 29.9 | 30.4 | 28.1 | 29.1 | 29.2 | 34.8 | 34.5 | 33.4 | 35.3 | 35.5 | 36.8 | 31.1 | 29.8 | 30.1 | 31.6 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| **Table 2.A.3(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Petroleum direct industry use (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 5.1 | 4.6 | 4.4 | 4.4 | 3.6 | 3.4 | 3.7 | 4.1 | 4.7 | 6.2 | 0.1 | 5.9 | 5.4 | 5.8 | 5.9 | 7.2 | 7.3 | 7.5 | 9.2 | 9.8 | 8.0 | 7.2 | 6.3 | 6.5 |
| Mining | 0.9 | 0.7 | 0.4 | 0.6 | 0.7 | 1.0 | 1.0 | 1.2 | 0.8 | 0.6 | 0.8 | 1.4 | 2.9 | 8.4 | 2.9 | 0.2 | 0.2 | 0.1 | 0.4 | 0.7 | 0.5 | 0.7 | 0.6 | 0.3 |
| Manufacturing | 1.9 | 1.7 | 1.8 | 1.9 | 1.9 | 1.8 | 1.8 | 1.7 | 1.6 | 1.8 | 0.4 | 1.6 | 1.5 | 2.0 | 1.9 | 1.9 | 2.0 | 1.9 | 2.2 | 2.5 | 2.6 | 2.9 | 3.0 | 2.5 |
| Electricity, Gas, Water and Waste Services | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 1.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Construction | 1.2 | 1.5 | 1.6 | 2.2 | 2.5 | 2.7 | 2.6 | 2.7 | 3.2 | 4.2 | 0.0 | 3.2 | 2.5 | 3.5 | 3.1 | 2.7 | 3.2 | 3.7 | 3.5 | 3.3 | 3.5 | 3.7 | 4.4 | 4.0 |
| Wholesale Trade | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Retail Trade | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 1.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 | 0.2 |
| Accommodation and Food Services | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Transport, Postal and Warehousing | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 |
| Financial and Insurance Services | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Administrative and Support Services | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.6 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Public Administration and Safety | 0.7 | 0.8 | 0.8 | 0.7 | 0.6 | 0.6 | 0.6 | 0.5 | 0.7 | 0.9 | 0.0 | 0.6 | 0.7 | 0.9 | 0.9 | 1.1 | 1.4 | 1.5 | 1.5 | 1.7 | 1.8 | 1.6 | 1.6 | 1.4 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Health Care and Social Assistance | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 12.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **11.2** | **10.7** | **10.4** | **11.2** | **10.7** | **10.7** | **11.1** | **11.7** | **12.6** | **15.6** | **17.0** | **14.2** | **14.4** | **22.0** | **16.2** | **14.7** | **15.7** | **16.5** | **18.8** | **20.2** | **18.5** | **18.0** | **18.1** | **16.7** |

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| **Table 2.A.3(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Petroleum direct industry use (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 45.5 | 43.4 | 42.0 | 39.4 | 33.8 | 31.5 | 33.4 | 35.2 | 37.3 | 40.1 | 0.5 | 42.0 | 37.6 | 26.4 | 36.7 | 48.6 | 46.7 | 45.8 | 49.1 | 48.7 | 43.4 | 39.8 | 35.1 | 38.7 |
| Mining | 8.4 | 6.9 | 3.9 | 5.7 | 6.6 | 9.5 | 9.4 | 10.4 | 6.4 | 4.2 | 4.9 | 9.9 | 20.4 | 38.1 | 17.7 | 1.7 | 1.2 | 0.9 | 2.0 | 3.4 | 2.5 | 3.6 | 3.3 | 1.7 |
| Manufacturing | 16.8 | 16.0 | 17.2 | 17.3 | 18.0 | 16.6 | 16.5 | 14.2 | 12.7 | 11.3 | 2.1 | 11.1 | 10.6 | 8.9 | 11.9 | 13.1 | 12.7 | 11.7 | 11.7 | 12.4 | 14.2 | 16.0 | 16.6 | 15.2 |
| Electricity, Gas, Water and Waste Services | 1.9 | 2.2 | 2.0 | 1.8 | 1.5 | 1.1 | 1.0 | 1.1 | 1.2 | 1.1 | 7.1 | 1.1 | 1.1 | 0.8 | 1.0 | 1.1 | 0.8 | 0.7 | 1.1 | 1.4 | 1.5 | 1.5 | 1.9 | 1.5 |
| Construction | 11.1 | 13.6 | 15.7 | 19.2 | 23.2 | 25.4 | 23.7 | 23.4 | 25.3 | 27.1 | 0.2 | 22.6 | 17.5 | 15.9 | 19.3 | 18.4 | 20.4 | 22.4 | 18.6 | 16.3 | 19.0 | 20.6 | 24.4 | 23.8 |
| Wholesale Trade | 1.8 | 2.2 | 2.6 | 2.3 | 2.2 | 2.1 | 2.0 | 2.1 | 2.2 | 1.7 | 0.6 | 1.2 | 1.2 | 1.0 | 1.3 | 1.8 | 1.9 | 1.6 | 1.4 | 1.2 | 1.2 | 1.0 | 1.0 | 1.3 |
| Retail Trade | 1.4 | 1.5 | 1.6 | 1.5 | 1.6 | 1.5 | 1.6 | 1.6 | 1.6 | 1.6 | 6.2 | 1.7 | 1.6 | 1.1 | 1.4 | 1.6 | 1.5 | 1.3 | 1.2 | 1.3 | 1.4 | 1.3 | 1.4 | 1.4 |
| Accommodation and Food Services | 0.4 | 0.5 | 0.6 | 0.5 | 0.6 | 0.6 | 0.6 | 0.7 | 0.6 | 0.5 | 1.1 | 0.4 | 0.4 | 0.3 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.8 |
| Transport, Postal and Warehousing | 0.6 | 0.7 | 0.8 | 0.8 | 0.8 | 0.6 | 0.5 | 0.4 | 0.3 | 0.2 | 0.0 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.5 | 0.6 | 0.8 | 1.0 | 0.8 | 0.7 |
| Financial and Insurance Services | 0.5 | 0.5 | 0.5 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.3 | 0.2 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 |
| Rental, Hiring and Real Estate Services | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.6 | 0.6 | 0.5 | 0.5 | 0.1 | 0.4 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 |
| Professional, Scientific and Technical Services | 0.7 | 0.8 | 0.9 | 0.8 | 1.0 | 0.9 | 1.0 | 1.0 | 0.9 | 1.2 | 0.2 | 1.0 | 0.8 | 0.6 | 0.9 | 1.1 | 1.1 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Administrative and Support Services | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.3 | 3.8 | 0.4 | 0.3 | 0.3 | 0.4 | 0.6 | 0.5 | 0.5 | 0.4 | 0.4 | 0.4 | 0.3 | 0.3 | 0.4 |
| Public Administration and Safety | 6.6 | 7.3 | 7.5 | 5.9 | 5.7 | 5.4 | 5.2 | 4.5 | 5.8 | 5.9 | 0.1 | 4.6 | 4.7 | 3.9 | 5.6 | 7.4 | 8.7 | 9.1 | 8.0 | 8.3 | 9.5 | 8.9 | 8.8 | 8.4 |
| Education and Training | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Health Care and Social Assistance | 1.0 | 0.9 | 0.9 | 0.8 | 0.9 | 0.9 | 0.9 | 0.9 | 1.1 | 1.0 | 0.2 | 1.2 | 1.4 | 1.0 | 1.2 | 1.3 | 1.2 | 1.4 | 1.7 | 2.0 | 2.2 | 2.1 | 2.3 | 2.4 |
| Arts and Recreation Services | 0.4 | 0.4 | 0.6 | 0.6 | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 |
| Other Services | 1.7 | 1.6 | 1.6 | 1.4 | 1.6 | 1.5 | 1.7 | 1.9 | 2.0 | 1.7 | 71.3 | 1.3 | 1.0 | 0.7 | 1.0 | 1.1 | 1.0 | 1.1 | 1.2 | 1.2 | 1.1 | 1.0 | 1.2 | 1.5 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| **Table 2.A.4(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Petroleum – transport (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 8.6 | 10.6 | 10.7 | 12.2 | 13.5 | 13.9 | 15.0 | 15.2 | 15.1 | 12.4 | 30.6 | 12.3 | 10.9 | 10.0 | 11.1 | 11.9 | 11.9 | 10.8 | 8.2 | 6.1 | 6.8 | 8.2 | 8.8 | 6.6 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 18.5 | 18.3 | 19.8 | 20.3 | 20.9 | 20.7 | 19.4 | 20.2 | 19.9 | 19.9 | 0.0 | 19.9 | 22.6 | 27.7 | 35.1 | 28.3 | 26.2 | 25.6 | 27.9 | 31.4 | 27.2 | 24.4 | 23.0 | 18.8 |
| **Total** | **27.2** | **28.9** | **30.6** | **32.5** | **34.4** | **34.6** | **34.4** | **35.5** | **35.0** | **32.4** | **30.6** | **32.2** | **33.4** | **37.7** | **46.2** | **40.2** | **38.1** | **36.3** | **36.0** | **37.5** | **33.9** | **32.6** | **31.8** | **25.4** |

