DESTINATION THINK DESTINATION

DISCUSSION PAPER

Initial findings in the development of a roadmap to carbon zero by 2030

March 2023

Wānaka

QUEENSTOWN LAKES DISTRICT COUNCIL

Queenstown NEW ZEALAND

CONTENTS

ABOUT THIS PLAN

This discussion paper is the result of a collective effort of many people who are passionate about a regenerative future in Queenstown Lakes.

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- Paul Anderson, Chief Executive Officer, NZSki Ltd.
- Tim Barke, Chief Executive, Lake Wānaka Tourism
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- Tim Barke, Chief Executive, Lake Wānaka Tourism, Chair of the Otago Conservation Board for DoC
- Rod Drury, Founder and Non Executive Director, Xero
- Stephen England-Hall, Chief Executive Officer, RealNZ
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- Monique Kelly, Co-founder, WAO Summit
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EXECUTIVE SUMMARY

The Queenstown Lakes district has set a goal for the visitor economy to reach carbon zero by 2030. This discussion paper presents research and analysis that will influence the creation of a roadmap to guide decarbonisation across the district. The destination management group (DMG) seeks to engage the community and stakeholders to strengthen this analysis before selecting climate solutions that are appropriate for the district.

Complete decarbonisation is an immense undertaking. The scale of the challenges and the opportunities ahead are great, and solutions will be interconnected with many aspects of society. This paper's contributors are following a framework of Kāi Tahu values and guiding principles described in this document. This framework shapes the way potential climate solutions will be evaluated and prioritised in the future.

Queenstown Lakes is primed for district-wide decarbonisation in a way that few places are. Its numerous advantages include the presence of many organisations aligned with the carbon zero goal that are already testing or have already implemented climate solutions. These climate solutions include infrastructure, conservation, technology, behavioural change, activism and much more. This makes Queenstown Lakes an ideal testbed for investments in rapid decarbonisation, catalysing innovation, and economic diversification. This district will demonstrate how decarbonisation can accelerate regenerative tourism practices across Aotearoa New Zealand.

An emissions assessment finds that the transportation sector is the most significant source of greenhouse gas (GHG) emissions within the district's visitor economy. This includes moving people to the district and within it. International aviation is the largest single emissions source. Since there are data gaps and challenges around assigning responsibility, this paper presents three potential estimates of these emissions, resulting in a wide range of estimated values. Aviation will be challenging to decarbonise, but it will remain necessary, given the risks these emissions present to the district and globally, regardless of the chosen methodology.

Rapid improvements to the district's energy infrastructure are needed to support the transition within key sectors, including transportation. Today's energy grid does not represent a significant source of emissions. However, Queenstown Lakes needs to immediately build greater clean energy capacity and resilience if the economy is to decarbonise through electrification.

The emissions assessment identifies many gaps in the data that are worth investigating. The primary gaps are 1) in-district vs. out-of-district transport fuel usage, 2) the number of fossil fuel-consuming "devices," 3) aviation emissions as mentioned above, and 4) more precise attribution of emissions to the visitor economy. The next phase of the decarbonisation project will work toward understanding these areas more clearly and allocate resources accordingly.

Despite data gaps, the four greatest levers of change for decarbonising the visitor economy are already clear. The levers include adjusting visitor volume, visitor origin, the GHG intensity of transportation, and the GHG intensity of in-destination activity. Actions that affect these four aspects of travel have the highest potential for positive impact. This paper presents a list of solutions organised by emissions source and proposes a set of evaluation criteria. These are open for discussion, and the DMG invites readers to provide input.

Action follows planning. The DMG has organised a large list of potential action categories in a framework that will enable rapid change and keep momentum going to 2030 and beyond. Actions are sequenced according to categories that include pilot projects and foundational initiatives. The framework will help the project team allocate resources appropriately.

This discussion paper also describes some initial recommendations on the path to decarbonisation. After collecting feedback about this paper, the next step is to develop a roadmap to guide decarbonisation actions in Queenstown Lakes district until 2030. The DMG also recommends making a coordinated policy request of local and central governments to create an arena that supports the objective. Further recommendations are that the district takes a leadership position on decarbonisation toward other districts and destinations; that Queenstown Lakes acts immediately and measures iteratively; that widespread action needs to be coordinated; and that education and extensive communication are in place to encourage high participation.

Now, the decarbonisation effort needs your help. You are invited to join the discussion by contributing your ideas and feedback in response to this paper.

INTRODUCTION

The impacts of the climate emergency present immediate risks to Queenstown Lakes. We are not only seeing the impacts around the world through our smartphone screens, but we are also feeling them close to home. Auckland Airport has recently flooded, disrupting travel within Aotearoa New Zealand. Climate-amplified weather events around the country are severing road connections. Hawke's Bay was inundated, prompting discussions of how to manage evacuations. And the South Island is dealing with a prolonged drought. Decarbonising the economy is a massive undertaking, but it is no longer a choice.

This discussion paper is a key step toward developing a roadmap for the Queenstown Lakes visitor economy to reach *carbon zero by 2030*. The vision to rapidly decarbonise is the keystone outcome of the Destination Management Plan (DMP) *Travel to a Thriving Future*[1], which sits under the district's Spatial Plan. This paper is a key output of the DMP.

To achieve rapid decarbonisation, community members across the district must share knowledge and expertise to fill in the gaps. As tourism is a cross-sectoral industry (as measured by Stats NZ), there is little existing data describing the total visitor economy of the Queenstown Lakes district, for example. Portions of the underlying estimates by sector will be attributed to tourism. Our approaches to creating estimates are imperfect, but a clearer picture is beginning to emerge. This discussion paper presents initial findings in a way that encourages a robust discussion.

Your feedback will strengthen the district's collective understanding of what is required to rapidly decarbonise. Making connections in this way mirrors nature. Mycelial networks transfer vital nutrients and information across vast, forested ecosystems. Giant trees depend on these thin tissues that connect them with their neighbours. In a similar way, climate action will benefit from a network connecting the deep reservoirs of skill spread across Queenstown Lakes. Decarbonisation is a complex, systemic challenge that requires immediate, coordinated participation across society.

This paper's contributors thank you in advance for taking the time to read these initial findings and provide input. We welcome all feedback from community members and stakeholders as we continue to learn together and co-create a resilient and thriving future. Achieving the carbon zero by 2030 vision will make our home a more vibrant and resilient place while inspiring other communities that join us on the climate journey.

Please join this discussion today by providing your feedback to strengthen the roadmap toward decarbonisation.

1 Travel to a Thriving Future is Queenstown Lakes' Regenerative Tourism Strategy (2022).

VALUES & GUIDING PRINCIPLES

VALUES

In recognition of the level of system change required along the journey of a decarbonisation transition, we have been deliberate in navigating in alignment with a set of values that hold people and place at its core. The values that will be used to guide the roadmap are consistent with those laid out in the DMP, *Travel to a Thriving Future and the District's Spatial Plan*[2].

VALUES	DESCRIPTION	APPLICATION
Whanaukataka	Family and community focused	Ensuring consideration of the social implication of decisions to enable community and whanau connections and growth.
Manaakitaka	Hospitality	Demonstrating behaviour that acknowledges others, through the expression of archa, hospitality, generosity and mutual respect.
Rakatirataka	Leadership	Ensuring the treaty partnership is recognised to enable mana whenua leadership in decision-making processes.
Haere whakamua	Future focused	Adopting a forward looking orientation with future generations in mind.
Tikaka	Appropriate action	Ensuring consideration of the appropriateness of decisions that will have a bearing on social, economic, environmental and cultural outcomes.
Kaitiakitaka	Stewardship	Enabling the inherited responsibility of mana whenua to support and protect people, the environment, knowledge, culture, language and resources on behalf of future generations.
Mauri	Life force	Recognising the life force in all lands, waters and the natural environment that stems from time immemorial, requiring a high duty of care for kaitiaki (and others) to maintain an intact and healthy mauri, ensuring that what is gifted from the Atua is not neglected.

2 Queenstown Lakes District Council. Queenstown Lakes Spatial Plan (2022).

GUIDING PRINCIPLES

The following principles will inform how potential pathways to decarbonise the Queenstown Lakes tourism industry are evaluated and executed. These guiding principles were developed from the engagement and learnings of the Destination Management Plan as well as from the advice from this discussion paper's advisors and contributors.

Encourage local economic development and diversification

Taking climate action is not only important for the environment but also an opportunity for social and economic resilience by pursuing solutions that enhance local economic development and diversification.

Avoid overreliance on future technological innovations

Many of the solutions to climate action exist today and we can't afford to over rely on future innovation. There is inherent risk built into unproven solutions when existing solutions are available.

Collaborate, partner and support

Decarbonising the tourism sector is a massive undertaking that will require collaboration, partnerships and support from throughout the community. In particular, partnership with Kāi Tahu will be key. Wherever possible, duplication of efforts should be avoided through this collaborative approach.

Empowering change

Many aspects of decarbonisation will require systems change. Enabling others is an important role rather than relying on centralisation.

Climate justice

The climate emergency requires a just transition so as not to exacerbate inequalities. Solutions should centre around the principle of equity and enable meaningful involvement of diverse people in the development, implementation and enforcement of measures for transition. The visitor economy is currently central to the economic wellbeing of the majority of residents in the district so ensuring a just transition will be highly important.

Follow best practices

The DMP outlines an approach that seeks to eliminate all possible GHG emissions before resorting to carbon removal. Offsets are not a viable long-term solution for net zero, and carbon removal will only be pursued where decarbonisation is not viable.

RAPID DECARBONISATION AS A CATALYST FOR INNOVATION

DECARBONISING IS AN ENORMOUS OPPORTUNITY

Tourism is highly carbon intensive, and Queenstown Lakes' economy is disproportionately concentrated on the visitor economy. This presents a risk to the local and New Zealand economy that must be proactively addressed.

While much of the technology required to decarbonise already exists, adoption remains very challenging. Transitioning from a highly-carbon intense tourism economy to a zero-carbon, diversified economy has many benefits. The learning that will result from leading will be enormous, as will the innovations and economic growth in areas such as clean aviation, mobility, ecosystem restoration, carbon removal, renewable energy and energy storage. The outputs of these types of industries are valuable to the host community and will serve to diversify the district's economy and make it more resilient.

> *"Every company and every industry will be transformed by the transition... The question is, will you lead, or will you be led?"*
>
> *"In a few short years, we have all watched innovators reimagine the auto industry. And today, every car manufacturer is racing toward an electric future. The auto industry, however, is merely on the leading edge – every sector will be transformed by new, sustainable technology.*
>
> *Engineers and scientists are working around the clock on how to decarbonize cement, steel, and plastics; shipping, trucking, and aviation; agriculture, energy, and construction. I believe the decarbonizing of the global economy is going to create the greatest investment opportunity of our lifetime. It will also leave behind the companies that don't adapt, regardless of what industry they are in. And just as some companies risk being left behind, so do cities and countries that don't plan for the future. They risk losing jobs, even as other places gain them. The decarbonization of the economy will be accompanied by enormous job creation for those that engage in the necessary long-term planning.[3]"*
>
> *– Larry Fink, CEO at BlackRock*

Queenstown Lakes is choosing to lead instead of being led.

QUEENSTOWN LAKES IS THE PERFECT TESTBED FOR NEW ZEALAND

The Queenstown Lakes District (QLD) is primed for actions leading to rapid decarbonisation. This is the ideal site for today's most ambitious and noteworthy decarbonisation projects – especially those led by tourism and the visitor economy. Local residents are ready for change. According to the *Mood of the Nation* survey, seventy-eight percent of the Queenstown respondents said there was too much tourism pressure on the environment and infrastructure[4]. This is nearly double the percentage compared to respondent sentiment from other areas of New Zealand. Many individuals, businesses and industries have been adopting regenerative business practices for years. The strategic vision to reach carbon zero by 2030 is creating alignment among a diverse array of stakeholders within and connected to the visitor economy.

Queenstown Lakes is globally connected and internationally known as a popular destination. Welcoming millions of visitors each year, the destination enjoys a vital exchange of culture and ideas. To ensure long-term resilience, the district will need to diversify its economy and its infrastructure. Energy demands in the district will soon outgrow the supply. The energy infrastructure must be strengthened to meet the needs of residents and travellers, and it must also prepare for increasing climate risks.

Queenstown Lakes brings together a special combination of resources, skills, size, connection, reputation and collaboration. The district is small enough to be nimble and confident enough to experiment with new climate action initiatives. The majority council-owned Queenstown Airport provides a good example. The airport brings a competitive advantage to the district through its links with international and domestic destinations. Its progressive leadership and community ownership make this an encouraging site of innovation, where the potential to lead a regenerative economy is high. Decarbonising the aviation sector is a significant challenge for New Zealand and the world and this responsibility must be carried by the visitor economy as a whole, not just Queenstown Airport. Working collaboratively can turn this challenge into enormous opportunities and demonstrate leadership in this space.