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| **Table 2.A.4(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Petroleum – transport (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 31.8 | 36.7 | 35.1 | 37.7 | 39.3 | 40.2 | 43.7 | 42.9 | 43.1 | 38.4 | 99.9 | 38.1 | 32.5 | 26.5 | 24.0 | 29.7 | 31.2 | 29.6 | 22.7 | 16.2 | 19.9 | 25.2 | 27.7 | 25.9 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 68.2 | 63.3 | 64.9 | 62.3 | 60.7 | 59.8 | 56.3 | 57.1 | 56.9 | 61.6 | 0.1 | 61.9 | 67.5 | 73.5 | 76.0 | 70.3 | 68.8 | 70.4 | 77.3 | 83.8 | 80.1 | 74.8 | 72.3 | 74.1 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.A.5(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Other stationary energy (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.0 | 0.3 | 0.2 | 0.2 | 0.2 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.0 | 0.2 | 0.5 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| Mining | 0.2 | 0.3 | 0.2 | 0.2 | 0.1 | 0.0 | 0.3 | 0.2 | 0.2 | 0.4 | 0.5 | 0.8 | 7.7 | 20.2 | 9.5 | 0.1 | 0.0 | 0.1 | 0.5 | 0.3 | 0.3 | 0.1 | 0.2 | 0.1 |
| Manufacturing | 1.4 | 1.6 | 1.8 | 2.5 | 2.2 | 0.1 | 1.9 | 1.2 | 0.9 | 0.6 | 1.5 | 0.3 | 1.2 | 1.3 | 2.1 | 1.7 | 0.2 | 0.7 | 2.1 | 0.8 | 1.0 | 0.4 | 1.0 | 0.9 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 0.3 | 0.6 | 0.5 | 0.0 | 0.1 | 0.3 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 |
| Construction | 0.2 | 0.3 | 0.4 | 0.7 | 0.7 | 0.0 | 0.8 | 0.6 | 0.6 | 0.5 | 0.0 | 0.1 | 0.4 | 0.4 | 0.5 | 0.4 | 0.0 | 0.3 | 0.6 | 0.2 | 0.3 | 0.1 | 0.3 | 0.3 |
| Wholesale Trade | 0.1 | 0.2 | 0.3 | 0.3 | 0.3 | 0.0 | 0.3 | 0.2 | 0.2 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.0 | 0.1 | 0.2 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 |
| Retail Trade | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.0 | 0.2 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.2 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.2 | 0.3 | 0.3 | 0.5 | 0.5 | 0.0 | 0.8 | 0.6 | 0.5 | 0.3 | 0.0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.0 | 0.1 | 0.3 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 |
| Professional, Scientific and Technical Services | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.0 | 0.4 | 0.3 | 0.2 | 0.2 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.0 | 0.2 | 0.5 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 |
| Administrative and Support Services | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.0 | 0.2 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 | 0.0 | 0.1 | 0.3 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 |
| Public Administration and Safety | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.0 | 0.3 | 0.2 | 0.2 | 0.2 | 0.0 | 0.0 | 0.2 | 0.2 | 0.2 | 0.2 | 0.0 | 0.2 | 0.4 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **3.3** | **4.1** | **4.4** | **6.2** | **5.4** | **0.2** | **5.8** | **4.1** | **3.5** | **3.0** | **2.9** | **1.6** | **10.9** | **23.5** | **14.5** | **4.7** | **0.4** | **2.2** | **6.2** | **2.4** | **3.0** | **1.1** | **2.5** | **2.3** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.A.5(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Other stationary energy (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 7.7 | 7.2 | 6.6 | 6.3 | 5.1 | 4.9 | 5.2 | 6.1 | 6.8 | 6.8 | 0.0 | 4.0 | 2.1 | 0.9 | 2.2 | 7.0 | 7.1 | 7.7 | 8.2 | 7.5 | 6.7 | 5.9 | 4.9 | 5.9 |
| Mining | 7.5 | 7.0 | 3.7 | 3.8 | 2.7 | 4.6 | 4.9 | 5.6 | 5.0 | 14.4 | 16.8 | 48.1 | 70.8 | 86.1 | 65.2 | 2.6 | 1.7 | 2.5 | 7.4 | 13.0 | 9.1 | 9.1 | 9.1 | 6.1 |
| Manufacturing | 43.9 | 39.7 | 41.5 | 40.2 | 40.3 | 37.0 | 33.4 | 29.6 | 25.4 | 20.9 | 51.9 | 16.4 | 10.9 | 5.5 | 14.5 | 37.4 | 38.2 | 33.8 | 33.7 | 32.0 | 33.9 | 36.2 | 39.0 | 38.0 |
| Electricity, Gas, Water and Waste Services | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.4 | 0.4 | 3.7 | 2.8 | 1.5 | 3.8 | 11.2 | 8.4 | 6.3 | 5.3 | 6.4 | 8.0 | 8.3 | 8.7 | 6.8 |
| Construction | 6.7 | 8.4 | 9.5 | 12.1 | 13.5 | 14.4 | 13.4 | 14.3 | 16.7 | 16.9 | 0.0 | 7.9 | 3.3 | 1.6 | 3.6 | 8.8 | 9.8 | 11.8 | 9.8 | 8.1 | 9.1 | 9.7 | 10.3 | 10.9 |
| Wholesale Trade | 4.4 | 5.6 | 6.0 | 5.5 | 5.0 | 4.9 | 4.7 | 5.4 | 5.8 | 4.2 | 0.1 | 1.7 | 1.0 | 0.5 | 1.2 | 4.1 | 4.3 | 4.2 | 3.6 | 2.8 | 2.7 | 2.5 | 2.1 | 2.9 |
| Retail Trade | 1.7 | 1.8 | 1.8 | 1.7 | 1.8 | 1.8 | 1.9 | 2.0 | 2.1 | 2.0 | 1.8 | 1.2 | 0.6 | 0.3 | 0.6 | 1.7 | 1.7 | 1.7 | 1.5 | 1.5 | 1.5 | 1.5 | 1.4 | 1.6 |
| Accommodation and Food Services | 0.6 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 | 0.8 | 1.0 | 0.9 | 0.8 | 0.0 | 0.3 | 0.2 | 0.1 | 0.2 | 0.6 | 0.7 | 0.8 | 0.8 | 0.8 | 0.9 | 0.8 | 0.7 | 1.1 |
| Transport, Postal and Warehousing | 3.3 | 4.0 | 3.9 | 3.6 | 3.5 | 3.4 | 3.3 | 3.6 | 3.6 | 2.7 | 0.2 | 1.4 | 0.7 | 0.3 | 0.6 | 2.1 | 2.4 | 2.5 | 2.6 | 2.4 | 2.3 | 2.2 | 2.2 | 2.3 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.0 | 0.2 | 0.1 | 0.0 | 0.1 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Financial and Insurance Services | 0.5 | 0.5 | 0.5 | 0.4 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.4 | 0.4 | 0.2 | 0.1 | 0.0 | 0.1 | 0.5 | 0.6 | 0.5 | 0.5 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| Rental, Hiring and Real Estate Services | 6.1 | 6.2 | 7.2 | 8.3 | 8.9 | 10.4 | 14.1 | 13.5 | 13.0 | 10.4 | 0.0 | 4.1 | 1.6 | 0.7 | 1.6 | 4.4 | 4.7 | 4.7 | 4.4 | 4.3 | 4.6 | 3.9 | 3.2 | 3.5 |
| Professional, Scientific and Technical Services | 4.6 | 5.5 | 5.5 | 5.4 | 6.0 | 6.0 | 6.4 | 6.6 | 6.6 | 7.8 | 0.1 | 3.9 | 2.0 | 0.9 | 2.1 | 6.6 | 7.0 | 8.1 | 8.0 | 7.1 | 6.9 | 6.4 | 5.8 | 6.2 |
| Administrative and Support Services | 3.2 | 3.7 | 3.6 | 3.3 | 3.4 | 2.9 | 2.9 | 2.9 | 3.0 | 3.2 | 0.4 | 2.5 | 1.3 | 0.6 | 1.6 | 4.5 | 4.4 | 5.0 | 4.2 | 3.9 | 3.7 | 3.4 | 2.9 | 4.2 |
| Public Administration and Safety | 5.9 | 6.0 | 5.6 | 4.9 | 5.0 | 4.9 | 4.8 | 4.7 | 5.6 | 5.0 | 0.3 | 2.5 | 1.5 | 0.7 | 1.7 | 5.2 | 6.1 | 6.9 | 6.0 | 5.7 | 6.1 | 5.7 | 5.2 | 5.4 |
| Education and Training | 0.5 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 0.9 | 0.8 | 0.5 | 0.5 | 0.3 | 0.1 | 0.2 | 0.8 | 0.8 | 0.8 | 0.9 | 1.0 | 1.1 | 1.0 | 1.0 | 0.9 |
| Health Care and Social Assistance | 1.0 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.9 | 1.1 | 1.0 | 0.2 | 0.7 | 0.4 | 0.2 | 0.4 | 1.0 | 1.0 | 1.3 | 1.7 | 1.8 | 1.8 | 1.8 | 1.8 | 2.1 |
| Arts and Recreation Services | 0.6 | 0.6 | 0.9 | 0.8 | 0.6 | 0.5 | 0.4 | 0.5 | 0.7 | 0.5 | 0.1 | 0.2 | 0.1 | 0.0 | 0.1 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 |
| Other Services | 1.3 | 1.3 | 1.2 | 1.1 | 1.2 | 1.1 | 1.3 | 1.5 | 1.7 | 1.4 | 26.8 | 0.6 | 0.3 | 0.1 | 0.3 | 0.8 | 0.8 | 0.9 | 1.0 | 1.0 | 0.8 | 0.8 | 0.8 | 1.1 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| **Table 2.A.6(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Heavy industry (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 1.5 | 1.6 | 1.6 | 1.9 | 2.2 | 2.2 | 2.3 | 2.3 | 2.4 | 2.5 | 2.4 | 2.3 | 2.5 | 2.5 | 2.4 | 2.3 | 2.2 | 2.4 | 2.8 | 2.7 | 2.7 | 3.1 | 2.7 | 2.3 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **1.5** | **1.6** | **1.6** | **1.9** | **2.2** | **2.2** | **2.3** | **2.3** | **2.4** | **2.5** | **2.4** | **2.3** | **2.5** | **2.5** | **2.4** | **2.3** | **2.2** | **2.4** | **2.8** | **2.7** | **2.7** | **3.1** | **2.7** | **2.3** |

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| **Table 2.A.6(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Heavy industry (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| **Table 2.A.7(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Oil and gas production (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

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| **Table 2.A.7(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Oil and gas production (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** | **0.0** |

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| **Table 2.A.8(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Non-metallic minerals (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 4.1 | 3.8 | 3.7 | 4.3 | 4.1 | 4.4 | 4.2 | 4.3 | 4.1 | 3.9 | 4.1 | 5.2 | 5.8 | 5.5 | 5.7 | 5.7 | 5.1 | 4.6 | 4.9 | 6.6 | 7.8 | 7.5 | 9.0 | 13.3 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **4.1** | **3.8** | **3.7** | **4.3** | **4.1** | **4.4** | **4.2** | **4.3** | **4.1** | **3.9** | **4.1** | **5.2** | **5.8** | **5.5** | **5.7** | **5.7** | **5.1** | **4.6** | **4.9** | **6.6** | **7.8** | **7.5** | **9.0** | **13.3** |

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| **Table 2.A.8(b) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Non-metallic minerals (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Mining | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Manufacturing | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Electricity, Gas, Water and Waste Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Wholesale Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Retail Trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Accommodation and Food Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Transport, Postal and Warehousing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Information Media and Telecommunications | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Financial and Insurance Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Rental, Hiring and Real Estate Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Professional, Scientific and Technical Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Administrative and Support Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Public Administration and Safety | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Education and Training | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Health Care and Social Assistance | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Arts and Recreation Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Other Services | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Households | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.A.9(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Total direct by industry and households (‘000 tonnes)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 9.6 | 8.9 | 8.6 | 8.6 | 7.2 | 6.5 | 7.7 | 8.4 | 8.6 | 10.6 | 3.5 | 10.7 | 10.1 | 10.3 | 10.0 | 11.9 | 10.6 | 11.7 | 14.0 | 13.3 | 11.2 | 10.1 | 9.1 | 9.4 |
| Mining | 2.1 | 1.9 | 1.2 | 1.7 | 1.5 | 2.2 | 1.9 | 2.1 | 1.5 | 1.9 | 6.3 | 5.3 | 17.2 | 47.5 | 20.8 | 0.7 | 0.4 | 0.4 | 1.5 | 2.2 | 1.8 | 1.4 | 2.0 | 1.0 |
| Manufacturing | 76.2 | 80.0 | 82.6 | 88.5 | 95.1 | 93.0 | 74.5 | 72.3 | 67.7 | 71.8 | 70.7 | 81.4 | 69.3 | 65.9 | 68.8 | 71.2 | 66.3 | 75.2 | 82.1 | 85.4 | 101.3 | 96.0 | 94.1 | 95.5 |
| Electricity, Gas, Water and Waste Services | 0.4 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 2.1 | 1.8 | 2.0 | 2.3 | 2.9 | 4.0 | 2.8 | 2.5 | 2.4 | 2.3 | 2.0 | 1.2 | 2.1 | 1.4 |
| Construction | 1.8 | 2.1 | 2.4 | 3.4 | 3.8 | 3.4 | 3.9 | 3.9 | 4.4 | 5.5 | 0.1 | 3.9 | 3.3 | 4.5 | 4.1 | 3.5 | 3.6 | 4.4 | 4.6 | 3.9 | 4.2 | 3.7 | 5.1 | 4.6 |
| Wholesale Trade | 0.9 | 1.2 | 1.4 | 1.5 | 1.4 | 1.0 | 1.3 | 1.3 | 1.4 | 1.1 | 1.4 | 0.9 | 0.9 | 1.0 | 1.2 | 1.4 | 1.1 | 1.2 | 1.3 | 1.0 | 0.9 | 0.6 | 0.8 | 0.9 |
| Retail Trade | 3.8 | 4.3 | 4.5 | 4.9 | 5.5 | 5.3 | 6.1 | 6.4 | 6.2 | 6.8 | 4.0 | 9.1 | 7.5 | 7.2 | 7.1 | 7.4 | 5.7 | 5.6 | 6.1 | 6.2 | 5.3 | 5.4 | 5.8 | 5.1 |
| Accommodation and Food Services | 1.9 | 2.2 | 2.8 | 2.8 | 3.0 | 3.1 | 3.7 | 4.4 | 3.6 | 3.5 | 0.5 | 3.8 | 3.1 | 2.9 | 3.3 | 4.0 | 3.3 | 3.8 | 4.7 | 4.8 | 4.1 | 4.4 | 4.4 | 5.1 |
| Transport, Postal and Warehousing | 9.5 | 11.6 | 11.7 | 13.2 | 14.4 | 14.6 | 16.5 | 16.5 | 16.2 | 13.5 | 31.6 | 13.5 | 11.8 | 10.9 | 12.1 | 13.2 | 12.9 | 12.0 | 9.7 | 7.5 | 8.1 | 9.3 | 10.0 | 7.5 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.3 | 0.4 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.6 | 0.3 | 0.6 | 0.5 | 0.4 | 0.5 | 0.6 | 0.4 | 0.5 | 0.7 | 0.7 | 0.7 | 0.8 | 0.7 | 0.6 |
| Financial and Insurance Services | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.4 | 0.4 | 1.5 | 0.3 | 0.2 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 |
| Rental, Hiring and Real Estate Services | 3.4 | 3.7 | 4.0 | 4.1 | 4.0 | 3.8 | 6.1 | 5.6 | 5.0 | 4.9 | 0.1 | 4.6 | 3.1 | 3.1 | 2.9 | 2.8 | 2.2 | 2.2 | 2.2 | 1.9 | 1.6 | 1.4 | 1.3 | 1.2 |
| Professional, Scientific and Technical Services | 0.8 | 1.0 | 1.0 | 1.2 | 1.4 | 1.1 | 1.6 | 1.5 | 1.4 | 1.8 | 2.2 | 1.9 | 1.5 | 1.6 | 1.7 | 1.9 | 1.4 | 1.7 | 2.3 | 1.9 | 1.6 | 1.2 | 1.5 | 1.3 |
| Administrative and Support Services | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.5 | 0.5 | 0.5 | 0.4 | 5.8 | 0.5 | 0.5 | 0.5 | 0.8 | 0.8 | 0.5 | 0.6 | 0.7 | 0.6 | 0.5 | 0.2 | 0.4 | 0.4 |
| Public Administration and Safety | 9.1 | 9.5 | 9.3 | 9.2 | 10.2 | 9.9 | 10.6 | 9.9 | 11.0 | 11.5 | 0.4 | 12.8 | 11.5 | 12.2 | 13.4 | 15.2 | 13.9 | 15.8 | 16.1 | 16.5 | 14.6 | 14.6 | 14.4 | 12.2 |
| Education and Training | 0.4 | 0.4 | 0.5 | 0.6 | 0.8 | 0.8 | 1.0 | 1.0 | 0.9 | 0.9 | 0.6 | 1.2 | 0.9 | 0.9 | 0.9 | 1.1 | 0.8 | 0.9 | 1.2 | 1.3 | 1.2 | 1.2 | 1.2 | 1.0 |
| Health Care and Social Assistance | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.8 | 0.9 | 0.9 | 1.1 | 1.1 | 0.2 | 1.5 | 1.6 | 1.5 | 1.4 | 1.4 | 1.1 | 1.4 | 2.1 | 2.4 | 2.1 | 2.1 | 2.4 | 2.3 |
| Arts and Recreation Services | 0.3 | 0.4 | 0.5 | 0.6 | 0.4 | 0.3 | 0.3 | 0.4 | 0.5 | 0.4 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| Other Services | 0.5 | 0.5 | 0.5 | 0.5 | 0.6 | 0.5 | 0.7 | 0.8 | 0.8 | 0.8 | 32.4 | 0.7 | 0.5 | 0.5 | 0.6 | 0.6 | 0.4 | 0.5 | 0.7 | 0.7 | 0.5 | 0.4 | 0.6 | 0.6 |
| Households | 64.3 | 63.3 | 63.5 | 63.9 | 64.5 | 65.2 | 66.6 | 70.4 | 68.1 | 69.4 | 52.6 | 77.3 | 69.7 | 75.8 | 85.8 | 81.6 | 70.3 | 69.0 | 71.6 | 72.8 | 68.3 | 61.5 | 59.4 | 53.3 |
| **Total** | 186.6 | 193.1 | 196.8 | 207.4 | 216.3 | 213.1 | 205.2 | 207.7 | 200.2 | 207.5 | 216.4 | 232.1 | 215.6 | 249.9 | 238.9 | 224.0 | 198.1 | 210.1 | 224.5 | 225.9 | 230.3 | 215.9 | 215.6 | 203.8 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Waste – private | 4.1 | 4.0 | 4.1 | 4.3 | 4.3 | 4.1 | 3.8 | 3.6 | 3.3 | 3.6 | 4.5 | 5.6 | 6.8 | 7.8 | 8.2 | 8.1 | 8.1 | 8.6 | 9.2 | 10.0 | 11.7 | 12.9 | 13.0 | 12.9 |
| Waste – public | 11.0 | 10.7 | 10.0 | 10.7 | 9.8 | 9.8 | 10.2 | 10.0 | 9.5 | 9.2 | 9.4 | 9.5 | 8.7 | 8.5 | 9.0 | 7.9 | 6.4 | 4.8 | 5.1 | 5.7 | 5.5 | 5.9 | 5.5 | 5.2 |
| Agriculture land use | 32.1 | 25.0 | 31.0 | 42.5 | 40.7 | 41.8 | 42.6 | 45.9 | 51.9 | 56.6 | 55.9 | 53.4 | 48.1 | 47.6 | 52.2 | 55.9 | 52.1 | 50.3 | 52.8 | 51.5 | 55.0 | 54.0 | 48.9 | 45.9 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total emissions excluding LULU** | **233.8** | **232.9** | **241.9** | **265.0** | **271.1** | **268.7** | **261.9** | **267.2** | **264.9** | **276.9** | **286.1** | **300.6** | **279.2** | **313.8** | **308.3** | **295.9** | **264.7** | **273.8** | **291.6** | **293.1** | **302.5** | **288.7** | **283.0** | **267.8** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 2.A.9(a) Mount Alexander Shire – CO2(e) emissions by 1-digit ANZSIC industry – Total direct by industry (per cent of total)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **1997** | **1998** | **1999** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
| Agriculture, Forestry and Fishing | 5.1 | 4.6 | 4.4 | 4.2 | 3.3 | 3.1 | 3.7 | 4.0 | 4.3 | 5.1 | 1.6 | 4.6 | 4.7 | 4.1 | 4.2 | 5.3 | 5.3 | 5.6 | 6.2 | 5.9 | 4.9 | 4.7 | 4.2 | 4.6 |
| Mining | 1.1 | 1.0 | 0.6 | 0.8 | 0.7 | 1.0 | 0.9 | 1.0 | 0.8 | 0.9 | 2.9 | 2.3 | 8.0 | 19.0 | 8.7 | 0.3 | 0.2 | 0.2 | 0.7 | 1.0 | 0.8 | 0.7 | 0.9 | 0.5 |
| Manufacturing | 40.9 | 41.4 | 42.0 | 42.7 | 44.0 | 43.6 | 36.3 | 34.8 | 33.8 | 34.6 | 32.7 | 35.1 | 32.2 | 26.4 | 28.8 | 31.8 | 33.5 | 35.8 | 36.6 | 37.8 | 44.0 | 44.5 | 43.7 | 46.8 |
| Electricity, Gas, Water and Waste Services | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 1.0 | 0.8 | 0.9 | 0.9 | 1.2 | 1.8 | 1.4 | 1.2 | 1.1 | 1.0 | 0.9 | 0.6 | 1.0 | 0.7 |
| Construction | 0.9 | 1.1 | 1.2 | 1.7 | 1.7 | 1.6 | 1.9 | 1.9 | 2.2 | 2.6 | 0.1 | 1.7 | 1.5 | 1.8 | 1.7 | 1.5 | 1.8 | 2.1 | 2.0 | 1.7 | 1.8 | 1.7 | 2.4 | 2.3 |
| Wholesale Trade | 0.5 | 0.6 | 0.7 | 0.7 | 0.6 | 0.5 | 0.6 | 0.6 | 0.7 | 0.5 | 0.6 | 0.4 | 0.4 | 0.4 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 |
| Retail Trade | 2.1 | 2.2 | 2.3 | 2.4 | 2.5 | 2.5 | 3.0 | 3.1 | 3.1 | 3.3 | 1.8 | 3.9 | 3.5 | 2.9 | 3.0 | 3.3 | 2.9 | 2.7 | 2.7 | 2.8 | 2.3 | 2.5 | 2.7 | 2.5 |
| Accommodation and Food Services | 1.0 | 1.2 | 1.4 | 1.4 | 1.4 | 1.5 | 1.8 | 2.1 | 1.8 | 1.7 | 0.2 | 1.6 | 1.4 | 1.2 | 1.4 | 1.8 | 1.7 | 1.8 | 2.1 | 2.1 | 1.8 | 2.0 | 2.0 | 2.5 |
| Transport, Postal and Warehousing | 5.1 | 6.0 | 6.0 | 6.4 | 6.7 | 6.9 | 8.0 | 8.0 | 8.1 | 6.5 | 14.6 | 5.8 | 5.5 | 4.4 | 5.1 | 5.9 | 6.5 | 5.7 | 4.3 | 3.3 | 3.5 | 4.3 | 4.7 | 3.7 |
| Information Media and Telecommunications | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.1 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 | 0.3 |
| Financial and Insurance Services | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.7 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Rental, Hiring and Real Estate Services | 1.8 | 1.9 | 2.0 | 2.0 | 1.8 | 1.8 | 3.0 | 2.7 | 2.5 | 2.3 | 0.1 | 2.0 | 1.4 | 1.2 | 1.2 | 1.3 | 1.1 | 1.0 | 1.0 | 0.8 | 0.7 | 0.6 | 0.6 | 0.6 |
| Professional, Scientific and Technical Services | 0.4 | 0.5 | 0.5 | 0.6 | 0.6 | 0.5 | 0.8 | 0.7 | 0.7 | 0.9 | 1.0 | 0.8 | 0.7 | 0.6 | 0.7 | 0.9 | 0.7 | 0.8 | 1.0 | 0.8 | 0.7 | 0.6 | 0.7 | 0.6 |
| Administrative and Support Services | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 2.7 | 0.2 | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 0.3 | 0.3 | 0.3 | 0.2 | 0.1 | 0.2 | 0.2 |
| Public Administration and Safety | 4.9 | 4.9 | 4.7 | 4.4 | 4.7 | 4.6 | 5.2 | 4.8 | 5.5 | 5.5 | 0.2 | 5.5 | 5.3 | 4.9 | 5.6 | 6.8 | 7.0 | 7.5 | 7.2 | 7.3 | 6.3 | 6.8 | 6.7 | 6.0 |
| Education and Training | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.3 | 0.5 | 0.4 | 0.4 | 0.4 | 0.5 | 0.4 | 0.4 | 0.5 | 0.6 | 0.5 | 0.5 | 0.6 | 0.5 |
| Health Care and Social Assistance | 0.4 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.5 | 0.5 | 0.5 | 0.1 | 0.7 | 0.7 | 0.6 | 0.6 | 0.6 | 0.5 | 0.7 | 0.9 | 1.1 | 0.9 | 1.0 | 1.1 | 1.1 |
| Arts and Recreation Services | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.1 | 0.2 | 0.3 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Other Services | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.4 | 0.4 | 0.4 | 15.0 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.2 | 0.3 | 0.3 |
| Households | 34.5 | 32.8 | 32.3 | 30.8 | 29.8 | 30.6 | 32.5 | 33.9 | 34.0 | 33.5 | 24.3 | 33.3 | 32.3 | 30.4 | 35.9 | 36.5 | 35.5 | 32.8 | 31.9 | 32.3 | 29.7 | 28.5 | 27.5 | 26.2 |
| **Total** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** | **100.0** |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 2.A.10 Industry structure** | | | |
| **ANZSIC 2-digit number** | **Industry** | **ANZSIC 2-digit number** | **Industry** |
| 1 | Agriculture | 44 | Accommodation |
| 2 | Aquaculture | 45 | Food and Beverage Services |
| 3 | Forestry and Logging | 46 | Road Transport |
| 4 | Fishing, Hunting and Trapping | 47 | Rail Transport |
| 5 | Agriculture, Forestry and Fishing Support Services | 48 | Water Transport |
| 6 | Coal Mining | 49 | Air and Space Transport |
| 7 | Oil and Gas Extraction | 50 | Other Transport |
| 8 | Metal Ore Mining | 51 | Postal and Courier Pick-up and Delivery Services |
| 9 | Non-Metallic Mineral Mining and Quarrying | 52 | Transport Support Services |
| 10 | Exploration and Other Mining Support Services | 53 | Warehousing and Storage Services |
| 11 | Food Product Manufacturing | 54 | Publishing (except Internet and Music Publishing) |
| 12 | Beverage and Tobacco Product Manufacturing | 55 | Motion Picture and Sound Recording Activities |
| 13 | Textile, Leather, Clothing and Footwear Manufacturing | 56 | Broadcasting (except Internet) |
| 14 | Wood Product Manufacturing | 57 | Internet Publishing and Broadcasting |
| 15 | Pulp, Paper and Converted Paper Product Manufacturing | 58 | Telecommunications Services |
| 16 | Printing (including the Reproduction of Recorded Media) | 59 | Internet Service Providers, Web Search Portals and Data Processing Services |
| 17 | Petroleum and Coal Product Manufacturing | 60 | Library and Other Information Services |
| 18 | Basic Chemical and Chemical Product Manufacturing | 62 | Finance |
| 19 | Polymer Product and Rubber Product Manufacturing | 63 | Insurance and Superannuation Funds |
| 20 | Non-Metallic Mineral Product Manufacturing | 64 | Auxiliary Finance and Insurance Services |
| 21 | Primary Metal and Metal Product Manufacturing | 66 | Rental and Hiring Services (except Real Estate) |
| 22 | Fabricated Metal Product Manufacturing | 67 | Property Operators and Real Estate Services |
| 23 | Transport Equipment Manufacturing | 69 | Professional, Scientific and Technical Services (Except Computer System Design and Related Services) |
| 24 | Machinery and Equipment Manufacturing | 70 | Computer System Design and Related Services |
| 25 | Furniture and Other Manufacturing | 72 | Administrative Services |
| 26 | Electricity Supply | 73 | Building Cleaning, Pest Control and Other Support Services |
| 27 | Gas Supply | 75 | Public Administration |
| 28 | Water Supply, Sewerage and Drainage Services | 76 | Defence |
| 29 | Waste Collection, Treatment and Disposal Services | 77 | Public Order, Safety and Regulatory Services |
| 30 | Building Construction | 80 | Preschool and School Education |
| 31 | Heavy and Civil Engineering Construction | 81 | Tertiary Education |
| 32 | Construction Services | 82 | Adult, Community and Other Education |

|  |  |  |  |
| --- | --- | --- | --- |
| **Table 2.A.10 Industry structure (continued)** | | | |
| **ANZSIC 2-digit number** | **Industry** | **ANZSIC 2-digit number** | **Industry** |
| 33 | Basic Material Wholesaling | 84 | Hospitals |
| 34 | Machinery and Equipment Wholesaling | 85 | Medical and Other Health Care Services |
| 35 | Motor Vehicle and Motor Vehicle Parts Wholesaling | 86 | Residential Care Services |
| 36 | Grocery, Liquor and Tobacco Product Wholesaling | 87 | Social Assistance Services |
| 37 | Other Goods Wholesaling | 89 | Heritage Activities |
| 38 | Commission-Based Wholesaling | 90 | Creative and Performing Arts Activities |
| 39 | Motor Vehicle and Motor Vehicle Parts Retailing | 91 | Sports and Recreation Activities |
| 40 | Fuel Retailing | 92 | Gambling Activities |
| 41 | Food Retailing | 94 | Repair and Maintenance |
| 42 | Other Store-Based Retailing | 95 | Personal and Other Services |
| 43 | Non-Store Retailing and Retail Commission Based Buying | 96 | Private Households Employing Staff and Undifferentiated Goods- |

# 3. MASG activities supporting ZNET 2030

The rationale and operational aspects of MASG’s current activities supporting ZNET 2030 are outlined below.