3 Larry Fink. Larry Fink's 2022 Letter to CEOs: The Power of Capitalism (2022).

4 Tourism Industry Aotearoa and Tourism New Zealand. Mood of the Nation (2020).

There are myriad examples of innovation and regeneration already in practice across the visitor economy of Queenstown Lakes. The Headwaters Eco Lodge at Camp Glenorchy is one example of leadership that has proven that decarbonisation is possible. The lodge welcomes eco-conscious travellers as the world's first accommodation certified according to the Living Building Challenge – among the highest standards for sustainability in tourism. Cardrona Alpine Resort has achieved sustainability milestones in eliminating landfill bins and providing free shuttles to reduce traffic. The Wao Aotearoa organisation has become a significant leader of education and advocacy in sustainability. Its annual summits help communities, including youth, imagine a future aligned with regenerative principles. Wao's efforts have created safe spaces for sectors to traverse existential topics, such as decarbonising tourism and construction.

The district is surrounded by timely opportunities; including the Southland wind farms and hydrogen project, and the Milford Opportunities Project. The significant ambition for the tourism industry to reach carbon zero by 2030 has the support of the mayor and has been unanimously endorsed by Council.

THE BENEFITS FOR AOTEAROA NEW ZEALAND

Queenstown Lakes has leverage for this kind of change in ways that few other places do. With proper investment and execution, Queenstown Lakes can accelerate the decarbonisation of the tourism economy by trialling innovations at both individual and systemic levels.

New technologies to reduce carbon emissions caused as a part of travel are already being tested here. Innovations may give rise to new products and markets in areas like clean transportation that can be replicated around New Zealand as part of the larger decarbonisation effort. Decarbonisation of the Queenstown tourism economy can create investment opportunities in neighbouring districts and will require technology from throughout New Zealand. Preliminary research has uncovered numerous aligned businesses already operating in New Zealand that could aid the transition. Examples include Whoosh, Wisk, Ocean Flyer, Candella, CarbonCrop, Air New Zealand, Carbonz, Southland's hydrogen and wind investments, Milford Opportunities Project, Wellington Electric Boat Building Company, McMullen & Wing, Ohmio and many more. This initiative also presents a significant opportunity to attract investment and innovation to New Zealand. Becoming known as both an early adopter and a showcase site will enhance the reputation of the district and of New Zealand.

This district has the potential to become Aotearoa New Zealand's testbed for decarbonisation. Queenstown Lakes could offer a controlled area in which to test and evaluate new regulatory initiatives and policies.

The destination management planning process that gave rise to the carbon zero goal, is evidence of a shift towards more holistic thinking about humanity's relationship to place – a departure from traditional ways for thinking about destination promotion and competition. Today, the district's leaders are weighing environmental, sociological and economic concerns. There is a consistent focus to ensure inclusion of Kāi Tahu in all planning and implementation efforts.

Queenstown Lakes can share inspiration and learning on the path toward de-risking the visitor economy in this district and to protect a vital economic sector for Aotearoa New Zealand.

INITIAL FINDINGS

CURRENT DECARBONISATION INITIATIVES

Initial research has been conducted to understand the current landscape of existing relevant initiatives within Queenstown Lakes and New Zealand as a whole.

Climate-related initiatives within Queenstown Lakes

There are a number of existing environmental and climate-related initiatives that are being undertaken by both the community and local government. See Appendix A for a full list of initiatives.

Community-led initiatives are focused on ecological restoration (tree planting/invasive species removal), sustainable agriculture/food security, predator control, and educational events.

There is significant work relevant to decarbonisation being conducted by Queenstown Lakes District Council (QLDC), particularly, the Climate and Biodiversity Plan[5], Waste Minimisation and Management Plan[6], and Public Transport Business Case[7]. The key Otago Regional Council (ORC) initiatives include their regional GHG inventory and Regional GHG scenario analysis[8]. ORC has also developed a *Regional Public Transport Plan (RPTP)*[9] to set out the objectives and policies for delivering public transport in Dunedin, Whakatipu and the wider Otago Region from 2021 to 2031. In terms of Kāi Tahu climate-related initiatives, the climate change strategy *Te tāhū o te whāriki – Anchoring the Foundation*[10] provides climate action direction across the whole spectrum of Kāi Tahu interests, assets and activities.

Climate-related initiatives within Aotearoa New Zealand

Aotearoa New Zealand's legislative and policy framework relating to climate change and decarbonisation has changed significantly in the past 5 years. An independent Climate Change Commission has been established, offshore oil and gas exploration has been banned, significant increases in the price of carbon emissions have been observed, and an aspiration for 100% renewable electricity by 2030 has been pursued by the current government.

In 2022, the Government released Aotearoa's first Emissions Reduction Plan[11], which contains the first three "emissions budgets" for the country (to 2035) and outlines the policy initiatives and actions which it believes will meet these budgets. These actions – numbering over 290 - are too numerous to list here, but span how the budgets will be met through policies for the bioeconomy, transport, energy and industry, building and construction, agriculture, forestry and waste. The plan also includes action in the science and research system, funding and financing, and climate change risk and opportunity reporting in the public and private sector. See below for a number of initiatives related to aviation emissions.

It is important to note that the Emissions Reduction Plan is a pan-Government plan, and includes actions owned by a range of Ministries, regulators, and other Crown Entities. A key aspect of the plan is partnership with Māori in the delivery of the plan.

5 Queenstown Lakes' District Council. Queenstown Lakes Climate and Biodiversity Plan 2022 - 2025 (2022).

6 Queenstown Lakes' District Council. Waste Minimisation and Management Plan 2018 (2018).

7 Queenstown Lakes' District Council. Queenstown Public Transport Business Case (2020).

8 Otago Regional Council (ORC). Otago Greenhouse Gas Emission Inventory (2021).

9 Otago Regional Council (ORC). The Regional Public Transport Plan 2021-2031 (2021).

10 Ngāi Tahu. Te tāhū o te whāriki - Anchoring the Foundation (2018).

11 New Zealand Government. Te hau mārohi ki anamata Towards a productive, sustainable and inclusive economy: Aotearoa New Zealand's first emissions reduction plan (2022).

While there is a potential for a change in government at the 2023 elections, we believe that the Emissions Trading Scheme, and the determination to deliver to New Zealand's Emissions budgets, will remain relatively unchanged. The major difference between the two parties relates to how those commitments are met – whether through technological and behavioural change or through permitting higher levels of gross emissions and relying on offsetting, such as forestry.

There are multiple funding opportunities available to assist with transition and capital seeking investment in relevant areas, for example ANZ Business Green Loans and Bank of NZ committing $10 billion in sustainable finance by 2025.

In addition to this national context, there are numerous grassroots and community initiatives around the country which are developing and testing renewable microgrids, sustainable transport, encouraging mode shift away from private vehicle usage, circular economy and regeneration of the natural environment (e.g. predator and pest control/ elimination to support Predator Free 2050)[12]. Some regions are developing local emissions reduction plans and energy strategies which include decarbonisation objectives.

These regional initiatives include some analyses of the emissions impact of tourism. One study that has helped inform our analysis of tourism initiatives is "The carbon footprint of Auckland tourism" (Becken, S and Higham, J.)[13]. This comprehensive 2021 report for Auckland Unlimited looked at bottom-up and top-down estimates of tourism economy emissions for the Auckland region and provides a template for what a more comprehensive inventory of Queenstown's emissions could look like.

Starting in 2030, Air New Zealand will begin to replace its Q300 domestic fleet with green hydrogen or battery hybrid powered aircraft. The first demonstration flight is scheduled for 2026.

Request for feedback

We recognise that this overview of decarbonisation initiatives highlighted above is not comprehensive.

Please provide feedback here if you have suggestions for other initiatives to be included.

12 Department of Conservation. Towards a Predator Free New Zealand: Predator Free 2050 Strategy (2020).

13 Susanne Becken and James Higham. The carbon footprint of Auckland tourism (2021).

VISITOR ECONOMY EMISSIONS

An estimate of the emissions attributable to the visitor economy is important because it allows us to understand the materiality of various emissions sources. Understanding the sources of emissions will allow us to be strategic with resource allocation as we create pathways to decarbonise.

There is limited data on the greenhouse gas emissions directly attributable to the visitor economy. Therefore, this analysis leveraged previous emissions inventories for the entire district and applied a layer of attribution to assign responsibility to the visitor economy. The initial estimates presented in this discussion paper build off emissions inventory work that has been conducted for the district by ORC and QLDC. Analysis was conducted to present estimates of emissions attributable to the visitor economy, which is essentially a cross section of many industries and aspects of society. When assessing the emissions associated with international aviation, it became apparent that this is the largest emissions source and there are a range of estimates that can be produced depending on the data and methodology used. This paper therefore presents three different estimates for international aviation emissions so that readers can understand and explore the different options. Please see Appendix B and C for methodology details. In addition, analysis is presented around the importance of a clean energy grid, and a discussion regarding in-destination vs out-of-destination emissions.

Visitor economy

The visitor economy is a system that includes far more than tourism-related businesses; it consists of many sectors and businesses that impact travellers. All this is inter-linked with communities and the environment. The visitor economy includes the places people stay, the transport that connects them, and the infrastructure that enables it. It includes activities of all kinds, the ecosystems where those activities happen, the culture and heritage people experience, and the industries behind them – the whole web of interdependent relationships and interactions that are part of the visitor experience.

EMISSIONS OVERVIEW

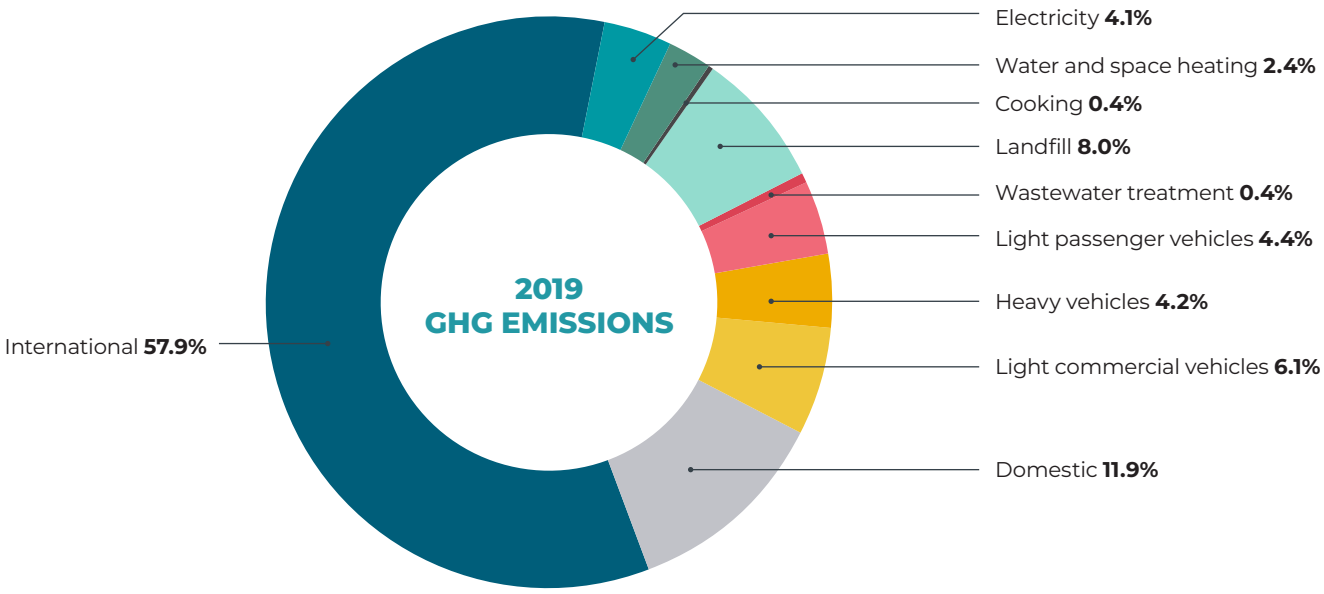
The major categories of visitor economy emissions include stationary energy, waste, road transportation and air transportation. Three emissions estimates are provided below. The difference between each of the three emissions estimates is the approach taken to calculate international aviation emissions. In each of the approaches below, aviation emissions represent the majority of emissions. Details for the approaches to calculating each of the international aviation emissions estimates are provided in the section below titled *Approaches to Estimate International Air Transportation Emissions*.

ESTIMATE 1

	EMISSIONS SOURCE	EMISSIONS QUANTITY (tCO_2e)*	EMISSIONS PROPORTION (%)
Stationary energy		**46,231**	**6.9%**
	Electricity	27,295	4.1%
	Water and space heating	16,238	2.4%
	Cooking	2,698	0.4%
Waste		**56,513**	**8.5%**
	Landfill	53,530	8.0%
	Wastewater treatment	2,983	0.4%
Road transportation		**98,112**	**14.7%**
	Light passenger vehicles	29,535	4.4%
	Heavy vehicles	27,946	4.2%
	Light commercial vehicles	40,631	6.1%
Air transportation		**464,645**	**69.8%**
	Domestic	79,238	11.9%
	International	385,407	57.9%
Total		**665,501**	**100.0%**

*CO_2e stands for measuring all greenhouse gases in the form of carbon dioxide equivalents, taking into account their particular impact on atmospheric warning.