## 3.1 The bioenergy facility

For the past half dozen years, MASG via prefeasibility studies, feasibility studies, community advocacy and community engagement activities. The project is now entering the final stage of working towards financial close, approvals and the commencement of construction. The investment in the project will be between $16.4 million and $19 million depending on the final plant configuration.

### 3.1.1 Technology overview

The project is a renewable energy project, producing some 270,000GJ of renewable energy. The intent of renewable energy is to reduce greenhouse gas emissions by reducing our reliance on fossil fuel generation. By removing waste from landfill and using it as the source, we can make this renewable energy project highly efficient, with an anticipated Greenhouse Gas saving of 88,500 tonnes CO2e as the technology applied by the project will eliminate unwarranted emissions. The facility will divert approximately 36,000 tonnes of organic waste from landfill annually.

The facility is a relatively small scale wet and dry non-toxic organic waste processing facility with the project will consist of two units namely, an Anaerobic Digester (AD) processing wet organics and a Biomass (BM) facility processing dry organics.

The Anaerobic Digester facility will use wastewater and organic waste from Don Smallgoods as well as suitable wasted 'wet' organics to produce biogas using anaerobic digestion. The biogas will be used as natural gas substitute at Don Smallgoods. The wet organics streams imported into the site will include wasted food organics/by products from food and beverage manufactures and retailers, food waste from cafes/restaurants, a 'wet' component extracted from kerbside FOGO at other sites, grease trap, and potentially poultry shed wastes and biosolids from wastewater treatment facilities, currently spread on farmland. These materials will be transported in accordance with EPA prescribed waste transport regulations, meaning they will be in sealed and odour-containing vehicles. The facility will upgrade Don Smallgoods wastewater and organic waste systems, reducing odour from existing management facilities. It will also reduce traffic and odour risk from these vehicles from the site. The materials will be received in a negative pressure sealed receival building where air from the building will pumped to air filters to remove odour.

The nutrient-rich sludge (digestate) from the AD tanks will be converted into fertiliser by blending with biochar or being dried and used in the pyrolysis plant.

The Biomass facility is not a waste incinerator – it will be a pyrolysis/gasification plant that heats organics to 500°C in an airless environment cracking the chemicals in the cellulose to produce a syngas substitute for natural gas. What is left is biochar, a carbon-rich by-product that can be bagged and sold to the agriculture sector, and wood vinegar soil conditioner products. When biochar is ploughed into topsoil it can help retain moisture and sequester carbon. It can also be added to feedstock to reduce cattle’s methane emissions. Syngas is 40 per cent hydrogen, 15 per cent methane and the remainder carbon compounds and burns cleanly.

The BM facility will only receive clean “dry” waste streams , such as separated wasted woody materials (e.g. untreated timber off cuts from joinery work, single use untreated timber pallets, prunings) and tree waste from Harcourt orchards, straw, crop stubble and potentially 'oversize' screened woody mulch from commercial composting sites. None of this will have an odour being dry when received.

The facility will also recover energy from unrecyclable quarantine cardboard from Dons, and potentially some unrecyclable quarantine polyethylene plastic from Dons - but this will be determined through the environmental approvals process. The technology can cleanly convert polyethylene back into the natural gas it was manufactured from. Management of this quarantine cardboard and plastics at the site will reduce heavy traffic and odour risk associated with vehicles from the site. No other plastics, mixed wastes, or toxic will be used in the BM facility.

### 3.1.2 The plant operation

The Pyrolysis and Gasification plant will be a day operation only. The Anaerobic Digester is continuous but can be monitored remotely. The facility will be staffed with a single day shift by 3 to 5 employees only. The hours of operation and delivery will be included in EPA and planning approvals. It is anticipated the addition to net truck traffic (it will reduce loads of waste leaving the Don Smallgoods site) will be two to three additional large vehicles per operating day. The intent is to have supply contracts with waste management companies that will supply consolidated large loads. While we will be supplied with all of the non-toxic organic waste available from Don Smallgoods, this is insufficient to reach a viable scale. This will meet MASG’s objective of providing a better resource management option for such wastes regionally to reduce greenhouse gas emissions.

### 3.1.3 Emission reductions

Table 3.1 outlines the emissions savings from the project. The project will be able to utilise most of the wet organics supply available within the Mount Alexander Shire from both public and private disposables eliminating 18,050 tonnes of CO2(e) from avoided landfill. Therefore 25,650 tonnes of emissions will represent avoided emissions in other shires which supply the facility with feedstock. Avoided emissions for the MAS manufacturing sector will sum to 15,345 tonnes representing the substitution of fossil fuel gas for renewable gas. The total emission reductions that can be credited to MAS will be 62,850 tonnes of CO2(e) or 22 per cent of MAS 2019 emissions.

|  |  |  |
| --- | --- | --- |
| **Table 3.1 Bioenergy facility - CO2 savings** | | |
|  |  | **Tonnes of CO2(e)** |
| Wet organics | Avoided landfill emissions |  |
|  | Mount Alexander Shire | 18,050 |
|  | Other LGAs | 25,650 |
| Dry organics | Avoided lifecycle emissions from biochar production | 23,400 |
| Substitution of fossil fuel natural gas for renewable biogas |  | 15,345 |
| Other (waste water treatment) |  | 6,055 |
|  |  |  |
| **Total** |  | **88,500** |
|  |  |  |
| **Total Mount Alexander Shire** |  | **62,850** |

## 3.2 Housing retrofit: Energy efficient ZNET ready households

From MAS CO2 accounts in Appendix 2A, total household emissions from electricity and gas (Table 2.A.1(a) and Table 2.A.1(b)) summed to 36,400 tonnes of CO2 in 2019. The number of occupied households in MAS in 2019 is estimated at 8,400, or 4.3 tonnes of CO2 per household. In accordance with the ZNET ready concept, nearly two-thirds of the emissions are ZNET ready in that they will come from electricity which is, in this paper, planned to be fully ZNET ready by 2036. This section outlines and MASG activity designed to assist in this objective.

### 3.2.1 A limited program: ZNET ready households

In relation to the household sector’s non-transport energy use, a basic program would be to achieve as quickly as possible ZNET ready status for MAS households. This would in turn involve eliminating gas usage. From Table 3.2, the 13,800 tonnes of household CO2(e) use translate into 251,000 gigajoules. Taking the average heating and cooking units’ consumption of gas at 20,500 MJ per year, this translates into 12,250 units being necessary to be replaced by the equivalent electrified units. The average cost for replacing gas-fired heating (including hot water) and cooking would be approximately $3,500 (after Government rebate for hot water electrification), giving a total cost of $43 million.

Over a 20 to 25 year period a large part of this expenditure would be self-financing. That is, it would be financed by the depreciation expenditure households would have to make to replace their existing gas using units when they come to the end of their lives. However, if the target was ZNET ready by 2030 or 2036, then incentives would have to be put in place to encourage households to bring forward replacement expenditures by up to $20 million. But such incentives would only be justified if the State brought forward its ZNET target for the electricity grid to the early 2030s. The cost and energy cost saving data in this section is taken from MASG 2021a.

### 3.2.2 A more ambitious program: Near ZNET households

As noted in Chapter 1, given limited resources the first priority must be ZNET ready status as the rollover in replacement investments that maintain the need for fossil fuel energy will postpone the achievement of ZNET beyond unacceptable timelines, such as 2050, which are unacceptable from the perspective of what has to be done to mitigate the costs of climate change.

A more ambitious program, therefore, would target the direct creation of ZNET households. Such a program would be based on the recognition that the construction characteristics of many of the dwellings in MAS have poor energy efficiency characteristics which can be rectified, albeit at some cost.

Table 3.2 identifies the vintages of 14 dwelling types, their construction characteristics and the decline in the heating energy source (gas or electricity) if the dwellings were brought up to a six star energy rating. In terms of the housing types, CR4, CR6, CR7, CR8, CR9, CR10, CR11, CR12 and CR13 are the dwelling types most applicable to MAS.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Table 3.2 Dwelling types and construction characteristics** | | | | | |
| **Housing characteristics** | **Decade vintage** | **Construction characteristics** | | | **Heating energy main fuel (per cent)** |
| CR1 | 2000 | MR | BV | S | 49 |
| CR2 | 1990 | TR | BC | ST | 32 |
| CR3 | 1990 | TR | BV | S | 44 |
| CR4 | 1970 | TR | BV | ST | 43 |
| CR5 | 1980 | MR | CB | S | 9 |
| CR6 | 1920 | MR | WB | ST | 48 |
| CR7 | 1910 | MR | WB | ST | 34 |
| CR8 | 1940 | TR | BV | ST | 55 |
| CR9 | 1950 | TR | WB | ST | 21 |
| CR10 | 1980 | TR | BV | ST | 30 |
| CR11 | 1970 | TR | BV | ST | 44 |
| CR12 | 1950 | TR | BV | ST | 58 |
| CR13 | 1960 | TR | BV | ST | 9 |
| CR14 | 1960 | TR | BV | ST | 36 |

*Notes:* TR = Tiled roof.  
MR = Metal roof.  
BV = Brick veneer.  
CB = Cavity brick.  
WB = Weatherboard.  
S = Slab on ground.  
ST = Suspended timber foundation.

From MASG (2021a), the average cost of bringing these dwellings to six star status from retrofitting in the form of:

* draught sealing;
* ceiling insulation;
* floor insulation;
* wall insulation; and
* double glazing and shading,

is of the order of $11,210.

Investments in electrification and PV systems would bring a dwelling to a rating of at least 9, or as close to ZNET as possible, as well as being ZNET ready. After relates the additional cost of the PV system would be $2,000 compared to a gross cost of $6,225, while the electrification cost has been given above. The total cost would be in the range of $27,500 to $29,000. Not every dwelling will require the full electrification cost, with some dwellings being fully electrified, the average cost can be reduced to $25,600.The three components, retrofit, electrification and PV, will be evaluated as standalone components. In terms of the retrofit component from MASG (2021a), the energy cost savings are expected to be between $1,000 and $1,500 annually, giving a payback period of between 8 and 12 years. For high market driven take-up rates the payback period has to be no more than 3 to 4 years. In the absence of additional incentives to shorten the payback period, moral suasion policies at the very least will be necessary for at least some of the opportunities for retrofitting to be exploited.

While there is incentive for moderate to high income household to undertake retrofit and electrification expenditures this is not the case for low income and renter households.

### 3.2.3 MASG Project: Zero Net Retrofit for Vulnerable Communities – Pilot

In order to test its cost assumptions of achieving ZNET ready households with maximum energy efficiency as well as to design strategies to overcome the obstacles for low income and renter households in obtaining ZNET ready status MASG secured funding from the Lord Mayors Charitable Trust to undertake a project entitled Zero Net Retrofit for Vulnerable Communities – Pilot.

The project objective is to show how low-income owner-occupiers and renters can have their homes retrofitted to a Zero Net standard using Environmental Upgrade Agreements (EUA) MASG calculates that homes with a RE Scorecard rating of 2 stars, can be raised to 9 by a Zero Emissions retrofit at an average cost of around $23,500.

Using a team of a not-for-profit Zero Net Upgrade service providers the project will select ten dwellings. The dwellings will be on a star rating of 2 on the basis of the Residential Efficiency Scorecard Report. MASG will work with the retrofit team to decide on the 10 homes and coordinate the installation of the agreed retrofitting options.

The options will include:

* double glazing and shading;
* heating electrification;
* hot water electrification;
* lighting;
* draught sealing;
* ceiling insulation;
* floor insulation;
* wall insulation;
* solar PV on the roof; and
* behavioural change – Home Users Guide.

For renters, legal frameworks will be assessed which allow landlords and tenants to share the costs of energy efficiency and climate resilience upgrades while for low income households the project will explore how extensions of the Council Energy Upgrade Finance (EUF) scheme where loan repayments are made via council rates can be applied to overcome the financing obstacle.

The project outcome is to show how refitting for ZNET ready households status is feasible for almost all household types.

### 3.2.4 Targeted community engagement strategy one: The construction industry supply chain

If the MASG project proves successful then what would be the follow-on type strategies to target the annual $82 million expenditure decisions to ensure ZNET ready status and six star efficiency?

One such strategy would be to directly engage with the construction industry supply chain. The construction industry supply chain has direct involvement in many of the replacement and new construction investment and, therefore, by default in the equipment that will be installed in these structures.

As the majority of the expenditure decisions would have go through the Council approval process, the Council could use to the maximum its powers to mandate, guideline adherence and persuasion to ensure approval outcomes are as near as possible to ZNET ready status.

A requirement would be for the council to actively engage on a semipermanent basis with the members of the construction industry supply chain both within MAS and in nearby shires. The minimum objective would be to use moral suasion to assist in the region achieving its ZNET objectives. Members of the supply chain would include:

* builders;
* project house suppliers;
* architects;
* building designers;
* material suppliers;
* construction assessors;
* waste management; and
* banks, etc.

One incentive the Council could apply to achieve its objectives is to argue for the legal authority to extend the scope of its Energy Upgrade Finance (EUF) scheme where loan repayments are made via council rates.

## 3.3 The Regenerative Agriculture Program

For MASG, the Regenerative Agriculture Program (RAP) commenced in 2019 with the signing of a contract with the North Central: Catchment Management Authority (NCCMA). Over 2019 to 2021, the RAP allowed the following activities to be undertaken:

* workshops on regenerative agriculture; and
* facilitation and coordination between farmers embarking on regenerative agriculture initiatives.

As will be seen in the next Chapter the RAP is anticipated to make the highest contribution to MAS achieving ZNET 2030 contributing 30 per cent of the emission reductions. This requires the drivers of the program to be explored in detail.

### 3.3.1 What is the objective of the RAP and how is it achieved to 2024

The objectives of the RAP are to use changed animal and crop management practises to increase the CO2 retained in the soil, that is, enhance the amount of soil organic carbon, and thereby gain additional farm revenue from:

1. carbon credit from the soil carbon sequestration from the Federal Government’s Emission Reduction Fund (ERF); and
2. increased farm productivity from carbon sequestration and thereby increased farm real output.

The RAP will include any farm in MAS that commits to, if it is commercially viable, applying farm management practises which lead to soil CO2 sequestration.

From Chapter Two above the objective of the RAP is to at least achieve ZNET from MAS agriculture land use emissions of 50,000 tonnes of CO2. Than that would contribute a net mission drawdown to the overall MAS ZNET.

### 3.3.2 The instruments of CO2 sequestration

The instruments of CO2 soil sequestration are changes in farm practises to maximise CO2 soil injection. This requires changed practises in relation to:

1. crop residual waste and animal manure management by rotational grazing;
2. mulching and changed tillage practises; and
3. cover cropping and CO2 intensive soil additions such as biochar.

By a combination of processes, including encouraging earthworms and other macrofauna, microbial activity and nutrient release, this will increase the amount of soil organic carbon stored in the soil.

### 3.3.3 The virtuous cycle of enhanced soil organic carbon

Figure 3.1 outlines the virtuous cycle of CO2 carbon sequestration, that is, how it operationally works. The first step is the injection of finance to cover:

1. the required capital investment – fixed and mobile fencing and water sources, machinery , soil additives etc.; and
2. the establishment costs for access to the Emission Reduction Fund and its carbon credit units called ACCUs.

The up-front costs can be financed from:

1. farm retained profits;
2. new borrowings from the finance sector; and
3. government or private sector grants.

The establishment costs cover:

* testing and laboratory costs for soil characteristics, including nutrients, structure and baseline CO2 content;
* scheme registration costs; and
* plant hire and technical assistance costs.

Ongoing costs will include audit costs to establish the increase in CO2 drawdown and technical support costs.

Once the initial establishment costs have been applied, changed farm practises can be introduced which will increase the CO2 retained in the soil. The increased CO2 retained in the soil will:

* increase soil water retention;
* accelerate the breaking down of carbon bonds in the soil accelerating the growth of soil biota and improving soil structure; and
* improves nutrient turnover and pH buffering,

which combine to increase soil productivity in the form of increased crop and pasture yields.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Figure 3.1: The virtuous cycle of farm carbon sequestration** | | | | | | |
|  |  |  | **Required capital injection** |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  | **Farm investable funds** |  |  |  |
|  |  |  |  |  |  |  |
|  | **Increased farm net revenue** |  |  |  | **New or replacement investment in farm fencing, water infrastructure** |  |
|  |  |  | **Baseline or revised soil farm CO2** |  |  |  |
|  | **Increased farm productivity** |  |  |  | **Changed farm practises** |  |
|  |  |  |  |  |  |  |
|  |  |  | **Increased soil CO2 retention** |  |  |  |
|  |  |  |  |  |  |  |

### 3.3.4 The parameter drivers of the impact of CO2 sequestration

There are a number of parameters whose empirical settings will determine the impact of CO2 sequestration strategies for a given farm. The parameters are discussed in turn. The key parameters are given in Table 3.3 with ranges for each parameter.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3.3 Parameter drivers for the impact of agriculture CO2 sequestration in MAS** | | | | | | | | |
|  |  | **Scenario** | | | | | | |
| **Parameter** | **Range** | **Base** | **One** | **Two** | **Three** | **Four** | **Five** | **Six** |
| CO2 sequestration (tonnes/ha/year | 0.2 – 10 | 7 | 4 | 7 | 7 | 7 | 7 | 7 |
| CO2 sequestration – upper limit (tonnes/ha) | 160 | 100 | 100 | 60 | 100 | 100 | 100 | 100 |
| Capital investment/ annual costs ($/ha – 10 to 12 years) | 500 – 2500 | 700 | 700 | 700 | 1100 | 700 | 700 | 700 |
| Carbon stock – productivity elasticity | 0.05 – 0.5 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.5 | 0.10 |
| Baseline CO2 soil content (tones/ha) | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| Cost – production elasticity | 0.05 – 0.5 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.6 |
| Depreciation rate | 0.08 – 0.15 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Interest rate | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Farm size (ha) | – | 730 | 730 | 730 | 730 | 730 | 730 | 730 |
| Carbon price ($/tonne) |  | 21 | 21 | 21 | 21 | 50 | 21 | 21 |

#### Annual CO2 sequestration per hectare

The most important parameter is the annual CO2 sequestration rate per hectare that can be expected from the application of the changed farm management practises. The retention rate will depend on many factors, including:

1. rainfall and temperature;
2. soil type;
3. years of cultivation since European settlement; and
4. crop and livestock types.

The range will extend from as little as 0.2 for soils in Western Australia with a low legacy of cultivation and where the only relevant farm practise change is in tillage, to estimates of near double digit levels, for example dairy farms in high rainfall regions and a long history of cultivation.

For a given region the only way to determine the likely sequestration factor is by trials across the various micro elements and soil types for the region.

#### The maximum cumulative CO2 sequestration rate

The opportunity for CO2 sequestration comes from the loss of CO2 from the soil as a result of inappropriate farm management practises since European settlement. For lands with a long history of cultivation, estimates suggest that CO2 sequestration can occur over a 20 to 25 year period which, for high annual retention rate soils, would place the maximum cumulative CO2 sequestration rate at, very approximately, 160 tonnes per hectare.

When the maximum cumulative sequestration is reached, it will be a signal that the “natural” soil carbon dynamics have returned to the state that would have prevailed before European settlement.

#### Establishment costs

The establishment costs shown in Table 3.4 are appropriate for the scale of farm assumed to apply, on average, for Mount Alexander Shire. That is, approximately 730 hectares. The type of costs covered by establishment costs have been noted above. The recurring costs after every three years are largely the audit costs to establish a new CO2 baseline for the soil, which is a requirement for redeeming ACCU units from the ERF.

|  |  |
| --- | --- |
| **Table 3.4 RAP establishment costs ($’000 per farm)** | |
|  | **Establishment costs** |
| Year 0 | 28 |
| Year 1 | 8.0 |
| Year 2 | 2.0 |
| Year 3 | 9.5 |
| Year 4 | 2.0 |
| Year 5 | 2.0 |
| Year 6 | 9.5 |
| Year 7 | 2.0 |
| Year 8 | 2.0 |
| Year 9 | 9.5 |

#### Capital investment costs

The capital investment costs, or cumulative annual costs, associated with, for example, the addition to the soil of CO2 intensive additives, can vary widely. At the middle to upper end of the ranges shown in Table 3.3, CO2 soil carbon sequestration would not be economic at carbon price levels likely to prevail in the medium-term future.

#### Depreciation and interest rates

If the non-establishment costs take the form of capital expenditures, the depreciation and interest rates will be relevant to the financial outcome. The parameter settings are given in Table 3.3.

#### The carbon stock productivity elasticity

As the carbon stock increases in the soil, farm productivity can expect to increase because crop/pasture yields will increase. The relationship between the soil carbon stock and farm yield or productivity will, like all the other parameters, will depend on a wide range of factors. However, it should generally be in the range of 0.05 to 0.5. The elasticity represents the per cent increase in farm net revenue from a 1 per cent increase in the stock of carbon in the soil.

#### The cost of production elasticity

The cost production elasticity measures the per cent change in farm standard costs with respect to a 1 per cent change in real farm output. It is likely that farm costs will increase for animal rotation practises because livestock farming and water sources will have to be moved more than what would otherwise have been the case. However, in many cases this will be supplied by increased unpaid hours on the farm properties.

### 3.3.5 The profitability of agriculture CO2 carbon sequestration

The potential for agriculture CO2 sequestration to be an important instrument for MAS to reach ZNET will depend on the profitability for the average farm in MAS if farms change practises to support ZNET. That is, will the average farm obtain sufficient additional revenue to cover the additional costs of CO2 sequestration activities?

#### The agriculture sector in MAS

From the Australian Bureau of Statistics (ABS) Agricultural Census, the Agriculture sector in MAS consists of 80,000 hectares with 162 agricultural enterprises, not all will be operating farms. Farm enterprises of reasonable scale will be approximately 100 with an average size of 730 hectares. Of the farms in 2020, average farm production/revenue per hectare is assessed at $667 per hectare or $487,000 per average farm. Total costs are assessed at $422,000 and net farm income $65,000.

With these estimates the financial impact of CO2 sequestration practises can be calculated given the parameter settings in Table 3.3 for the base case and scenarios around the base case.

#### MAS farm profitability: CO2 sequestration

The Base case scenario CO2 sequestration parameter settings are given in Table 3.3. The average farm is assumed to borrow 100 per cent for the capital expenditure at an interest rate of 5 per cent.

The key Base case outcomes are given in Table 3.5.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 3.5 MAS: Impact on farm profitability and CO2 sequestration by scenario** | | | | | | | | |
|  |  | **Scenario** | | | | | | |
|  | **Zero CO2 sequestration** | **Base** | **One** | **Two** | **Three** | **Four** | **Five** | **Six** |
| Total farm net income – first 3 years ($’000) | 195 | 17.3 | 15.8 | 17.3 | -70.3 | 17.3 | 17.3 | 15.9 |
| Total discounted net farm income – 20 years at 5% per annum ($’000) | 875 | 1,342 | 705 | 1,176 | 887 | 2,805 | 2,034 | 1,233 |
| MAS eligibility ratio |  | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| MAS annual emissions reduction (‘000 tonnes) |  | 84.0 | 47.9 | 84.0 | 84.0 | 84.0 | 84.0 | 84.0 |
| MAS number of farms |  | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Average annual CO2 emissions reduction per farm (‘000 tonnes) |  | 5.1 | 2.9 | 5.1 | 5.1 | 5.1 | 5.1 | 5.1 |
| Number of farms required for ZNET agriculture |  | 10 | 17 | 10 | 10 | 10 | 10 | 10 |
| Year of new set of farms required |  | 16 | 16 | 10 | 16 | 16 | 16 | 16 |

|  |  |  |
| --- | --- | --- |
| **Table 3.6 CO2 sequestration sources: Interest on net farm income ($’000)** | | |
|  | **First three years farm income** | **Discounted cumulative farm income over 20 years at 5% discount rate** |
| No CO2 sequestration | 195 | 875 |
|  |  |  |
| **Difference from no CO2 sequestration case** |  |  |
| Base case | -178 | 467 |
| Scenario one | -179 | -170 |
| Scenario two | -178 | 301 |
| Scenario three | -265 | 12 |
| Scenario four | -178 | 1,930 |
| Scenario five | -178 | 1,159 |
| Scenario six | -179 | 358 |

#### The Base case

From Table 3.5, over a 20 year period the cumulative discounted farm income for the average MAS farm will be $875,000 for the zero CO2 sequestration case. For the Base case parameter settings this increases to $1,392,000 in 2020 prices. From Table 3.6, this represents a discounted farm income increase of $467,000. The Base case assumes the current $21 per tonne of CO2 from the ERF. Prima facie, at the Base case parameter settings CO2 sequestration is profitable and should be self-financing and be undertaken with additional assistance to farmers.

However, there is a substantial commercial obstacle which qualifies this conclusion. From Table 3.5, the first three years of net income for the farm declines from $195,000 to $17,300. In practice, since revenue from the carbon credits is assumed to be available at the end of the third year of CO2 sequestration practice, or at the end of the fourth year of the program, after audit costs this would leave net farm income at zero for most of the first four years of the program.

The timings of expenditures and income mean that there would be substantial barriers to implementing the program, except in a likely small number of farms with high financial assets. The only practical way of overcoming this problem would be for government assistance in providing a low or zero cost lending program that allowed farmers to claim up to 70 per cent against the expected post-first audit allocation. The problem here, of course, is that the post-audit actual farm CO2 retention rates may fall short of the expected, which may not be covered by the 30 per cent margin held back from the allowable expected revenue drawdown.

However, as Table 3.5 also makes clear, the RAP is of high strategic value from the MAS ZNET perspective.

At an average annual farm CO2 sequestration rate of 5.1 tonnes per farm, with MAS agriculture land emissions at 50,000 tones, it would require only 10 farms in MAS to participate in the program to neutralise the emissions. That is, achieve ZNET from the perspective of agriculture land emissions.

However, if just 15 per cent of the eligible 100 farms were found to be significantly profitable in the long-run, then the total annual emissions of CO2 sequestration from the RAP would be 84,000 tonnes, making a further 34,000 offset contribution to the total MAS ZNET target. From this perspective it is essential that solutions be found for the short-term financing constraints.