Note that CO_2e was measured as much as possible in this report but there are some gaps which are outlined in the *Data and analysis gaps* subsection titled *Accounting for all GHG emissions*.

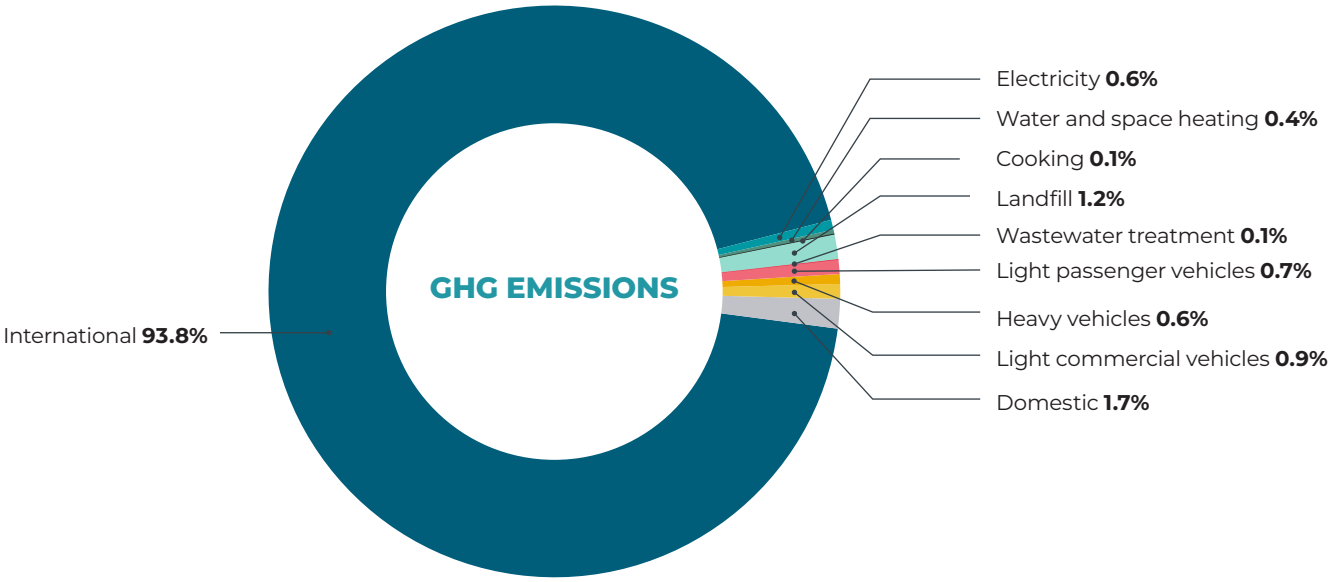


ESTIMATE 2

	EMISSIONS SOURCE	EMISSIONS QUANTITY (tCO_2e)*	EMISSIONS PROPORTION (%)
Stationary energy		**46,231**	**1.0%**
	Electricity	27,295	0.6%
	Water and space heating	16,238	0.4%
	Cooking	2,698	0.1%
Waste		**56,513**	**1.2%**
	Landfill	53,530	1.2%
	Wastewater treatment	2,983	0.1%
Road transportation		**98,112**	**2.2%**
	Light passenger vehicles	29,535	0.7%
	Heavy vehicles	27,946	0.6%
	Light commercial vehicles	40,631	0.9%
Air transportation		**4,338,288**	**95.6%**
	Domestic	79,238	1.7%
	International	4,259,050	93.8%
Total		**4,539,144**	**100.0%**

*CO_2e stands for measuring all greenhouse gases in the form of carbon dioxide equivalents, taking into account their particular impact on atmospheric warning.

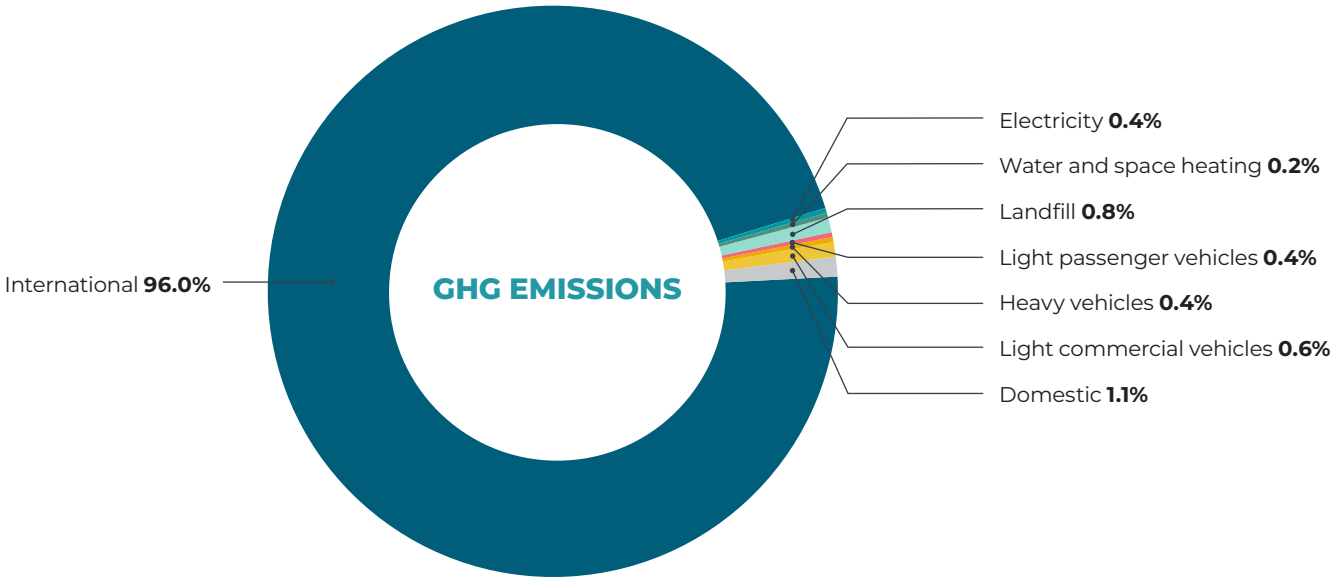
Note that CO_2e was measured as much as possible in this report but there are some gaps which are outlined in the *Data and analysis gaps* subsection titled *Accounting for all GHG emissions.*



ESTIMATE 3

	EMISSIONS SOURCE	EMISSIONS QUANTITY (tCO_2e)*	EMISSIONS PROPORTION (%)
Stationary energy		**46,231**	**0.7%**
	Electricity	27,295	0.4%
	Water and space heating	16,238	0.2%
	Cooking	2,698	0.0%
Waste		**56,513**	**0.8%**
	Landfill	53,530	0.8%
	Wastewater treatment	2,983	0.0%
Road transportation		**98,112**	**1.4%**
	Light passenger vehicles	29,535	0.4%
	Heavy vehicles	27,946	0.4%
	Light commercial vehicles	40,631	0.6%
Air transportation		**6,804,054**	**97.1%**
	Domestic	79,238	1.1%
	International	6,724,816	96.0%
Total		**7,004,910**	**100.0%**

*CO_2e stands for measuring all greenhouse gases in the form of carbon dioxide equivalents, taking into account their particular impact on atmospheric warning. Note that CO_2e was measured as much as possible in this report but there are some gaps which are outlined in the Data and analysis gaps subsection titled A



APPROACHES TO ESTIMATE INTERNATIONAL AIR TRANSPORTATION EMISSIONS

Accurate data on the quantity of GHGs associated with aviation emissions is difficult to ascertain and making decisions on assigning responsibility to the visitor economy for portions of aviation emissions is a challenging exercise. It is clear from the visitor economy GHG emission assessment above that the approach used to calculate international aviation emissions significantly changes the emissions profile. Therefore it is important to give this area particular attention. Below is an overview of the approaches taken to calculate international aviation emissions.

Estimate 1

Estimate 1 borrows from the emissions inventory work that has been conducted for the district by ORC and QLDC and resulted in an estimate of international aviation emissions of 385,407 tCO_2. Previous inventories and data sets were used in combination to create an estimate of international aviation emissions. The inventories used were ORC's Otago greenhouse gas inventory, Statistics NZ regional greenhouse gas inventory, and StatsNZ's Tourism Satellite Account. Please see Appendix B for more methodology details. While this method provides us with an initial estimate, there are some notable gaps that result in a GHG inventory that most likely underestimates international aviation emissions. The inventories leveraged have a combination of the methodology gaps and assumptions as outlined next.

Characteristics and assumptions

- Only emissions from airlines domiciled in New Zealand (such as Air New Zealand) were accounted for.
- Only one leg of return trips was accounted for (i.e., a one-way journey).
- Only emissions associated with fuel sold at the airport were accounted for.
- If a visitor's journey included multiple flight connections, it only accounted for the last flight in the journey that landed in Queenstown Airport.
- Domestic flight emissions were estimated using the fuel sold at the airport.
- A Radiative Forcing Index (RFI) was not accounted for, which measures the impact of non-CO_2 emissions.

Estimate 2

Estimate 2 was pursued in order to address the gaps present in Estimate 1. This estimate has a different set of characteristics and assumptions as outlined below. This 2018 international aviation emissions assessment resulted in an estimate totalling 4,259,050 tCO_2e. Please see Appendix C for the calculation breakdown and assumptions.

Characteristics and assumptions

- The total return trip from point of origin is attributed to the Queenstown Lakes visitor economy.
- A Radiative Forcing Index of 1.9 is used, which is based on the IPCC Sixth Assessment Report[14].
- Emissions are not attributed to other destinations that may have been part of the itinerary[15].
- Includes trips from any international visitors who are travelling for leisure or business purposes and are visiting for less than 365 days.
- Uses specific aircraft emissions profiles.
- IATA emissions calculator and its methodology is relied upon.

14 *IPCC Sixth Assessment Report* represents the consensus view of many credible climate scientists. Chapter 3 of the report provides a detailed assessment of the physical science basis of climate change, including the radiative forcing caused by various greenhouse gases, including carbon dioxide (CO_2) emissions from aviation. It should be noted that this RFI of 1.9 is lower than some other scientific studies calculated such as the RFI of 3 proposed by Lee *et al's The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018.*

15 It is recognised that if every destination adopted this approach there would be a double counting issue. Currently we do not know of any destination around the world that is accounting for even a portion of their international aviation emissions. If this methodology were to be adopted it would be in the spirit of taking a leadership position and attempting to estimate the full risk to the visitor economy.

Estimate 3

Estimate 3 uses the same methodology as Estimate 2 but adjusts one key variable. There are certain variables that can significantly change an aviation emissions estimate. One of the most significant variables in the Radiative Forcing Index (RFI) used. A third estimate was pursued to account for research from some scientists who argue that the RFI of 1.9 does not fully represent the impact of aviation emissions. Research conducted by Lee et al indicates that an RFI of 3 may be more accurate[16]. This 2018 international aviation emissions assessment resulted in an estimate totalling 6,724,816 tCO_2e. Please see Appendix C for methodology details.

Characteristics and assumptions

- The total return trip from point of origin is attributed to the Queenstown Lakes visitor economy.
- A Radiative Forcing Index of 3 is used, based on research conducted by Lee et al[17].
- Emissions are not attributed to other destinations that may have been part of the itinerary.
- Includes trips from any international visitors who are travelling for leisure or business purposes and are visiting for less than 365 days.
- Uses specific aircraft emissions profiles.
- IATA emissions calculator and its methodology is relied upon.

The aviation decarbonisation challenge

Aviation is one of the most difficult sectors to decarbonise, as stated by the International Energy Agency (IEA) report titled *The Future of Aviation*[18]. This report assesses the challenges and opportunities for decarbonizing the aviation sector and notes that significant technological breakthroughs will be required to achieve deep decarbonisation. Additional research and development is necessary to develop and scale sustainable fuels, assess sustainable feedstocks. Further development is also required in the areas of efficient production storage and use of green hydrogen and e-fuels. In addition to sustainable fuel types, some solution pathways will require airframes and supporting infrastructure to be redesigned. Finally, even some sustainable aviation solutions will still have to contend with the non-CO_2 climate impacts of their implementation. Therefore, regardless of the methodology used to estimate aviation emissions, this emissions source presents one of our greatest challenges in reaching the carbon zero vision.

There are various GHG intensities associated with source markets. Markets that are further away will have a larger aviation footprint. Longer haul flights will also be the last to decarbonise via technological improvements to clean aviation solutions. Below is a table that estimates GHG emissions from a selection of source markets on a per passenger basis for a round trip.

16 *Lee et al. The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018 (2021).*

17 This research estimated a higher RFI for aviation CO_2 emissions than the IPCC's estimate by taking into account a wider set of indirect effects of aviation emissions.

18 International Energy Agency (IEA). The Future of Aviation (2020).

FLIGHT GHG INTENSITY OF SELECT MARKET SEGMENTS[19]

Source market	GHG footprint per passenger (tCO_2e)[20]
New Zealand (Auckland)	0.32
Australia	0.90
China	2.17
USA	3.24
UK	4.11

Distinguishing between Queenstown Airport's emissions and visitor economy aviation emissions

It is important to note that the emissions associated with Queenstown Airport's activity and the Queenstown Lakes visitor economy's aviation emissions are two very different calculations. The Queenstown Airport's international aviation emissions only represent a subset of the visitor economy's actual international aviation emissions. A key purpose behind the visitor economy's carbon zero vision is to intentionally acknowledge the current dependency of the visitor economy in Queenstown Lakes on visitors who arrive via carbon intensive methods.

Key considerations

There is uncertainty associated with assessing international aviation emissions based on the data available and the attribution of responsibility. These analyses outline a range of estimates for Queenstown Lakes' international aviation emissions, which is a helpful starting point to understand the magnitude of this emissions source. Certainly there is room for improvement in calculating this emissions source which is reiterated in the *Data and analysis gaps* section below. There are also a number of key questions that we can ask ourselves as we confirm an appropriate methodology for calculating aviation emissions.

Considerations when selecting a methodology and determining assumptions:

1. What constitutes a "visitor"?
2. How far back in the visitor's journey do we need to go in order to attribute emissions to Queenstown Lakes' visitor economy?
3. How do we apportion responsibility of emissions to other destinations visited on the way to Queenstown Lakes?
4. Do we need to account for both legs of the trip or only one

19 The figures in this table use the Estimate 2 approach as outlined above.

20 All emissions estimates are calculated based on an assumption that the passenger flew a round trip in an economy cabin class.

INCREASING ELECTRICITY SUPPLY IS A CRITICAL PRIORITY

There is a foundational need to increase clean electricity supply in order to achieve the carbon zero vision. Electricity-based emissions currently account for 4.1% of the visitor economy's total emissions. This relatively low proportion may provide a false impression of the importance of the electricity system's role in the decarbonisation transition. The low proportion of emissions is a result of the fact that electricity generated in New Zealand is approximately 85% renewable, and therefore has a very low emissions footprint (by international standards).

Despite only creating 4.1% of emissions, electricity provides nearly 30% of the district's non-aviation energy needs. The remaining 70% is provided largely by petrol, diesel, coal and LPG. For most (but not all) of these activities, the lowest cost way to decarbonise will be through electrification – electric vehicles, heat pumps, and induction hobs – which will, in turn, significantly increase the district's demand for electricity[21]. Further, electrifying aviation will require significant electricity supply.

The district's electricity needs are met entirely from the national grid, with the exception of small local hydro[22] and a small amount of rooftop solar. Both Queenstown and Wānaka are reliant on a small number of large power lines that connect them to the grid. The increase in electricity demand from decarbonisation, as well as the inevitable increase in demand that will arise through growth in-district population and commercial activity, will very soon outstrip the present-day capacity of existing power lines.

Achieving the vision of carbon zero (as well as important co-benefits arising from increasing resilience to natural hazards) will require further investments in the infrastructure that connect the district to the national grid. The district is working with Transpower, Aurora and Powernet to ensure these investments are well-timed to meet any demand growth that cannot be met through local, decentralised and resilient solutions. However, continued reliance on the national grid has the disadvantage of creating Scope 2 emissions, resulting from the use of coal and natural gas in the national electricity supply[23]. In a number of scenarios, it will also leave the district exposed to the risk of a failure in these key assets in the event of a natural hazard. There are a number of ways to address resilience; simply expanding the capacity of the existing network does not achieve this. Either commissioning different connections to the grid (thus diversifying the network supply) or investing in reliable local generation and storage (discussed below) are required for resilience to be improved.

Efforts to upgrade the network infrastructure need to be complemented by an increase in local supply from zero-carbon electricity, such as solar. Since many areas of decarbonisation will rely on a clean and resilient supply of electricity, addressing the electricity system is considered a foundational area of action. A comprehensive local study of the barriers to investment in solar (residential and utility-scale) is critical. Enabling homes and businesses to smartly use their appliances and charge their electric vehicles is also an important part of the puzzle, as is understanding how natural hazard resilience can be improved.

Addressing clean electricity supply is a foundational area of activity. Foundational areas of action are explained in more detail in a subsequent section called *Foundational Initiatives*.

21 We note that, even if locally-produced hydrogen is contemplated as a low-carbon fuel, it requires significant amounts of electricity to be produced, if done by electrolysis. Lower electricity-intensive ways of producing hydrogen are available, however.

22 Wye Creek and Oxburn

23 We acknowledge the government's aspiration of 100% renewables, but note that renewable geothermal – currently ~15% of the national supply – still produces greenhouse gas emissions. Hence even if coal and gas was removed from the electricity system, some emissions would remain.

IN-DISTRICT VS. OUT-OF-DISTRICT EMISSIONS

As a community, we have varying amounts of control and influence to reduce certain types of emissions. One key factor is whether the GHGs associated with the tourism sector were emitted within the district or not.

In-district emissions

Emissions that occurred within the district total 200,856 tCO_2e. The top sources, in descending order, of in-district emissions include landfill, light commercial vehicles, light passenger vehicles, heavy vehicles, and electricity.

IN-DISTRICT EMISSIONS

Emissions source	Emissions quantity (tCO_2e)	Emissions proportion (%)
Landfill	53,530	26.7%
Light commercial vehicles	40,631	20.2%
Light passenger vehicles	29,535	14.7%
Heavy vehicles	27,946	13.9%
Electricity	27,295	13.6%
Water and space heating	16,238	8.1%
Wastewater treatment	2,983	1.5%
Cooking	2,698	1.3%
Total	**200,856**	

This breakdown assumes that all road transportation, waste and stationary energy emissions occurred within the destination. We know that there are some exceptions to this, but more research would be needed to determine these nuances. For example, road transportation emissions were calculated based on the total fuel sold within the region. Some of this fuel would be purchased locally and then consumed enroute to another destination, and some fuel, that is unaccounted for in the current methodology, would be purchased outside the destination and used to travel here. Accounting for general aviation, such as tour helicopters, within this category is also a current gap. Current accessible data sources were not able to separate in-district general aviation from domestic aviation, so the entire category is accounted for in out-of-district emissions. However, this breakdown gives us a starting point to understand the rough proportion of emissions origination.

Out-of-district emissions

Emissions that occurred outside of the destination range depending on the approach used to estimate international aviation emissions. Estimate 1 results in a total of 464,645 tCO_2e, Estimate 2 results in a total of 4,338,288 tCO_2e, and Estimate 3 results in a total of 6,804,054 tCO_2e. In all cases, these totals are made up of both domestic and international aviation emissions.

See Appendix C for approaches to estimating international aviation emissions.

OUT-OF-DISTRICT EMISSIONS (ESTIMATE 1)

Emissions source	Emissions quantity (tCO_2)	Emissions proportion (%)
International air transportation	385,407	82.9%
Domestic air transportation	79,238	17.1%
Total	**464,645**	

OUT-OF-DISTRICT EMISSIONS (ESTIMATE 2)

Emissions source	Emissions quantity (tCO_2)	Emissions proportion (%)
International air transportation	4,259,050	98.2%
Domestic air transportation	79,238	1.8%
Total	**4,338,288**	

OUT-OF-DISTRICT EMISSIONS (ESTIMATE 3)

Emissions source	Emissions quantity (tCO_2)	Emissions proportion (%)
International air transportation	6,724,816	98.8%
Domestic air transportation	79,238	1.2%
Total	**6,804,054**	

KEY TAKEAWAYS

- There are certain emissions categories that occur within the destination that may present more immediate opportunities to decarbonise. This could include addressing fossil fuel based road transportation and landfill emissions, for example.
- Moving visitors to and around the destination are the most emissions intensive activities.
- International aviation (especially long-haul) represents the majority of emissions using all three calculation methods outlined.
- Regardless of which international aviation assessment is most accurate, we are left with similar conclusions; long-haul aviation is emissions-intensive.
    - The aviation challenge will require consolidated leadership and advocacy efforts from key organisations within the district's tourism system, so that in-district businesses can focus on the decarbonisation of their operations.

Request for feedback

There are a range of methodologies and approaches that can be used in assessing the visitor economy emissions for the district which we will continue to consider. We encourage feedback and discussion regarding this area of analysis. We have also outlined some ways that the assessment could be strengthened on the following pages.

FUTURE IMPROVEMENT AND DISCUSSION QUESTIONS

DATA AND ANALYSIS GAPS

There are numerous areas where additional, or more granular data and analysis would be desirable. However, the level of detail of this initial assessment should not prohibit action. We are confident that this estimate is appropriate to begin planning and acting while improving measurement over time. From a materiality perspective, we have provided primary and secondary areas that warrant additional resourcing in order to develop the carbon zero roadmap.

Primary areas of need

Attribution to visitor economy:

Emissions inventories typically are tied to either the type of fuel, or sector of the economy. As Tourism is a cross-sectoral industry (as measured by Stats NZ), portions of these underlying estimates need to be attributed to tourism. Our approach has used a mix of "allocators", all of which are imperfect.

Aviation:

Aviation emissions, both domestic and international, would benefit from additional analysis leading to higher accuracy assessments. Further assessment would also benefit from consensus on attribution of responsibility that is assigned to the district, as this alters the methodology and results significantly. There are currently a range of estimates associated with this emissions category, particularly international aviation.

Marine emissions:

Accounting for marine emissions, specifically marine transportation emissions is currently a gap in analysis. Further assessment into this emissions course would be beneficial in the future. Attribution of responsibility to other destinations, based on a visitor's multi-stop itinerary, could come into consideration during this exercise.

Fossil-fuel consuming devices:

There is currently no way to estimate the number of fossil-fuel consuming devices (heaters, vehicles, cookers) in a district or tourism economy. Vehicle registration data faces a number of challenges at the district level, and there is no database of commercial diesel or coal boilers <500kW, or gas hobs and gas hot water systems. Knowing the number of devices would help form estimates of the magnitude of funding and financing required, and trades-based workforce, that might be required to decarbonise. Some data are already collected by industry, for example ski fields and the CDEM networks collect data on diesel consumption in generators.

AFOLU (agriculture, forestry and other land use):

Previous GHG analysis was used to assess emissions from agriculture as well as LULUCF (land use, land use change and forestry); however, there currently isn't an effective method to attribute the proportion of these emission categories that the visitor economy should take responsibility for. Total emissions for the region for these categories are 71,923 tCO_2e for agriculture and -162,000 tCO_2e for LULUCF. Further research and analysis is required in this area.

Regional Carbon Dioxide Removal (CDR) potential:

It is important to understand the region's potential to remove carbon locally. There are some groups working on this but more analysis could be conducted in partnership.

Secondary areas of need

In-district vs out-of-district transport fuel usage:

At a national level, Stats NZ reports that household use of private vehicles for domestic tourism is the second largest source of emissions in the tourism industry, behind aviation. At a regional and district level, current emissions estimates for road transport are based on fuel sold in the district. We have no way of knowing whether this is a good representation of the fuels consumed in travelling to the district. This is especially important for domestic households using their private car for tourism purposes. This could be informed by, for example, an updated version of Byett, Welvaert, Stroombergen and Patterson (2018) which modelled visitor flows around the South Island.

Accounting for all GHG emissions:

This report leveraged a collection of previous studies to determine the emissions for the visitor economy. Each of these previous studies incorporated various levels of comprehensiveness when accounting for all types of GHG emissions. Future research and analysis could attempt to close some of these non-CO_2 emissions gaps.

Embedded product emissions:

These would be the emissions associated with the production of visitor economy goods. This could include both domestically produced and imported goods. There will be challenging considerations around the attribution to the district's visitor economy.

Refrigerants:

Refrigerants and their associated emissions have not been included in this paper, and it was difficult to find information of this GHG inventory category in other reports. Refrigerants are a key source of emissions. Once this emission type is estimated it would have to be proportionately attributed to the visitor economy.

Tourism industry offsets and carbon dioxide removal (CDR):

Some actors in the tourism industry are making offset or CDR purchases or participating in conservation efforts. The current investment levels and corresponding aggregate amount of CO_2 mitigation and removal is unknown.

DISCUSSION QUESTIONS

- Which GHG emitting activities should the visitor economy take responsibility for and in what proportion? This can be particularly difficult to decipher with products/services that residents share:
  - Hospitality industry emissions
  - Public transport and private ride-sharing services (e.g., taxis)
  - Medical industry emissions
  - Landfill and wastewater related emissions
  - Construction emissions and embodied building material emissions
  - Agriculture emissions
  - Forestry and other land use emissions
- Proportion of responsibility for transportation emissions
  - Should the destination take responsibility for all travel to and from the destination, or just one-way?
  - If an itinerary has multiple stops, how should we apportion the visitor's transportation emissions?
  - How much can Queenstown Lakes influence visitor demand?
- Which kinds of carbon removal should we pursue in eliminating residual emissions from hard to abate sectors
- What level of GHG measurement accuracy is necessary before beginning to take action?

Request for feedback

Our team will continue to explore ways in which we can improve data and analysis in the future. Please contribute your thoughts regarding the further areas for improvement, comments for discussion questions, and feel free to submit additional discussion questions that should be considered.

SCENARIOS

A key need to develop an effective decarbonisation roadmap is to develop scenarios that will inform potential paths of action. Four important parameters that exist across different scenarios include, the volume of visitors, where visitors originate from, the GHG intensity of transportation to the destination and the GHG intensity of activities of visitors while in the destination. When these parameters are adjusted via particular initiatives, the resulting operating environment changes.