From Table 3.5, given the maximum CO2 average retention rate of 100 tonnes per farm ZNET a new set of farms would be required in the program after 16 years.

This is, however, depends the plausibility of the Base case parameter settings. Accordingly, six further scenarios are calculated with each scenario representing a variation to one of the key Base case parameter settings.

#### Scenario one

Scenario one varies the CO2 annual retention rate. From Table 3.3 for Scenario one, the CO2 annual retention rate per hectare is set at 4, with the outcome from Table 3.5 that the cumulative discounted 20 year net farm income is $705,000 or, from Table 3.6, $170,000 below the No sequestration case. That is, at the Scenario one CO2 annual average retention rate per hectare CO2 sequestration would not be attempted and membership of the RAP would be thin. Therefore, at $21 per tonne ERF rate the average farm annual CO2 retention rate would have to be no less than 6 tonnes for the RAP to be attractive on a the long-run basis.

#### Scenario two

Scenario two focuses on the maximum CO2 average farm retention rate. From Table 3.3, this is reduced from 100 tonnes to 60. From Table 3.6, this would reduce the 20 year cumulative discounted net income for the average farm to $1,176,000, or from Table 3.5, a net gain of $301,000 compared to the no sequestration case. This outcome suggests that at Base case parameter settings this maximum average farm retention rate should be at least 50 tonnes for the RAP membership to be attractive.

#### Scenario three

From Table 3.3, the Scenario three changed parameter setting focusses on the average capital cost per hectare when the cost is increased from $700 per hectare to $1,100 per hectare. This would increase the average farm total capital cost from $0.51 million to $0.8 million, or a 10 year average annual operating cost equivalent.

From Table 3.5, the 20 year cumulative discounted net average farm income is reduced to $887,000 or, from Table 3.6, just $12,000 greater than the No CO2 sequestration case. That is, participation in the RAP program would not be attractive. This would suggest that, assuming the other parameter settings of the Base case remain constant, the capital cost per hectare should be no greater than $800 for participation in the RAP to be attractive.

#### Scenario four

From Table 3.3, the change in parameter for Scenario 4 is the carbon price, which is increased to $50. This results in a large increase in long-run farm profitability increasing net farm income from Table 3.5 by a factor of 3.2, compared to the No CO2 sequestration case. At $50 per tonne it would tolerate substantial adverse movement in other Base case parameters and membership of the RAP would still be attractive. For example, at 3.5 tonnes per hectare average annual CO2 retention rate RAP membership would still be as attractive at $50 per tonne CO2 as a 7 tonnes retention rate at $21 per tonne CO2 ACCU rate.

#### Scenario five

From Table 3.3, Scenario five varies the carbon stock-productivity elasticity. The elasticity increases from 0.1 to 0.5. This means the productivity of the soil, with respect to a change in the soil carbon stock, increases by a factor of 4 compared to the Base case. Not surprisingly, this increases the long-run productivity of the average farm considerably. Net average farm income, from Table 3.5, increased by a factor of 2.3, or by $1.2 million compared to the Zero CO2 sequestration case.

#### Scenario six

From Table 3.3, Scenario six involves a threefold increase in the elasticity of cost with respect to real production increases from 0.1 to 0.6. From Table 3.5, RAP membership is still attractive, albeit reducing the Base case 20 year cumulative average discounted net farm income by $109,000.

### 3.3.6 Lack of knowledge: The other major obstacles to RAP membership

It is apparent from the above scenario analysis that the other major obstacles to RAP membership, that is besides the short-term financing gap, is lack of knowledge. That is, for a given farm what is likely to be the value of the parameter listed in Table 3.3 and, in particular, the CO2 annual retention rate and the capital investment/annual operating cost requirement? The second issue is, how do the parameters vary across MAS for changes in micro environment and soil types?

Few farms will be willing to risk $0.5 to $1.0 million capital expenditure or the average annual cost equivalents over ten years without reasonably precise estimates of the parameters.

In the short-term, the urgent need is for as widespread testing and trials as possible to gather this information and the commitment at least of that number of farms to undertake the expenditures to neutralise the annual 50000 agriculture land emissions.

### 3.3.7 The MASG RAP: Funding

In 2021 MASG received a $100,000 grant to assist in the next stage of the RAP. The grant was from a Court Order as a suitable fine for a spillage event at the Don KR plant at Castlemaine. The judgement was on the basis of:

1. $100,000 was a suitable fine; and
2. the MASG RAP was a suitable project in that it was likely to yield high long-term environmental benefits to MAS.

From the above analysis the Court judgement was sound in relation to the worthiness of the RAP program.

### 3.3.8 The MASG RAP: Activities 2022 and beyond

The funds over the 2022 to 2024 period will be allocated to the following activities.

* $15,000 allocated to the facilitation of training sessions, education and guest speakers. Depending on scheduling, these are typically undertaken every 6 weeks and would allow MARAG to provide up to 8 sessions. Each session is typically attended by approximately 30 landholders.
* $10,000 allocated to program management, being the estimated costs incurred by MARAG for running the program between 1 July 2022 and 30 June 2023.
* $50,000 allocated to comprehensive soil carbon baseline testing (costing approximately $7,500 per property); implementation of appropriate land management practices (pasture and revegetation); compliance with the Federal Government Carbon Farming Initiative; the opportunity to generate carbon credits. MASG estimate that this has the ability to involve 3,000 hectares across the region, sequestrating approximately 300,000 tonnes of carbon over a ten-year period (all figures are indicative).
* $25,000 allocated to purchasing equipment for biochar manufacture, compost tea reactors, and support for sowing of multi-species cover crops. This equipment is to be used as a shared resource across all interested landholder members actively involved in the program.

### 3.3.9 Other current policy developments

Not surprisingly given the importance soil carbon can plan in reducing emissions there are and will be policy developments which will assist in rolling out the program so long as the trials prove successful.

The Victorian Government has a $3.9 million program to deliver ground-breaking Victorian research into agriculture emissions reduction technologies and practices.

* Deliver flagship trials in pasture-based grazing systems to test two promising methane-inhibiting feed additives for use on Victorian farms.
* Collaborate on a national scale to enhance research and innovation, improve greenhouse gas reporting, and improve access to financial support for climate action for Victorian farmers.
* Position the Ellinbank SmartFarm research centre to become the world’s first carbon neutral dairy farm, and open it to visitors who can see new technology in action.

The Government has also allocated investment of $15.4 million to provide information, tools and services to support emissions reduction, adaptation and climate risk management across the Victorian agriculture sector.

* Empower farmers and growers to measure and reduce on-farm emissions with a pilot of up to 250 on-farm action plans providing up to $5 million in grants to implement recommended actions.
* Build the tools needed to support climate resilient decision making, and provide foundational data and information to support up to date and localised decisions.

Which will be of direct use for the planned MAS activities.

The MASC could explore the feasibility of setting up a local offset scheme, under Clean Energy Regulator protocols so in order to achieve their own or entities ZNET objectives offset units could be purchased from local farmers.

## 3.4 The MAS ZNET Ready Business Program

In tandem with the household retrofit and electrification program there will need to be a business program led by an organisation representing the business sector in MAS. Below is MASG suggests of how such a program would operate. The focus of the MAS ZNET Ready business program would be on the electrification of the 73000 tonnes of business emissions which are not ZNET ready.

### 3.4.1 Targeted community engagement: Detailed general business engagement – high emitters

The Program would be modelled on the Federal Government Business Connect Program of 2014 to 2017. The first step would be the mobilisation of a MAS strong base of retired or semi-retired technical and scientific professionals and bring them to the standard required to implement the program. Most would be engaged on a volunteer basis.

Once the required expertise was available, from Table 2.4 above, the next step would be to engage the 30 top emission businesses with the objective to obtain agreement for each of them to commit to ZNET ready status by no later than 2036.

In the initial stage the consultations will involve:

1. collecting information on the business energy using capital stock;
2. understanding the medium-term investment plan; and
3. where the business would like to be in 20 years or so.

With this information the consulting team, in consultation with the business, would develop a replacement and new investment strategy consistent with the medium and longer term vision of the enterprise that would produce ZNET ready status by 2036 or earlier. If the enterprise commits to the strategy it would be incorporated as a member of the Warrarrack initiative and the enterprise’s commitment would be explicitly recognised.

### 3.4.2 Target community engagement: General Business ZNET ready commitment

The final target community engagement segment will be to persuade the residual 1020 businesses in MAS to commit to ZNET ready status.

From the remaining 1020 businesses a representative sample across all industries of 100 business could be selected and the engagement process of the top 30 emitters repeated and commitment to the objectives of the Warrarrack initiative secured. In addition out of the engagement process with 130 businesses the consulting team would be able to develop industry specific template plans for ZNET ready status for the remaining 920 businesses. These businesses commitment to the Warrarrack initiative would be on the basis of their commitment to the template plan as modified to suit their specific circumstances.

# 4. The pathway towards ZNET 2030

Building on the activities/programs outlined in the previous chapter, this chapter outlines how they can be combined to achieve ZNET 2030 or at the very least achieve the objective within a small number of years from 2020.

## 4.1 The role of the Victorian Government

The Victorian Government has an important role to play in determining whether or not ZNET 2030 can be achieved in MAS. This is by determining the degree to which ZNET ready energy use can be turned into ZNET energy.

The current policy is for Victoria to have 50 per cent renewable energy from electricity by 2030. However, as a result of rapidly increasing competitiveness of renewable electricity and the increasing political pressure to do more in terms of CO2 emission reduction it is assumed that the Victorian Government will respond to this by increasing the share of renewable energy in total electricity supply to 60-62 per cent by 2030.

It is also assumed that the electricity supply is fully 100 per cent renewable by 2036. However, the latter is not required for MAS to achieve ZNET by 2030. What is required is that the State Government add at least an additional 10 percentage point share of renewables to the current target by 2030.

## 4.2 Emissions and economic growth

Over the next decade the MAS population will grow along with economic activity, as represented by gross regional product (GRP), although in the post COVID-19 world the growth rates are likely to be lower than what would have been expected at the end of 2019.

Along with economic growth will come productivity growth. Each year the new vintage of motor vehicles are generally more fuel efficient than the previous vintage. The same is true for a wide range of equipment and machinery used in industry and households. Therefore, an important assumption made in this pathway to ZNET 2030 developed in this paper is that the productivity growth that will accompany the overall growth will result in emission reductions that will compensate for the growth in population, households and economic activity. The historical evidence is mixed in regard to the validity of this assumption. However, what can safely be assumed because of the increasing focus on climate change innovation resources will increase their share in focusing on this objective in both the private and public sectors. It therefore can be safely assumed that over the next decade productivity growth, in terms of outcomes in terms of energy efficiency and emission reductions, is likely to accelerate significantly compared to recent historical trends. That is, innovation by North American, European and North Asian manufacturers will accelerate. Secondly, as noted above, the overall growth rate of the MAS over the next decade is likely to be lower than the recent past.

The adoption of the productivity assumption allows a transparent framework to be adopted. In order to develop a 2030 ZNET pathway, given the productivity assumption, the focus only has to be on the 2019 data. That is, how ZNET 2030 can be achieved in terms of the 2019 CO2 emissions data. The implied assumption is that, via the programs outlined in Chapter 3, new housing and new business investment, as distinct from replacement investment, is of ZNET standard.

## 4.3 The terminal date of the pathways – 2036

The objective of the pathway to ZNET outlined below is to achieve ZNET by 2030 for MAS. However, the pathway and programs extend beyond 2030 to 2036. That is, the household sector retrofit/electrification program and the Business ZNET ready program extend to 2036. The reason for this is to achieve a balance between environmental objectives and costs. Given an average life of equipment of 20 years, a 15 years program would impose, on average, a 25 per cent cost margin on decision-makers compared to leaving the replacement decision to the end of the asset life. In addition, improvements in energy efficiency will provide offsets to this cost. Therefore, the net additional cost is likely to be 10 per cent or less. This hopefully would be within in range required for making moral suasion policies work.

## 4.4 ZNET 2030: The gas profile

Table 4.1 outlines the pathways for the various energy forms necessary to achieve ZNET 2030. In terms of gas, the two pieces of the CO2(e) emissions data which are relevant are the household gas emissions of 13,800 tonnes and industry emissions of 32,000 tonnes.

The first adjustment to the household baseline is the application of the retrofit program. The target of the program is that by 2036 two-thirds of the current housing stock in MAS is subject to the program with an average energy efficiency gain of 55 per cent. This timeline will enable ZNET 2030 to be achieved at the minimum net additional cost to the average household.

In terms of household gas usage, it will enable 2,600 tonnes of gas emissions to be removed by 2030 and 5,000 tonnes to be removed by 2036.

The balance of household gas emissions, or 8,700 tonnes, by 2036 will be required to be removed by the electrification component of the retrofit program. Overall, the program will achieve 7,500 tonnes reduction in household gas emissions by 2030 and the full 13,800 tonnes reduction by 2036.

The industry profile for gas emissions is adjusted by two factors. Firstly, the impact of the Bioenergy plant which will reduce emissions by 15,300 tonnes (from Table 3.1) by 2024 onwards. The second adjustment is from the business electrification program as outlined in Section 3.3 above, which removes 11,700 tonnes by 2036. The 5,000 tonnes residual emissions in 2036 represents gas usage which cannot be electrified and will have to await the replacement of network gas with, for example, hydrogen gas in the gas grid. Overall, from Table 4.1, MAS gas emissions decline from 46,000 tonnes in 2019 to 5,000 tonnes by 2030 and 11,300 tonnes by 2036.