Any path forward will consider these parameters. To determine possible pathways in a roadmap to decarbonise, we will need to consider scenarios for optimum levels of visitation, transportation emissions-intensity & distance and in-destination emissions-intensity.

PARAMETERS	DESCRIPTION
Visitor volume	Each visitor has a GHG footprint. Adjusting the number of visitors will affect the region's total emissions. Length-of-stay and yield-per-visitor are important sub-variables.
Visitor origin	Visitors from further away are generally associated with a higher GHG footprint. Influencing the origin of visitor markets will have significant impacts.
Transportation GHG intensity	How visitors get to the destination constitutes the majority of their GHG footprint.
In-destination activity GHG intensity	Decarbonising the activities that visitors participate in while in the destination will reduce their carbon footprint.

POTENTIAL SOLUTIONS

APPROACH

The potential solutions are organised into the categories of the main sources of emissions. At this point we are taking an approach of presenting numerous potential solutions for discussion. The next step, after we've gathered feedback, is to evaluate the solution set against weighted criteria in order to prioritise solutions. For example, any solution pursued will be evaluated against its ability to enable a just transition that doesn't exacerbate inequalities. An initial set of proposed evaluation criteria can be seen below in the section *Evaluating Solutions*.

The main emission source categories are stationary energy, waste, road transportation, and air transportation. While many solutions will be associated with a particular emissions source, we have also created a category to outline solutions at a systems level. These initiatives are the types of actions that are necessary in order to enable subsequent actions across sectors.

The idea with any solution, but particularly with systems level solutions, is to create an environment to encourage positive socio-economic tipping points. Creating effective solutions requires consideration of the 'jobs to be done' rather than presuming a one-to-one replacement of existing technology. This approach allows for a wider solution-set that includes behaviour change. For example, we don't necessarily need to replace all internal combustion vehicles (ICE) vehicles with electric vehicles (EVs). Focusing on the jobs to be done allows us to reimagine how to address transportations needs with a broader solution set.

SOLUTIONS BY EMISSIONS CATEGORY

Extensive research has been conducted to uncover climate action solutions that are associated with the emissions categories outlined below. The potential solutions presented are either being acted upon in various regions around the world or have been proposed as effective solutions.

CATEGORY		SOLUTION OPTIONS	BEST PRACTICES / CASE STUDIES
System level	**Overarching actions: policy, financing, behaviour change**	- Launch initiatives to educate the community and encourage behaviour change. - Evolve marketing plans and influence partner organisations to change the business mix, attracting market segments with a lower carbon-intensity and higher value. - Implement clean government procurement policy. - Explore a visitor economy price on carbon (used to fund decarbonisation). - Develop a carbon fund to finance decarbonisation. - Structure financing to include climate KPI incentives. - Industry or activity limits/restrictions. - Establish optimal visitor levels. - Building code regulations. - Provide/facilitate grants and concessionary loans. - Explore the spatial planning characteristics most suited to the development of a diversified knowledge economy	- How government procurement can drive down emissions and boost Canadian industry - Financing with climate KPI incentives - White Paper: Destination funding and the impact of tourism taxes on European cities and urban communities - Visiting Amsterdam? New rules issued for tourists as overtourism sparks backlash

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CATEGORY		SOLUTION OPTIONS	BEST PRACTICES / CASE STUDIES
Stationary energy	**Electricity**	**Enhance efficiency.** - Retrofit buildings to improve energy efficiency and reduce greenhouse gas emissions (examples: better insulation and windows, efficient lighting, and advanced heating and cooling systems). - Install living roofs that use soil and vegetation to reduce energy needs for heating and cooling. - Install building automation systems to enhance efficiency of heating, cooling, lighting, and appliances - Introduce building code requirements (net zero, LEED certified, passive house). **Improve the national electricity system to lower the emissions of imported electricity.** - Increase renewable electricity capacity (solar, hydro, wind, geothermal, waste to energy, biomass) - Eliminate fossil fuel energy production (especially coal). - Improve grid flexibility through consistent and complementary forms of renewable electricity, utility-scale storage (pumped hydro and molten salt), small-scale storage (batteries), and demand-response tools (smart thermostats and smart appliances). - Note: while we will advocate for changes at the national electricity market level, we're not willing to solely rely on this approach so we will complement this with local solutions. **Improve local provision of zero emissions electricity supply, storage and flexibility.** - District heating can reduce emissions by heating multiple buildings with hot water from a central plant. - Micro grids to increase energy security and clean energy production. - Install distributed energy sources (batteries and EVs) to enhance the ability to use clean energy sources. - Phase out diesel generators by replacing them with off grid renewable electricity generation and storage systems.	- Assessment of Electricity Decarbonization Scenarios for New Zealand and Great Britain using a Plant Dispatch and Electrical Energy Storage Modelling Framework

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CATEGORY		SOLUTION OPTIONS	BEST PRACTICES / CASE STUDIES
	Water and space heating/ cooling	- Provide financial support to electrify heating and cooling (e.g., heat pumps). - Invest in research and development of advanced biofuels that can be used as a replacement for LPG. - Implement energy efficiency measures in buildings to reduce overall energy consumption. - Increase production of alternative, cleaner energy sources such as solar, wind, and geothermal power.	- San Francisco and other cities ban natural gas
	Cooking	**Facilitate the switch to electric cooking methods:** - Advocate for building code changes. - Bans/regulations. - Rebate programs and grants. - Financing.	- The climate and health impacts of natural gas stoves
Waste	**Landfill**	- Reduce the amount of waste sent to landfills through recycling and composting programs. - Ban single use plastics. - Reduce food waste. - Use efficient food procurement, storage and preparation practices. - Capture landfill methane. - Alternative waste management methods such as incineration, pyrolysis, or gasification. - Facilitate zero waste programs within the visitor economy.	- Zero waste to zero emissions

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CATEGORY		SOLUTION OPTIONS	BEST PRACTICES / CASE STUDIES
	Wastewater treatment	- Implement water conservation measures (low-flow toilets and shower heads) to reduce the amount of water that needs to be treated. - Use more efficient wastewater treatment technologies, such as constructed wetlands or membrane bioreactors, to reduce the energy required for treatment. - Recycle and reuse treated wastewater for irrigation, industrial processes, and other non-potable uses. - Use renewable energy sources, such as solar or wind power, to power wastewater treatment plants. - Incorporate sustainable design principles in the planning, construction and operation of wastewater treatment plants. - Promote public education campaigns to raise awareness about the importance of proper wastewater management and the potential impacts of poor wastewater management on the environment and public health. - Develop decentralised wastewater treatment systems to reduce the energy required to transport wastewater to the treatment facilities (note: the ORC prefers centralised options in order to preserve groundwater quality). - Incorporate greywater systems in buildings to help to reduce the amount of potable water used in buildings and thus reduce the amount of wastewater that needs to be treated. - Methane capture from WWTP to either clean up for bioLPG or run through a gas turbine to produce local electricity.	- Wastewater: From Waste to Resource – The Case of Ridgewood, NJ, USA

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CATEGORY		SOLUTION OPTIONS	BEST PRACTICES / CASE STUDIES
Road transportation	**Light passenger vehicles** **Heavy vehicles** **Light commercial vehicles**	- Expand EV infrastructure. - Provide EV purchase incentives. - Provide EV usage incentives. - Electrify rental car fleets. - Ban ICE vehicles (or just for visitors). - Electrify public transportation and/or use hydrogen. - Make public transportation free. - Invest in high speed rail. - Develop walkable places. - Expand bike infrastructure. - Reduce battery mineral needs: lead with mass transit, e-bikes/biking, and urban density. - Build hydrogen infrastructure. - Encourage adoption of hydrogen vehicles. - Build biofuels infrastructure. - Encourage adoption of biofuel vehicles.	- 14 gorgeous car-free cities around the world - Free public transportation in Glasgow - How to achieve a walking/ cycling transformation - Car rental group Sixt set to electrify up to 90 percent of fleet by 2030 - Achieving Zero Emissions with More Mobility and Less Mining
Air transportation	**Domestic**	- Flights are powered by batteries. - Flights are powered by SAF. - Flights are powered by hydrogen. - Follow France's short-haul ban: where a train or bus could get to the destination in X hours or less.	- Air France-KLM adds biofuel surcharge to plane tickets - The rise of green travel: 2023-2028 - Air Travel – A Sustainable Future
	International	- Encourage short-haul and domestic visitation. - Flights are powered by SAF. - Adopt SAF blending mandates. - Flights are powered by hydrogen. - Minimum fuel efficiency standard for aircraft. - Improved air traffic management and flightpath forecasting. - Flight emissions are removed by carbon removal.	

Evaluating solutions

Once the list of solutions above has been strengthened with community feedback, solutions need to be evaluated and prioritised. This will include a layer of analysis indicating the level of readiness of solutions being considered. A set of criteria for evaluating solutions has been proposed below.

CRITERIA	DESCRIPTION	WEIGHTING
Impact	The potential of an initiative to reduce GHGs.	High
Co-benefits	Gauging the additional social and environmental benefits that an initiative could offer.	Low
Foundational	Is it an initiative that enables other decarbonisation activities? And does it address an issue at its source instead of addressing the symptom?	High
Inclusivity and equity	The solution's ability to contribute to a just and equitable transition.	High
Mana Whenua alignment	Alignment with Mana Whenua values, Māori objectives and economic opportunities.	High
Resilience	The ability for the solution to contribute to community resilience (ability to weather economic, social or environmental shocks).	Medium
Technological uncertainty (TRL)	The level of technological risk associated with the solution.	Medium
Agency	The ability for the parties involved to execute the solution	Medium
Timeframe	The time needed to execute the solution	Medium

CARBON DIOXIDE REMOVAL (CDR)

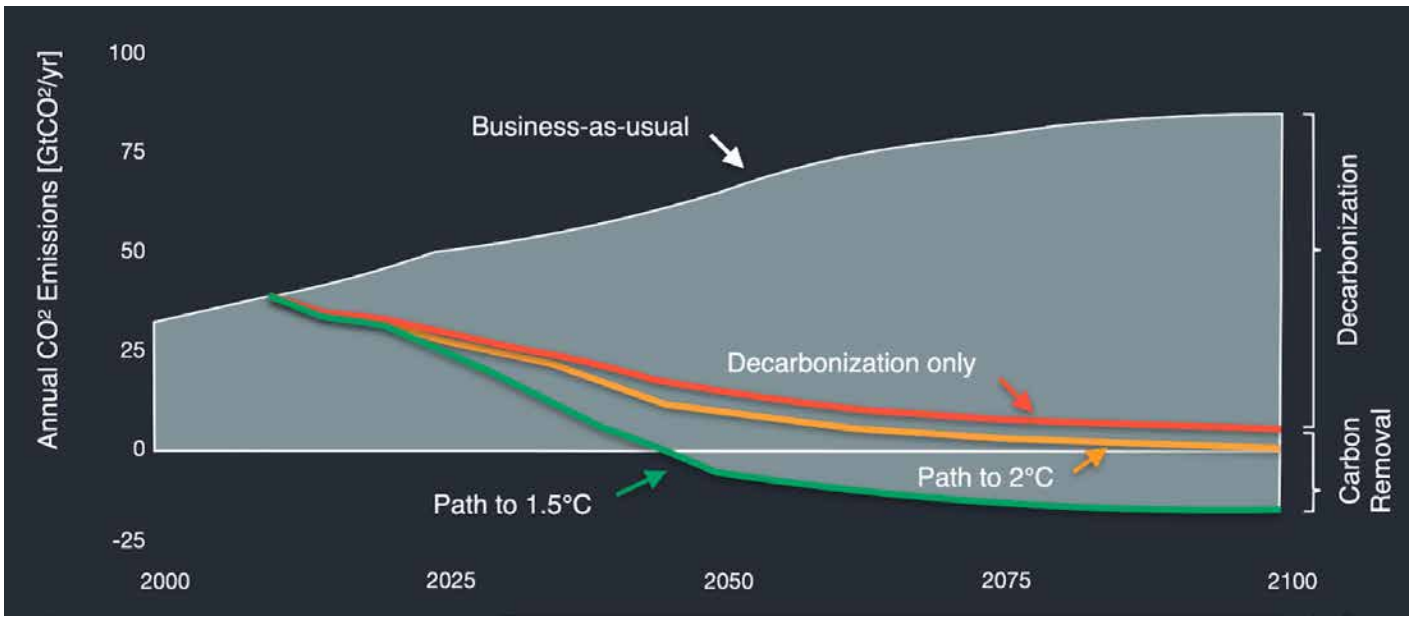
Once all efforts are made to decarbonise the visitor economy, there will very likely be residual emissions from hard-to-abate activities and embedded emissions. In order to account for these emissions, CDR would be necessary. We have chosen a climate mitigation approach that favours CDR instead of offsetting for outstanding emissions that cannot be reduced. According to the latest IPCC report, CDR is especially important for hard-to-abate sectors such as long-haul aviation and industrial processes[24]. CDR is not a replacement for reducing emissions, it is instead a necessary counterpart once all viable emissions reductions strategies have been pursued.

How CDR is pursued is of great importance. Ideally, CDR will occur as close to the district and timing of the emissions generated as possible but this may not always be feasible. CDR solutions will also be prioritised that provide the greatest benefits to local communities, ecosystems and economic diversification.

Offsetting emissions, a potential alternative to CDR, is attracting criticism. A key issue is that the vast majority of currently available offsets do not actually remove CO_2. Instead they fund avoidance activities, which is not a viable long-term strategy to reach carbon zero.

The potential CDR solutions have been organised into nature-based solutions, enhanced natural processes, and technological based solutions. These are the range of CDR solutions that could be considered but not all of these solutions will necessarily be possible within Queenstown Lakes. These solutions are also at different levels of commercial readiness.

The necessity of CDR globally to maintain warming below 1.5°C



The IPCC indicates that all pathways to stay below 1.5°C of warming require CDR (chart modified from the IPCC Special Report on Global Warming 1.5°C).

24 IPCC. AR6 Synthesis Report: Climate Change 2023 (2023).

POTENTIAL CARBON DIOXIDE REMOVAL (CDR) SOLUTIONS

SOLUTION TYPE	DESCRIPTION	READINESS LEVEL	PERMANENCE
Nature-based solutions	Afforestation and reforestation: planting trees and regenerating ecosystems to absorb CO_2.	Proven with some limitations around scalability and permanence.	Decades to centuries
	Restoration of freshwater wetland, coastal and marine habitats.	Proven with some limitations around scalability and permanence.	Decades to centuries
Enhanced natural processes	Enhanced Weathering: spreading minerals over land or in oceans to accelerate the natural process of weathering, which removes CO_2.	Proven at small scales. Needs additional research, development and commercialisation.	Millenia
	Soil carbon sequestration: improving the ability of soil to store carbon through sustainable agricultural practices.	Proven with some limitations around permanence.	Decades to centuries
	Kelp farming + sequestration: growing kelp to absorb CO_2 and then sinking it to the bottom of the ocean.	Needs additional research, development and commercialisation	Centuries
	Biochar/biooil + storage: produced through pyrolysis of biomass, such as wood or agricultural waste, in the absence of oxygen	Proven at small scales. Commercialisation and scalability is still a work in progress	Decades to Millennia
	Ocean alkalinity enhancement: adding alkaline substances to the ocean, such as limestone, which reacts with the dissolved CO_2 and increases the ocean's pH level.	Experimental phase, and its long-term effects on marine ecosystems are not yet fully understood	Decades to centuries
	Bioenergy with Carbon Capture and Storage (BECCS): using plant matter to generate energy while capturing and storing the resulting CO_2 emissions.	Proven at small scales. Commercialisation and scalability is still a work in progress.	Decades to Millennia
Technological based solutions	Direct Air Capture (DAC): facilities that capture CO_2 from the air using chemical processes.	Proven at small scales. Commercialisation and scalability is still a work in progress.	Millenia
	Concrete mineralisation	Proven at small scales. Commercialisation and scalability is still a work in progress.	Centuries to millennia

EVALUATING CDR SOLUTIONS

Different criteria are important to consider when evaluating different CDR options. These criteria include permanence, additionality, price, and co-benefits.

CRITERIA	DESCRIPTION
Permanence	The solution's ability to verifiably store CO_2 for a long period of time.
Additionality	The action taken to remove CO_2 from the atmosphere is not business as usual.
Price	The cost to remove one ton of CO_2.
Co-benefits	Other positive social and environmental impact in addition to CO_2 removal.
Unintended negative consequences	The level of uncertainty associated with unintended negative social and environmental impacts.

EXISTING CDR ACTIVITIES

CDR activities are already underway in Queenstown Lakes. There are numerous organisations working on nature-based solutions and limited, nascent technology-based solutions.

Request for feedback

The potential solutions listed are not comprehensive and we will continue to engage stakeholders and experts to strengthen them. We encourage feedback to suggest more solutions as well as comment on certain solutions if you have concerns. Any comments around the types of criteria that should be considered to evaluate solutions would also be helpful.

AN ECOSYSTEM OF ACTIONS

ENABLING RAPID CHANGE

An effective roadmap to carbon zero by 2030 requires that a theory of change needs to be defined. There are a number of different friction points that will need to be removed. Decarbonisation is a significant undertaking that requires many complex, coordinated, and interrelated actions. Various enabling functions will be required that will need to be defined in the roadmap. The high level of ambition called for by the DMP will require widespread support that can be increased over time.

At this stage, it is clear that various known actions are needed and other opportunities have arisen. Activities can serve different purposes; learning, inspiring change or foundational to decarbonisation. Activities will have optimal impact if timed appropriately relative to one another.

Below is a high level example of the sequencing of action types. This is an illustration of how specific actions should be timed when finalising the roadmap.

	2023	2024	2025	2026	2027	2028	2029	2030
PILOT PROJECTS	X	X						
LIGHTHOUSES	X	X	X	X				
FOUNDATIONAL INITIATIVES	X	X	X	X	X	X		
ENABLING CHANGE / REMOVING FRICTION	X	X	X	X	X	X	X	X
MEASUREMENT AND VERIFICATION	X	X	X	X	X	X	X	X

PILOT PROJECTS

The objective of pilot projects is to test assumptions and learn quickly. We have observed a willingness to share learning between organisations that might typically be seen as competitors. Pilots should identify learning and celebrate failure, so that small early mistakes can de-risk larger follow-on initiatives. This will allow us to allocate resources strategically and rapidly build experience and capacity throughout the community.

Pilot project examples

- Develop EV road trip itineraries
- Install bike racks at bus stops
- Encourage knowledge-sharing of a carbon pricing initiative among early adopters
- Work with one (or more) trade partners to create and trial a zero carbon consumer package
- Implement energy-efficiency pilot with a selection of hotel operators (e.g., My Green Butler)
- Work with one or more existing tourism operators to test business models that don't rely on price discounting for advanced sales
- Work with airline partners to test clean-aviation technology
- Test project(s) that test traveller-willingness to voluntarily pay for decarbonisation/carbon-removal

LIGHTHOUSES

Lighthouses are initiatives that represent quick and/or very visible progress. Quick and visible progress are an important signal to build momentum and inspire a coalition of community members to either contribute to existing initiatives and/or launch their own initiatives.

Lighthouse examples

- Eliminate single use plastics
- Develop gondola access to ski mountain(s) or as a transportation offering
- Deploy electric ferry transportation (e.g., Candela)
- Facilitate the transition of business fleet(s) to EVs
- Develop a solar farm on city owned land
- Develop a hydrogen distribution ecosystem to decarbonise ground transportation.
- Fund existing impact organisations
- Launch a carbon zero innovation centre
- Provide free public transportation
- Convert the fleets of rental car companies to EVs
- Install an underground transmission cable to Kingston
- Deploy drone seeding to regenerate ecosystems at scale
- Attract the first zero carbon flights
- Facilitate the acceleration of rooftop solar and energy storage
- Expand safe active transport routes
- Launch a carbon removal project

FOUNDATIONAL INITIATIVES

These are initiatives that are necessary for other actions to begin and/or they enable subsequent initiatives by creating more favourable conditions. Foundational initiatives should be focused on early in this carbon zero journey, especially since some of these types of initiatives can take significant time to execute.

Foundational initiative examples

- Build a decarbonised and resilient electricity system with adequate supply for the forecasted load associated with mass electrification
- Develop a green-hydrogen market
- Develop a HVO market
- Develop a carbon price/fee/tax to account for externalities associated with GHGs
- Expand EV infrastructure both to and within the district
- Address emissions from waste and wastewater
- Develop infrastructure to support clean aviation
- Work towards understanding and attracting the optimal visitor number and profile
- Identify streamlined mechanisms for GHG measurement
- Expand programs such as the Climate Action Initiative that support businesses to measure emissions and decarbonise
- Implement clean government procurement policy

ENABLING CHANGE / REMOVING FRICTION

Many barriers are preventing the transition to a clean tourism sector. For example; knowledge gaps and resistance to change, higher up-front costs for clean technology, policy, etc. This friction can be removed in a number of ways;

Friction removal initiatives examples

- Lobbying for policy (removing friction and incentivising change)
- Access to finance
- Education and support
- Encouraging innovation

MEASUREMENT & VERIFICATION

Our position on measurement and verification of GHG emissions is that it is very important, but perfection should not come at the expense of near term action. While system wide forms of measurement may have gaps initially, emissions reduction can also be measured at the project level to assess progress.

While there is certainly room for improvement of the initial GHG assessment, we understand the magnitudes of emission sources enough to begin planning and taking action. There are data gaps and challenges associated with achieving a high level of accuracy and these can be worked on iteratively and in parallel to action.

Types of measurement

- The effectiveness of individual initiatives
- Top-down visitor economy GHG assessment (using aggregate data sets to estimate the emissions of a system - similar to this report)
- Bottom up visitor economy GHG assessment (measuring the emissions of every individual actor in the visitor economy)
- Carbon dioxide removed

Request for feedback

What do you think about this approach to taking climate action? Do you have any suggestions?

INITIAL RECOMMENDATIONS

DEVELOP A ROADMAP

This discussion paper is intended to elicit feedback and commentary from interested stakeholders. Based on the response, a Roadmap should be finalised. To develop a comprehensive roadmap that defines pathways for the tourism sector to reach carbon zero by 2030, it will be necessary to:

- Fill gaps in baseline emissions data.
- Develop feasibility analysis and economic analysis of the jobs-to-be-done.
- Understand optimum visitation levels based on carbon intensity and impact on biodiversity.
- Identify existing work streams that can help accelerate this project and identify gaps (focused first on system-change enablement to ensure the onus isn't placed on individuals or businesses alone).
- Fill specific gaps in knowledge/expertise.
- Design pilot projects and scope for implementation.
- Identify friction points for pilot projects to address and potential organisations that could perform functions that are identified as gaps.
- Conduct a tourism business capability assessment and identify solutions to increase capabilities of tourism businesses.

COORDINATED POLICY REQUEST

The vision for Queenstown Lakes to become a climate action testbed will require policy support from local and central government. Widespread electrification is a foundational component of rapid decarbonisation and will require a significant increase in clean energy supply. The ability to test various new technologies may require special exemptions, particularly in the area of mobility. Enabling these types of innovations may require certain policy support.

TAKE A LEADERSHIP POSITION

There will be ongoing decisions to make regarding the quantity of emissions that we take responsibility for as a visitor economy. Catalysing the widespread change that is desired requires proactively taking accountability for all of the possible emissions associated with the tourism economy. This is true even if there are some justifications to pass responsibility on to other regions and actors.

There is also value in building partnerships and collaborating with regions and countries who share responsibility for these cross-border emissions. Taking a leadership position also means facilitating a just transition that protects and supports those most vulnerable to the impacts of pursuing climate action. Queenstown Lakes has an opportunity to play a leadership role in catalysing change, by sharing our learnings to ease the pathway for other districts and destinations.

ACT IMMEDIATELY AND MEASURE ITERATIVELY

There are significant gaps in data. Measurement of greenhouse emissions is difficult at both the system level and for individual businesses. Immediate action is critical. While measuring impact is critical, imperfect data should not be a barrier for action. Individual pilot projects and lighthouse projects should be evaluated for potential impact. The success of those projects should be measured by their effectiveness in reducing carbon emissions. Measuring emissions at an individual-business level will become more important as we progress towards 2030. However, there are a number of system-wide actions that can fundamentally change the emissions profile of the landscape that operators exist within.

COORDINATE AND ENABLE WIDESPREAD ACTION

Decarbonisation is a complex task that requires action across all industries and aspects of society. We must connect and coordinate all the silos that society often operates around. This extends beyond the district to build partnerships with other regions and countries. Decarbonising the visitor economy requires a layer of coordination and facilitation that enables widespread action without centralising responsibility, similar to the way mycelium connects and communicates across an ecosystem.

EDUCATION AND EXTENSIVE COMMUNICATION

Regardless of what the final decarbonisation roadmap looks like, it will be essential to support it with ample education and communication initiatives. A critical mass of stakeholder participation needs to be activated. Becoming a hub for decarbonisation also presents education opportunities for others throughout New Zealand and globally to learn and be inspired to catalyse change. The opportunity to build Queenstown Lakes' reputation and diversify the economy as a result of rapid transition requires that people outside of the district are both aware of the efforts and can benefit directly from them.

FEEDBACK

This document is primarily an invitation to collaborate as we begin towards this ambitious carbon zero goal. There are invitations for specific feedback throughout this document. We encourage you to provide feedback so that we can improve our approach, and leverage our community's strengths. Your feedback will directly inform our roadmap to decarbonisation.