## 4.5 ZNET 2030: Petroleum products

The petroleum product emissions (transport plus direct usage) for MAS is estimated at 49,900 tonnes in 2019. The main change that can be expected over the next 15 years is the take-up of electric vehicles (EVs). Since Australia no longer has a motor vehicle industry, the take-up of EVs in Australia will largely be driven by overseas trends and policy settings, which indicate that by the 2030s EVs will be the majority of new registrations.

The assumption in regard to the share of EVs in total motor vehicle registrations is profiles in Figure 4.1. By 2025 it is assumed that EVs are a quarter of new registrations rising to 70 per cent by 2032, at which point Australian Governments will follow the lead of overseas jurisdictions and ban the new registrations of internal combustion motor vehicles. Also, from Figure 4.1, the new registration profile results in one-fifth of motor vehicle stock being EVs by 2030 and a little under two-thirds by 2036. From Table 4.1, this will reduce petroleum emissions by 5,900 tonnes by 2030 and 18,100 tonnes by 2036.

With the current strong stimulus being given to green hydrogen production around Australia by both Governments and private industry, it is not implausible to assume the availability of competitive hydrogen based fuels by the end of the 2020s. This will not only be available for heavy vehicles, such as buses and trucks, but also to replace petroleum for motive power. By 2030, it is assumed that green hydrogen (or other fuels such as renewable biodiesel) will displace a modest 5,700 tonnes of emissions by 2030 before increasing to 22,300 tonnes by 2036.

Overall, the combined green transport fuel alternatives will reduce petroleum emissions to 38,300 tonnes by 2036 and to 9,500 tonnes by 2030.

**Figure 4.1: Mount Alexander Shire – Electric vehicle indicators**



## 4.6 ZNET 2030: Small-scale solar generation

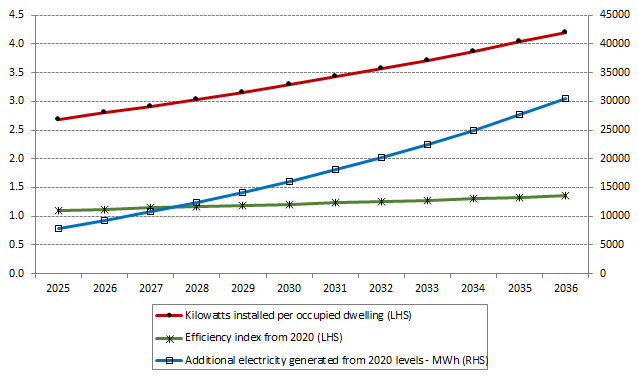
In terms of small-scale solar (SSS) capacity installed, the assumption is that this reaches 3.3 kW by 2030 and 4.2 kW by 2036. However, by the late 2020s the dominant share of the take-up will be for commercial and industrial processes.

To encourage behind-the-metre take-up for commercial and industrial premises, it assumes that policy settings are changed. The policy changes are:

1. the definition of SSS capacity increases to at least 1 MW; and
2. nearby siting of the capacity is allowed, subject to being in the same substation network, with a charge for ‘renting’ the local electricity distribution network.

Further, the larger units and technological change increase the efficiency of SSS by 35 per cent between 2020 and 2036. The overall result, from Figure 4.2, is that, compared to 2020 SSS electricity generation, generation increases from 16.0 gigawatt hours (GWh) in 2030 to 30.4 GWh by 2036.

**Figure 4.2: Mount Alexander Shire –Small-scale solar indicators**



## 4.7 ZNET 2030: Electricity

The retrofit program will impact on household electricity emissions in the same manner as the program impacted on the gas sector. Thus, from Table 4.1, the retrofit program will reduce household electricity emission, at 2019 purchased electricity renewable energy share, by 3,700 tonnes by 2030 and 7,300 tonnes by 2036. The industry baseline electricity emissions stay constant at 83,200 tonnes of emissions, giving a total at 2019 benchmark emissions of 102,100 tonnes by 2030 and 98,500 tonnes by 2036.

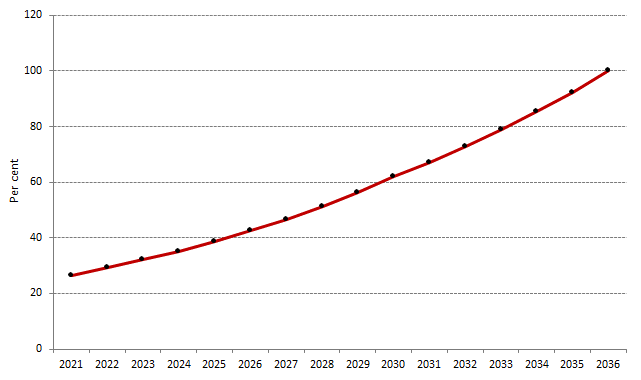
The next step is to adjust these emissions by the increase in the renewable energy share in total purchased electricity from 2020 onwards. The profile is shown in Figure 4.3. The share of renewables in electricity generation increases from 39 per cent by 2025 to 62 per cent by 2030 and 100 per cent by 2036.

From Table 4.1, the profile in Figure 4.3 results in the 2030 102,100 tonnes emission being reduced to 53,000 tonnes by 2030 and zero tonnes by 2036 from the 98,500 tonnes for that year.

For electricity demand, however, the electrification requirements for electricity from the substitution of gas and transport have to be added back in and the SSS generation deducted. This gives a net additional demand for electricity of 4.6 GWh by 2030 and 16.8 GWh by 2036. However, by 2036 emissions from electricity for this demand will be zero.

Overall, from Table 4.1, total net electricity emissions decline from 105,800 tonnes by 2019 to 54,800 tonnes by 2030 and zero by 2036.

**Figure 4.3: Victoria – Renewable share in electricity generation (per cent)**



## 4.8 ZNET 2030: Other emissions

Other emissions, from Table 4.1, estimated at 14,100 tonnes in 2019 are expected to decline mainly as a result in the decline of natural gas usage. As a result, the emissions are expected to reach 3,300 tonnes by 2036.

## 4.9 ZNET 2030: The final step to achieve ZNET 2030

From Table 4.1, as a result of the above initiatives, total MAS household and industry emissions decline from 215,600 tonnes to 119,700 tonnes by 2030. To the 67,400 tonnes emissions from agriculture and waste disposal is added giving a total of 187,100 tonnes. From this would be deducted the 84,000 tonnes saving from the 15 farm Regen Agriculture Program and the balance of 62,900 tonnes of emissions credited to the MAS Shire from the bioenergy facility, or 47,500 tonnes, leaving net emissions by 2030 at 55,600 tonnes.

In order to offset this for ZNET 2030, and the proposed plant proves successful and continually meets its environmental targets, then there is room for one more bioenergy plant in MAS. However, its emission savings would be less than the first plant even if it was the same size because the waste feedstock supply from MAS would be fully allocated to the first plant. However there would be some additional waste supplies from MAS from economic growth However Its CO2 reduction for the wider region would be the same.

The balance of 11,000 tonnes to reach ZNET 2030 could come from a changed land use initiative focussing on improving conservation values in the Shire.

After 2030, MAS would become a negative emitter reaching 96,000 tonnes by 2036. But to do this it may require the second bioenergy facility to be able to use part of its gas output to produce liquid petroleum fuel replacements.

If the availability of green hydrogen is faster than currently expected this would eliminate the requirement for a second bioenergy facility to reach ZNET 2030 or at least within a small number of years from that date.

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| **Table 4.1 Mount Alexander Shire: The pathway to ZNET** | | | | | | | | | | | | | | | |
|  |  |  | **2019** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **2033** | **2034** | **2035** | **2036** |
| **Gas sector** | | | | | | | | | | | | | | | |
| Households | Baseline | ‘000 tonnes of CO2(e) | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 | 13.8 |
| Households | Emission reduction from retrofit program | ‘000 tonnes of CO2(e) |  | -0.5 | -0.8 | -1.3 | -1.7 | -2.1 | -2.6 | -3.0 | -3.4 | -3.9 | -4.3 | -4.7 | -5.0 |
| Households | Electrification | ‘000 tonnes of CO2(e) |  | -1.8 | -2.4 | -3.1 | -3.7 | -4.3 | -4.9 | -5.6 | -6.2 | -6.8 | -7.4 | -8.1 | -8.7 |
| Households | net emissions | ‘000 tonnes of CO2(e) | 13.8 | 11.5 | 10.5 | 9.5 | 8.4 | 7.3 | 6.3 | 5.2 | 4.2 | 3.1 | 2.1 | 1.0 | 0.0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Industry | baseline | ‘000 tonnes of CO2(e) | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 | 32.1 |
| Industry | Bioenergy plant | ‘000 tonnes of CO2(e) |  | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 | -15.3 |
| Industry | net emissions after bioenergy plant | ‘000 tonnes of CO2(e) | 32.1 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 | 16.7 |
| Industry | electrification emissions | ‘000 tonnes of CO2(e) |  | -0.9 | -1.8 | -2.7 | -3.6 | -4.5 | -5.4 | -6.3 | -7.2 | -8.1 | -9.0 | -9.9 | -11.7 |
| Industry | Total net emissions | ‘000 tonnes of CO2(e) | 32.1 | 15.8 | 14.9 | 14.0 | 13.1 | 12.2 | 11.3 | 10.4 | 9.5 | 8.6 | 7.7 | 6.8 | 5.0 |
|  |  | ‘000 tonnes of CO2(e) |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Gas | Total net emissions | ‘000 tonnes of CO2(e) | 45.8 | 27.3 | 25.4 | 23.5 | 21.5 | 19.5 | 17.6 | 15.6 | 13.7 | 11.7 | 9.8 | 7.8 | 5.1 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Petroleum** | | | | | | | | | | | | | | | |
| Total | Baseline |  | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 | 49.9 |
| Electric vehicles |  |  |  | -1.4 | -2.1 | -2.8 | -3.7 | -4.7 | -5.9 | -7.3 | -8.9 | -11.2 | -13.5 | -15.8 | -18.1 |
| Green fuels (hydrogen) |  |  |  |  |  |  | 2.5 | -4.5 | -5.7 | -7.1 | -8.9 | -11.2 | -14.1 | -17.7 | -22.3 |
| **Total** | **Total net emissions** |  | **49.9** | **48.5** | **47.8** | **47.1** | **48.7** | **40.6** | **38.3** | **35.5** | **32.1** | **27.5** | **22.3** | **16.4** | **9.5** |

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| **Table 4.1 Mount Alexander Shire: The pathway to ZNET (continued)** | | | | | | | | | | | | | | | |
|  |  |  | **2019** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **2033** | **2034** | **2035** | **2036** |
| **Electricity sector** | | | | | | | | | | | | | | | |
| Households | Baseline | 000 tonnes of CO2€ | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 | 22.6 |
| Households | Emission reduction from retrofit program | 000 tonnes of CO2€ |  | -0.7 | -1.2 | -1.8 | -2.4 | -3.1 | -3.7 | -4.3 | -4.9 | -5.6 | -6.2 | -6.8 | -7.3 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Industry | baseline |  | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 | 83.2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** | **2019 demand** |  | **105.8** | **105.1** | **104.6** | **104.0** | **103.3** | **102.7** | **102.1** | **101.5** | **100.8** | **100.2** | **99.6** | **99.0** | **98.5** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total** | **2019 demand** | **Adjusted for renewables in purchased electricity** | **105.8** | **86.9** | **81.7** | **76.1** | **70.1** | **61.1** | **53.0** | **45.7** | **38.3** | **30.5** | **20.5** | **11.3** | **0.0** |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Electrification electricity demand | Household | MWh |  | 2581.4 | 3464.0 | 4346.6 | 5229.3 | 6111.9 | 6994.5 | 7877.1 | 8759.7 | 9642.3 | 10524.9 | 11407.5 | 12290.1 |
| Electrification electricity demand | Industry | MWh |  | 1275.4 | 2550.8 | 3826.2 | 5101.6 | 6377.1 | 7652.5 | 8927.9 | 10203.3 | 11478.7 | 12754.1 | 14029.5 | 16563.4 |
| Electrification electricity demand | Transport | MWh |  | 1445.0 | 2088.5 | 2863.6 | 3770.3 | 4808.7 | 5978.7 | 7382.7 | 9020.7 | 11360.7 | 13700.7 | 16040.7 | 18380.7 |
| Additional small-scale solar |  | MWh |  | -7836.6 | -9252.3 | -10772.9 | -12405.1 | -14156.1 | -16033.7 | -18045.9 | -20201.4 | -22509.3 | -24979.5 | -27622.2 | -30448.4 |
| Electrification electricity demand | Total | MWh |  | -2534.8 | -1149.0 | 263.6 | 1696.2 | 3141.5 | 4592.0 | 6141.8 | 7782.3 | 9972.4 | 12000.3 | 13855.6 | 16785.8 |
| Electrification electricity demand | Total | ‘000 tonnes of CO2(e) |  | -1.6 | -0.7 | 0.1 | 0.8 | 1.4 | 1.8 | 2.1 | 2.2 | 2.2 | 1.8 | 1.1 | 0.0 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Electricity** | **Total** | **‘000 tonnes of CO2(e)** | **105.8** | **85.3** | **81.1** | **76.3** | **70.9** | **62.5** | **54.8** | **47.8** | **40.5** | **32.7** | **22.4** | **12.4** | **0.0** |