FEEDBACK FORM

APPENDICES

APPENDIX A: CLIMATE-RELATED INITIATIVES

GROUP / NAME	LANDOWNER	YEAR(S)	PROJECT TYPE
'Birding NZ' (Whakatipu Birding)	QLDC	Mar-23	Regular bird monitoring training sessions (5MBCs, transects, eBird & Atlas) to build local capacity and capability. Establishing a Whakatipu-wide bird monitoring plan and network. Monitoring design with support from Landcare research & collaboration with existing organisations in the region (SLS, WWT, Mana Tāhuna Charitable Trust). Volunteer-led monitoring.
Akarua Corner (lake Hayes North) Restoration Group	QLDC	Aug 2022 - Ongoing	Reserve enhancement – weed removal/control & native plantings
Arrowtown Choppers	QLDC	started in 2021 - ongoing	Reserve enhancement – weed removal/control & native plantings & maintenance ongoing for the next 5 years including weed control, replacement of guards, and plant losses etc.
Bee the Change	QLDC	2021 - ongoing	Raise awareness and engage the general public about the importance of pollinators and the environment and how what we do has an impact. This is done by installing apiaries (beehives) in public places. Educational signage. Educating Otago Polytechnic students who are enrolled in the New Zealand Certificate in Apiculture (Level 3) utilising Whitechapel Reserve with a Reserve Permit.
Bob's Peak Community Planting Site	QLDC	in progress	Reserve enhancement – weed removal/control & native plantings
Boyes Crescent	QLDC	2021 - ongoing	Reserve enhancement – weed removal/control & native plantings
Bridesdale – LHESCCA	QLDC	Jan 2023 - ongoing	Reserve enhancement – weed removal/control & native plantings
Frankton Track Restoration Group	QLDC	in progress	Reserve enhancement – weed removal/control & native plantings
Friends of Matakauri Wetlands	QLDC	in progress	Protecting and restoring the ecosystem
Gibbston Community Association	QLDC	2021 - ongoing	Reserve enhancement – weed removal/control & native plantings & pest control
Glenorchy Community Association	QLDC	2021 - ongoing	Bible Terrace Restoration – weed removal/control & native plantings Community Native Nursery
Hawea Food Forest	QLDC	2012 - ongoing	An orchard and community gardens aimed at helping the community with food security and education.
Hawea Foreshore Management Group	QLDC	1980s - ongoing	Enhance the biodiversity along the Hawea Foreshore.

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Kerry Drive & Ballarat Street Restoration Group	QLDC	Oct 2022 - ongoing	Reserve enhancement – weed removal/control & native plantings
Kingston Community Association (KCA)	QLDC	2021 - ongoing	Reserve enhancement – weed removal/control & native plantings & pest control
KingsView Primary School	QLDC	in progress	Native plantings
LINZ Lakeweed Management	QLDC	2005 or so - ongoing	Lagarosiphon control in Whakatipu & Wānaka
Mana Tāhuna Charitable Trust	QLDC	2021 - 2025	Jobs for Nature – 4-year operational work scope for Te Wai Whakaata (The Lake Hayes) catchment partnering with the Friends of Lake Hayes Society. Mill Creek Restoration - planting, rabbit control, predator trapping. Wetland Project – In concept
NZ Plant Conservation Network (NZPCN)	N/A	Dec-22	2022 NZ Plant Conservation Network Conference
Precipice Creek Reserve Restoration Group	QLDC	Sep 2022 - ongoing	Reserve enhancement – weed removal/control & native plantings & pest control
QPS (Queenstown Primary School)	QLDC	Jan 2023 - ongoing	Seed to Tree programme – native plantings
Quail Rise Reserve restoration group	QLDC	unknown	Reserve enhancement – weed removal/control & native plantings & pest control
Queenstown Gardens / Te Kararo Trapline	QLDC	Aug 2022 - ongoing	Pest control in Queenstown Gardens / Te Kararo
Queenstown Harvest Community Gardens	QLDC	unknown	Allotments for personal gardening. Provide kai to baskets of blessings and kiwi harvest for community good. Predator control around Matakauri wetlands.
Remarkables Primary School	QLDC	in progress	Native plantings
Rock climbers (name TBC)	QLDC	in progress	Community agreement with local climbers to allow for hawthorn control on Gorge Road crags.
Ruby Island Management Committee	QLDC	1990s - onwards	Contributing to the upkeep of the island for recreation and environmental benefit.
Southern Lakes Sanctuary (SLS)	N/A	2021 - ongoing	Demonstrates the commitment by the people of the Queenstown-Lakes District to do their part in achieving Predator Free 2050. Initiatives include the Conservation Standards workshop and increasing biodiversity through extensive predator control.
St. Joseph's School	QLDC	in progress	Native plantings
Sunshine Bay Wekas	QLDC	2021 - ongoing	A group of residents who are clearing invasive, exotic plants from the QLDC managed walking tracks around Sunshine Bay / Queenstown. They target the removal of the following plants: pine, broom, gorse, willow.

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Te Kākano Aotearoa Trust	QLDC	2011 - ongoing	Wānaka community-based native plant nursery that specialises in propagating plants of local origin (Upper Clutha region) and uses these plants for localised native habitat restoration. We work with local community groups, schools, organisations & businesses in the effort to promote hands-on community land care.
Upper Clutha Wilding Tree Control Group	QLDC	2022 - ongoing	Wilding control
Wānaka Backyard trapping group	QLDC	2019 - ongoing	Predator control through community trapping groups.
WAI Wānaka	N/A	ongoing	Connects the many individuals, community groups, iwi, landowners and businesses undertaking positive work towards building healthy ecosystems and supporting community wellbeing in our region.
WAO	N/A	ongoing	A community non-profit set up to educate, inspire and enable New Zealand communities to move towards a regenerative future. Their mission is to accelerate the transition towards healthy, thriving, diverse, low emission communities. A key program is the Wao Climate Action Initiative, which enables local businesses and schools with the knowledge and tools to calculate their greenhouse gas (GHG) emissions and take action to reduce them.
Wetland Series	QLDC	Apr-23	Educational & community engagement events at QLDC wetlands (Albert Town lagoon, Matakauri wetlands & Shotover wetlands [once vested]). Collaborating with ORC (Brooke), local schools (Shotover Primary confirmed) & WRT. Wetland experts & hydrologists as guest speakers. Planting, bird monitoring & macro invertebrate sampling.
Whakatipu Island Reforestation Trust (WIRT)	QLDC	2003 - ongoing	Restoration of Pig & Pigeon Island – planting, mowing, trail maintenance & hut maintenance.
Whakatipu Reforestation Trust	QLDC	2015 - ongoing	Educate for Nature programme; Jean Malpas Nursery & Community Planting Days of natives.
Whakatipu Rowing Club	QLDC	2022 - ongoing	Reserve enhancement – weed removal/control & native plantings.
Whakatipu Wilding Group (WCG)	QLDC	2009 - ongoing	Wilding Control. WCG is focused on protecting our unique biodiversity and outstanding natural landscapes for the benefit of residents, users, visitors and particularly, for future generations. Volunteer Days – wilding control with hand tools and chainsaws.
Whakatipu Wildlife Trust	QLDC	unknown	Predator Control through community trapping groups across the Whakatipu basin. The WWT is the umbrella organisation for these operational groups (trap lines).

Local government led initiatives

ORGANISATION	INITIATIVE
QLDC	- Climate and Biodiversity Plan - Spatial Plan - Diversification Plan - Waste Management and Minimisation Plan (new regional plan underway) - Organics strategy - Reserve Management Plans - District Plan - Visitor Levy policy – Council is revisiting this and exploring options
ORC	- Regional GHG inventories – 2019/2020 complete, 21/22 underway - Regional GHG scenario analysis (includes one scenario that adopts CBP goal – 1.5 degree science-based pathway for Queenstown Lakes district) - Will also be developing a climate strategy over the next year - Transportation business cases (particularly public transportation)

APPENDIX B: VISITOR ECONOMY GHG ASSESSMENT AND METHODOLOGY

There has been no definitive analysis of tourism-related emissions for the Queenstown Lakes district. There are a number of potential simple methods that could be used to allocate the relatively detailed emissions inventories provided by ORC or QLDC for the district (totalling around 600,000t per annum), to the visitor economy. These include allocating a portion of each type of emissions source to tourism using:

- Tourism's share of district spending.
- Tourism's share of district GDP.
- Tourism's share of resident-equivalent population.

We explored each of these methods. The resulting estimate suggested that the visitor economy produced between 224,000t per annum and 280,000t per annum.

A criticism of this approach is that certain activities (e.g., transport) are significantly more intensive than others (e.g., electricity consumption). It is reasonable to expect that tourism has a different "share" of these emissions sources than the district economy as a whole. In an attempt to rectify this, we analysed StatsNZ's national tourism emissions inventory, applied similar allocators as above - i.e., visitor spending, or GDP in Queenstown Lakes as a proportion of national visitor spending. This yielded estimates of approximately 1,200,000t attributable to the district's visitor economy. This figure - for tourism alone - is twice the district's total GHG inventory as measured by QLDC and/or ORC. The significant increase from the figures above is likely a result of Queenstown Lakes receiving a higher share of international aviation emissions, arising from international flights into Auckland[25].

This led us to seek another method that could consider emissions at a finer granularity than the above estimates, and was partly inspired by Becken and Higham (2021)[26]. This methodology required augmentation of a number of data sources[27], none of which provided the whole picture. The key data sources were:

a. ORC's Otago greenhouse gas inventory analysis for the year ending June 2019, which included Queenstown Lakes estimates by source;

b. Statistics NZ regional greenhouse gas inventory for Otago, 2019 calendar year, which contains emissions by economic subsector;

c. StatsNZ's Tourism Satellite Account, which provides regional "ratios" that quantify key macroeconomic variables to assess tourism's role in the economy, by subsector.

Fundamentally, the tourism ratios in (c) were used to apportion the emissions sources in (a) to tourism. For this to occur, a number of additional assumptions needed to be made:

- How emissions "sources" (e.g., space and water heating) relate to economic subsectors. This was done at a very simplified level, accounting for domestic usage where necessary.
- The degree to which Queenstown Lakes ratios would differ from Otago regional estimates in (c). Conservative judgments about Queenstown Lakes were made, and are shown in bold in Table 1.

25 The ORC and QLDC figures only considered international flights departing from Queenstown Airport.

26 Becken, S. and Higham, J. (2021). The carbon footprint of Auckland tourism. Auckland Unlimited report: Auckland. The main challenge with directly applying this method to Queenstown Lakes district was that this district is a subset of the Otago district, hence the regional StatsNZ figures couldn't be used directly, as was the case in Auckland.

27 We are grateful for the assistance of Adam Tipper from StatsNZ in developing this methodology. However, no responsibility for errors or omissions in these figures should be attributed to Mr. Tipper or StatsNZ.

TABLE 1 - TOURISM RATIOS FOR OTAGO FROM STATSNZ'S TOURISM SATELLITE ACCOUNT, AND ESTIMATES USED FOR THIS STUDY

	Otago Tourism Satellite Account ratio	Estimated Queenstown Lakes district ratio
Retail sales – alcohol, food, and beverages	0.03	**0.1**
Other tourism products	0.06	0.06
Retail sales – other	0.13	0.13
Retail sales – fuel and other automotive products	0.17	0.17
Education services	0.18	0.18
Food and beverage serving services	0.42	**0.5**
Other passenger transport	0.58	**0.7**
Cultural, recreation, travel and tour services	0.58	**0.7**
Accommodation services	0.95	0.95
Air passenger transport	0.99	0.99
Imputed rental on holiday homes	1	1

- These individual subsector ratios were combined into higher-level sector ratios by calculating a GDP-weighted sum. These are shown in Table 2 below (the column "tourism proportion"). Ideally, we wouldn't have to take this approach if emissions were known in each of the subsectors in Table 1 above[28]. However, this is not the case[29].

- The degree to which tourism is allocated indirect (Scope 3) emissions from relatively unrelated sectors (e.g., Construction, Healthcare, Manufacturing). Based on StatsNZ's regional GHG inventory, these sectors account for 360kT of emissions at the regional level. Using sector-relevant GDP allocators, this converts into 55kt at the district level. It is somewhat speculative as to the degree to which the tourism industry is responsible for these emissions. For the figures published, we left the emissions for these sectors in the analysis and apportioned them to tourism per the figures in table 2. This results in a conservative estimate for tourism.

28 StatsNZ's regional greenhouse gas inventory does have emissions at a finer granularity than in Table 2, but this is at an Otago-wide level.

29 Improvements could be made to this if, for example, emissions factors for visitor transport and accommodation could be developed (e.g., CO_2e per visitor night for different types of accommodation, or for different visitor experiences) and combined with data relating to usage of these services.

TABLE 2 - MAPPING OF EMISSIONS SOURCES TO MAJOR ECONOMIC SUBSECTORS, AND TOURISM RATIOS USED

Subsectors	Dominant emissions sources	Tourism proportion	Source of emissions estimates
Retail, Education, Food and Beverage, Accommodation	Space, water heating and cooking	60%	ORC
	Electricity		
	Landfill and wastewater treatment		
Commercial Transport	Light and Heavy Commercial transport	70%	ORC
N/A	Passenger transport	31%	ORC
N/A	Aviation	99%	StatsNZ, MBIE
Agriculture	Ruminant emissions	0%	ORC

The underlying estimates of district emissions, and the conversion into tourism emissions, is shown below.