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| **Table 4.1 Mount Alexander Shire: The pathway to ZNET (continued)** | | | | | | | | | | | | | | | |
|  |  |  | **2019** | **2025** | **2026** | **2027** | **2028** | **2029** | **2030** | **2031** | **2032** | **2033** | **2034** | **2035** | **2036** |
| Other industry emissions |  |  | 14.1 | 12.7 | 12.0 | 11.2 | 10.5 | 9.7 | 8.9 | 8.1 | 7.3 | 6.4 | 5.6 | 4.7 | 3.3 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Total household and industry emissions |  | ‘000 tonnes of CO2(e) | 215.6 | 173.7 | 166.3 | 158.0 | 151.6 | 132.4 | 119.7 | 107.1 | 93.5 | 78.4 | 60.0 | 41.3 | 17.9 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Agriculture | Baseline | ‘000 tonnes of CO2(e) | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 | 48.9 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Agriculture | Regen Agriculture Program | ‘000 tonnes of CO2(e) |  | -40 | -50 | -70 | -78 | -84 | -84 | -84 | -84 | -84 | -84 | -84 | -84 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Waste |  | ‘000 tonnes of CO2(e) | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 | 18.5 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bioenergy plant |  | ‘000 tonnes of CO2(e) |  | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 | -47.5 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Bioenergy plant two | Two |  |  |  |  |  |  |  | -44.8 | -44.8 | -44.8 | -44.8 | -44.8 | -44.8 | -44.8 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Additional bioenergy plant | (LULU) |  |  |  |  |  |  |  | -11 | -5 | -5 | -5 | -5 | -5 | -5 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Total net emissions** |  |  |  | **153.6** | **136.2** | **107.9** | **93.5** | **68.3** | **-0.2** | **-6.8** | **-20.3** | **-35.5** | **-53.9** | **-72.6** | **-96.0** |

# 5. Mount Alexander Shire: ZNET – The cost of failure

In November 2020 MASG prepared a report titled “*The costs and benefits to Mount Alexander Shire households from climate change damage avoidance and CO2 reduction costs, 2020-2100*”. The introduction and overview of findings section of the report is included below.

## 5.1. Study objective

The objective of this paper is to analyse the impact on the welfare of the Mount Alexander Shire (MAS) residents from three aspects of climate change, namely:

1. the gross impact of economic damages arising from the three climate change scenarios;
2. the net impact of the climate change scenarios after taking into account the costs of the required complementary mitigation measures which is to answer the question, do avoided climate damage costs outweigh the cost of CO2e mitigation costs and especially the costs of world and Australian costs for ZNET 2050; and
3. the impact of industry restructuring measures required from the direct loss of Australian industry from climate change mitigation measures. This is the loss of the oil, gas and coal industries.

## 5.2 The methodology

The focus of the evaluation is on MAS household consumption expenditure as at 2019-20, and all positive and negative shocks that are evaluated from the perspective of these expenditures. In short, the economy is frozen at 2019-20 levels and the changes required over the next 80 years are applied for different emission and environmental outcomes as percentages to the 2019-20 benchmarks. This not only has the benefit of relating all changes to a benchmark that readers can relate to, it also avoids baseline “inflation” where the benchmarks relate to a far larger economy, 80 years ahead, severely distorting the quantitative conclusions by increasing all benefits and costs by a factor between five and nine.

The usual criteria for evaluating the impact of emission scenarios on the economy is gross domestic product (GDP). However, as Section 2 makes clear, this variable only captures a proportion of the impact of the costs and benefits of climate change damage and mitigation efforts. This study indicates that it is only approximately a third of the benefits and costs when a more accurate indicator to measure the totality of the costs and benefits, namely national and regional household consumption expenditure, is used.

In applying the methodology the first step is to generate three emission scenarios and their outcomes for temperature change from pre-industrial times.

The three emission scenarios, to 2100, are:

1. business as usual emission projections with little mitigation efforts (Business as usual);
2. an emission scenario consistent with the IPCC Paris convention pledges (Current pledges); and
3. a Zero Net 2050 World and Australian emissions projections (ZNET 2050).

Step two is to estimate the impact of the three emission scenarios on MAS households from the environmental damage each scenario generates. To this end damage functions are developed in Section 4 from:

1. natural disasters caused by the increasing frequency of extreme weather days and the increasing intensity of extreme weather days;
2. declining labour productivity (fall in GDP) from rising temperatures;
3. increasing agricultural prices from declining World agricultural production;
4. the costs of sea level rise; and
5. increasing defence expenditures as a response in an increasing unstable world from uncontrolled climate change.

The economic costs arising from these damage categories will be in the form of:

1. falling real incomes;
2. increasing cost of living costs; and
3. rising tax rates and interest rates to maintain demand-supply balance in the economy,

with the bottom line outcome being reflected in MAS household consumption expenditures.

The third step is to estimate the costs of migration in Section 3. That is, the total expenditure that must be undertaken in Australia to reach ZNET 2050, or for that matter, ZNET 2030. The ZNET strategy is a basic one of:

1. achieving a 100 per cent renewable energy source in the form of electricity; and
2. converting all uses of non-electricity energy (i.e. oil and gas) to electricity using technologies.

Step four is to apply the damage and mitigation cost functions to assess the net impact on MAS household consumption expenditures from both emission damages and the cost of emissions. The framework required to do this is outlined in Section 3. This will answer the question of is there a net benefit from undertaking the CO2e mitigation cost requirements to reach ZNET by 2050.

Two other issues are explored. Firstly, the costs and benefits of Australia unilaterally bringing forward a ZNET target to 2030 and, secondly, the cost that arises from the world adopting a ZNET target destroying key Australian industries of gas, oil and coal which supply $200 billion worth of exports, or 10 per cent of GDP.

## 5.3 An overview: The results

Table 5.1 shows the outcomes for the emission scenarios based on the analysis of Section 2. The key causal linkages run from annual world emissions, to CO2 concentration in the atmosphere, to global temperature rises in the atmosphere from pre-industrial times. The difference in temperature rise between the two polar extreme scenarios of Business as usual emissions and ZNET 2050 is just under 3oC by 2100. The Current pledges scenario produces a temperature rise closer to the Business as usual case than the ZNET 2050 case. Table 5.5 gives the percentage contribution from each damage component to total economic damage for the Business as usual case.

From Table 5.2, the total cumulative costs that Australia would have to spend to achieve ZNET 2050 is $1,202 billion, or an average annual expenditure of $40 billion over the next 30 years. The cost break-down by major component are also given in the table. Over 80 per cent of the costs are for the full electrification of the economy.

With few exceptions, the costs of the damages and mitigation costs would be formed at the international level (agricultural prices and export loss), or at the national level and applied at the MAS level via increased insurance costs, industry prices, national or state tax rates and interest rates in proportion to MAS’s share of:

1. national tax payments;
2. household income; and
3. consumption expenditure share by industry.

Table 5.3 shows the impacts on MAS household consumption expenditure of damages and costs of mitigation relative to the 2020 expenditure levels. By 2100 the gross damages inflicted on MAS households is 36.5 per cent of total expenditure, or a decline of $34,833 from current average expenditure levels. By 2040 it is still a decline of 8.3 per cent, or $7,929. ZNET 2050 limits the damages to within 1 or 2 per cent of current expenditures.

Table 5.3 also gives the net costs of mitigation which, for 2050, is $4,524 annually for MAS households. However, as Table 5.4 shows, since the gross costs of environmental damage avoidance from the Business as usual scenario is taken into account, the net gain to MAS household consumption expenditure is $7,905 annual expenditure, which rises to $33,914 by 2100.

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| --- | --- | --- | --- | --- | --- | --- |
| **Table 5.1 The three world emission scenarios to 2100** | | | | | | |
|  | **1975** | **2020** | **2040** | **2050** | **2075** | **2100** |
| **Annual emissions (gigatonnes CO2e)** | | | | | | |
| Business as usual/4C | 26.5 | 50.1 | 73.5 | 84.9 | 106.6 | 118.7 |
| Current pledges | 26.5 | 50.1 | 55.1 | 54.8 | 47.2 | 41.9 |
| ZNET 2050/1C | 26.5 | 50.1 | 13.1 | 7.3 | -10.8 | -14.8 |
|  |  |  |  |  |  |  |
| **CO2 concentration in atmosphere (parts per million)** | | | | | | |
| Business as usual/4C | 331.2 | 414.3 | 482.8 | 525.2 | 657.2 | 814.9 |
| Current pledges | 331.2 | 414.3 | 472.1 | 501.1 | 569.3 | 629.6 |
| ZNET 2050/1C | 331.2 | 414.3 | 446.1 | 451.2 | 443.6 | 427.6 |
|  |  |  |  |  |  |  |
| **Temperature change from pre-industrial times (Celsius)** | | | | | | |
| Business as usual/4C | 0.2 | 1.1 | 1.7 | 2.1 | 3.0 | 4.0 |
| Current pledges | 0.2 | 1.1 | 1.6 | 1.9 | 2.4 | 2.8 |
| ZNET 2050/1C | 0.2 | 1.1 | 1.4 | 1.4 | 1.4 | 1.2 |

|  |  |
| --- | --- |
| **Table 5.2 Australian ZNET 2050 costs (per cent of total)** | |
| Replace existing non-renewable electricity production | 16.5 |
| Replace transport fuels with electricity | 20.2 |
| Replace gas with electricity | 5.9 |
| Battery investment to stabilise the grid | 8.0 |
| Extension of the electricity grid for higher volumes and remote supply sources | 30.8 |
| Household, commercial and industrial conversion to all electric energy source | 5.8 |
| Other emission reductions | 12.8 |
| **Total** | **100.0** |
|  |  |
| **Total expenditure – $ 2018 billion** | **1202.4** |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 5.3 Impact on MAS households – Total consumption by World emission scenarios** | | | | | | | | |
|  | **Change in total expenditure from 2020 levels ($2018)** | | | | **Per cent change in total expenditure from 2020 levels (%)** | | | |
|  | **2040** | **2050** | **2075** | **2100** | **2040** | **2050** | **2075** | **2100** |
| **Excluding Australian mitigation costs** | | | | | | | | |
| Business as usual/4C | -7929 | -12432 | -20730 | -34833 | -8.3 | -13.0 | -21.7 | -36.5 |
| Current pledges | -4337 | -6752 | -9779 | -13213 | -4.5 | -7.1 | -10.2 | -13.8 |
| ZNET 2050/1C | -707 | -1052 | -1369 | -1653 | -0.7 | -1.1 | -1.4 | -1.7 |
|  |  |  |  |  |  |  |  |  |
| **Including Australian mitigation costs** | | | | | | | | |
| Business as usual/4C | -7929 | -12432 | -20730 | -34833 | -8.3 | -13.0 | -21.7 | -36.5 |
| Current pledges | -5362 | -8412 | -10143 | -13501 | -5.6 | -8.8 | -10.6 | -14.1 |
| ZNET 2050/1C | -3255 | -5576 | -2557 | -2572 | -3.4 | -5.8 | -2.7 | -2.7 |
|  |  |  |  |  |  |  |  |  |
| **Net impact of Australian mitigation costs** | | | | | | | | |
| Business as usual/4C | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Current pledges | -1025 | -1660 | -365 | -288 | -1.1 | -1.7 | -0.4 | -0.3 |
| ZNET 2050/1C | -2549 | -4524 | -1188 | -920 | -2.7 | -4.7 | -1.2 | -1.0 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 5.4 Benefit and cost of ZNET 2050 –** **MAS households** | | | | | | | | |
|  | **Change in total expenditure from 2020 levels ($2018)** | | | | **Per cent change in total expenditure from 2020 levels (%)** | | | |
|  | **2040** | **2050** | **2075** | **2100** | **2040** | **2050** | **2075** | **2100** |
| Business as usual/4C (no mitigation costs) | -7929 | -12432 | -20730 | -34833 | -8.3 | -13.0 | -21.7 | -36.5 |
| ZNET 2050/1C (mitigation costs only) | -2549 | -4524 | -1188 | -920 | -2.7 | -4.7 | -1.2 | -1.0 |
| Net benefit – difference | 5380 | 7908 | 19543 | 33914 | 5.6 | 8.3 | 20.5 | 35.5 |
| Net benefit – ratio | 3.1 | 2.7 | 17.5 | 37.9 | 3.1 | 2.7 | 17.5 | 37.9 |
| Industry restructure net benefit – difference | -5716.2 | -9522.1 | -6458.3 | -6470.7 | -6.0 | -10.0 | -6.8 | -6.8 |
| Net benefit – with industry restructure | 2212.7 | 2910.2 | 14272.1 | 28362.7 | 2.3 | 3.0 | 14.9 | 29.7 |

|  |  |
| --- | --- |
| **Table 5.5 Distribution of damage costs by component - Business as usual – 2100 (per cent)** | |
| Natural disasters | 38.5 |
| GDP/Labour productivity | 28.1 |
| Sea level rise | 2.7 |
| Defence | 21.5 |
| Agriculture price rise and other price increases | 9.2 |
| **Total** | **100.0** |