TABLE 3 - SOURCES OF EMISSIONS ESTIMATES

Emissions source	Data Source	District emissions level	Tourism ratio	Tourism allocation
Water and space heating	ORC (2021)	27,259	60%	**16,238**
Cooking	DETA (2019)[A]	4,530	60%	**2,698**
Electricity	ORC (2021)	45,822	60%	**27,295**
Light Commercial vehicles	ORC (2021) & DETA (2019)[B]	58,045	70%	**40,631**
Bus/truck/marine	ORC (2021) & DETA (2019)[B]	39,923	70%	**27,946**
Light Passenger vehicles	ORC (2021) & DETA (2019)[B]	95,023	31%[C]	**29,535**
Domestic & Local Aviation	StatsNZ[D]	80,038	99%	**79,238**
International Aviation	MBIE (2020)[E]	389,300	99%	**385,407**
Landfill	DETA (2019)[F]	89,863	60%[G]	**53,530**
Wastewater Tmt.	ORC (2021)	5,008	60%	**2,983**
Agriculture	ORC (2021)	194,861	0%[H]	**0**

We acknowledge that using different sources of emissions data risks a loss of internal consistency. However, since each type of emissions source is estimated independently of others, we do not believe this is a significant additional source of error.

We provide the following explanatory notes in respect to Table 3:

A. Only DETA isolated the emissions associated with cooking (primarily LPG).

B. We used ORC's figure for overall vehicle transport fleet emissions, but DETA had previously broken down the emissions by high-level vehicle category. We used the proportions developed by DETA to disaggregate ORC's figure.

C. The figure of 31% for the light passenger fleet assumed that approximately half of the petrol and diesel sold in the district (38M litres) was from passenger vehicles (the remainder was commercial), and of that half, 25M litres was used by resident households. This was based on an estimate of the size of the district's fleet and average consumption of fuel based on national statistics. Hence the remainder can be attributed to visitors. This is an area desperately in need of better data.

D. Figure supplied by StatsNZ for Queenstown Airport for calendar year 2019. This excludes any flights originating from, or departing to, international (i.e., Australian) destinations. This was higher than ORC's figure for the year end 30 June 2019 (65,000t). We understand both analyses relied on similar data but we have not attempted to reconcile the difference.

E. There are a range of estimates of underlying international aviation emissions, as discussed in the main body of this report. **ORC** estimated international aviation emissions at 60,000t for the year end 30 June 2019, but restricted their focus to flights departing or arriving from international destinations (Australia) directly into Queenstown Airport. We also investigated applying a Queenstown Lakes district tourism GDP-weighting to national estimates of international aviation emissions, in an attempt to pick up broader international aviation emissions beyond just those originating from Queenstown Airport. **StatsNZ** provides a national estimate of international aviation emissions of 3,161,000t[30] for the 2019 calendar year; applying a 10% allocator to Queenstown Lakes district results in 316,000t. However, StatsNZ's approach is based on the residency principle, and only accounts for inbound and outbound emissions from airlines domiciled in New Zealand (i.e., AirNZ). **MBIE** provide an estimate of international aviation emissions as part of its energy sector greenhouse gas emissions reporting[31]. For 2019, this figure was 3,893,000t. MBIE's estimate is based on fuel delivered by New Zealand airports for international flights, regardless of the carrier. Again, applying the Queenstown Lakes district tourism GDP allocator results in 389,300t for 2019. We used the MBIE figure. However, as discussed above, all of these methods are imperfect and contain inherent assumptions about the definition of a visitor, the proportion of a journey that should be considered, what the best allocator for Queenstown Lakes is (relative to other destinations e.g., Auckland where most international arrivals occur), and so on.

30 StatsNZ, Greenhouse gas emissions (industry and household): Year ended 2020 | Stats NZ

31 https://www.mbie.govt.nz/building-and-energy/energy-and-natural-resources/energy-statistics-and-modelling/energy-statistics/new-zealand-energy-sector-greenhouse-gas-emissions/

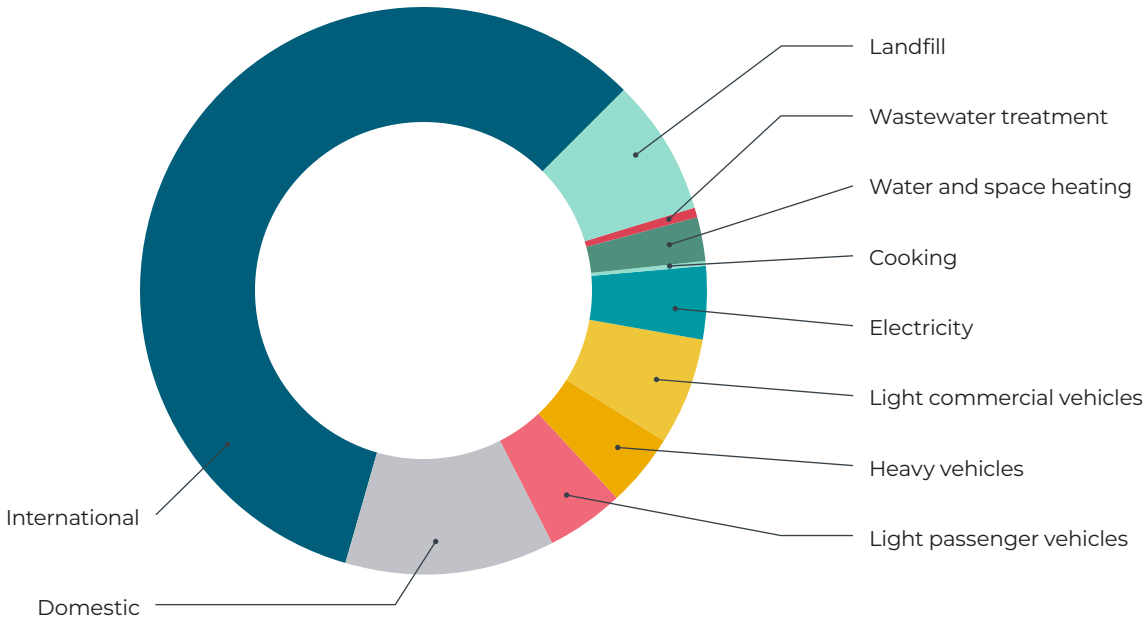
F. We could not determine how ORC's figure of 26,000t was calculated (it was noted as "hardcoded"). Instead, we used DETA's figure, due to it being based on a previous analysis completed by Tonkin and Taylor that was based on actual landfill flows. That said, since Tonkin and Taylor's calculation, the landfill owner has implemented gas capture and flaring, which will have significantly reduced the CH4 emissions from the landfill, converting them into CO_2.

G. We used an allocator associated with hospitality as we expect that the amount of landfill quantities produced by a visitor (relative to the resident population) is approximately proportional to the number of visitor nights.

H. Agricultural emissions in the district bear no relationship to visitor activity. While it is tempting to use this figure as representative of Scope 3 emission associated with consumption of agricultural products by visitors, we have no evidence that this is remotely the case. Hence, we have not made an allocation and strongly recommend this as an area for future research and analysis.

The resulting emissions are shown on the following page.

EST. TOURISM EMISSIONS IN QUEENSTOWN LAKES



APPENDIX C: INTERNATIONAL AVIATION EMISSIONS ASSESSMENT AND METHODOLOGY

This 2018 international aviation emissions assessment resulted in an estimate totalling 4,259,050 tCO_2e. The methodology and calculations table are presented below.

Key sources of information

- International Visitor Survey (IVS)[32]
- IATA (International Air Transport Association) Connect Calculator[33]
- IPCC Sixth Assessment Report - Working Group 1: The Physical Science Basis[34]
- Flight Connections[35]

Process

1. First, the number of international visitors arriving by country of origin needed to be determined. This was estimated using the Queenstown Lakes International Visitor Survey.
2. Next the departure and arrival airport were estimated. Since the International Visitor Survey only provided a country of origin for each visitor, a departure and arrival airport needed to be assumed. For the purposes of this estimate the departure and arrival airport was assumed to be the international airport with the largest flight volume within the country in question.
3. A flight route was then estimated using the Flight Connections flight tracker. All flights were assumed to be direct flights where flight routes exist and take the shortest available connection where no direct flight is available.
4. Aircraft seating arrangement by seating class was estimated.
5. With all the above information determined, the calculation was able to take place. The flight route, cabin class, and aircraft type were inputs into IATA's CO_2 footprint calculator (IATA methodology). This was then multiplied by the number of visitors arriving from the country of origin in question, multiplied by 2 to account for a round trip, and multiplied by the Radiative Forcing Index assumed.
6. This process was replicated across each line item in the 2018 International Aviation Emissions Calculations table below and added together to arrive at a total sum.

Assumptions

In order to estimate international aviation emissions a number of assumptions needed to be made. These include:

- All flights are direct where flight routes exist and take the shortest available connection where no direct flight is available (used FlightConnections to determine routes).
- Calculated from the highest volume airport in the country/region of origin.
- The total return trip is attributed to the Queenstown Lakes visitor economy.
- Emissions are not attributed to other destinations that may have been part of a visitor's potential multi stop itinerary.
- All flights are assumed to land in AKL since it is the airport with the largest flight volume in the country.
- Includes trips from any international visitors who are travelling for leisure or business purposes and are visiting for less than 365 days.
- Uses specific aircraft emissions profiles of the aircraft suggested by IATA based on the flight route.
- Cabin class breakdown assumed based on aircraft layouts of flights that arrive at AKL:
  - Economy: 74%
  - Premium economy: 12%
  - Business: 12%
  - First class: 2%
- A Radiative Forcing Index (RFI) of 1.9 is used, which is based on the IPCC Sixth Assessment Report[36].

Sensitivity analysis

With this method of calculating emissions, we are able to isolate and adjust key variables that influence the emissions estimate. Below we have demonstrated how the GHG inventory can change based on different assumptions and attribution of responsibility.

32 Ministry of Business, Innovation and Employment. International Visitor Survey (IVS) (2022).

33 IATA. IATA CO_2 Connect Calculator (2023).

34 IPCC. IPCC Sixth Assessment Report - Working Group 1: The Physical Science Basis (2021).

35 Flight Connections (2023).

36 Chapter 3 of the report provides a detailed assessment of the physical science basis of climate change, including the radiative forcing caused by various greenhouse gases, including carbon dioxide (CO_2) emissions from aviation. It should be noted that this RFI of 1.9 is lower than some other scientific studies calculated such as the RFI of 3 proposed by Lee *et al's The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018.*

2018 INTERNATIONAL AVIATION EMISSIONS CALCULATIONS

Country of origin	Number of visitors	Departure airport	Connecting airport	Arrival airport	Cabin class	Passengers/ cabin class	Trip	Aircraft – first leg	Aircraft – second leg	Aircraft – domestic leg	tCO_2 per passenger – international legs	tCO_2 per passenger – domestic leg	Total tCO_2 w/o RFI	tCO_2 per passenger w/RFI (1.9)	Total tCO_2 w/RFI (1.9)
Africa and Middle East	11,836	RUH	DBX	AKL	Economy	8,759	Round trip	Boeing 737 MAX 8 Passenger / BBJ MAX 8/ MAX 200	Airbus A380-800 Passenger	Airbus A320 Passenger (sharklets)	1.833	0.17	17,544	3.8057	33,332.756
		RUH	DBX	AKL	Premium economy	1,184	Round trip	Boeing 737 MAX 8 Passenger / BBJ MAX 8/ MAX 200	Airbus A380-800 Passenger	Airbus A320 Passenger (sharklets)	2.667	0.17	4,029	5.3903	7,655.951
		RUH	DBX	AKL	Business	1,657	Round trip	Boeing 737 MAX 8 Passenger / BBJ MAX 8/ MAX 200	Airbus A380-800 Passenger	Airbus A320 Passenger (sharklets)	6.919	0.17	10,069	13.4691	19,130.432
		RUH	DBX	AKL	First class	237	Round trip	Boeing 737 MAX 8 Passenger / BBJ MAX 8/ MAX 200	Airbus A380-800 Passenger	Airbus A320 Passenger (sharklets)	8.587	0.17	2,073	16.6383	3,938.618
Australia	372,088	SYD	n/a	AKL	Economy	275,345	Round trip	Boeing 737-800/BBJ2 (winglets)	n/a	Airbus A320 Passenger (sharklets)	0.306	0.17	131,064	0.9044	249,022.127
		SYD	n/a	AKL	Premium economy	37,209	Round trip	Boeing 737-800/BBJ2 (winglets)	n/a	Airbus A320 Passenger (sharklets)	0.306	0.17	21,254	0.9044	40,381.966
		SYD	n/a	AKL	Business	52,092	Round trip	Boeing 737-800/BBJ2 (winglets)	n/a	Airbus A320 Passenger (sharklets)	0.459	0.17	28,085	1.1951	53,361.884
		SYD	n/a	AKL	First class	7,442	Round trip	Boeing 737-800/BBJ2 (winglets)	n/a	Airbus A320 Passenger (sharklets)	0.459	0.17	4,681	1.1951	8,893.647
Canada	23,709	YYZ	DFW	AKL	Economy	17,545	Round trip	Embraer 175	Boeing 787-9	Airbus A320 Passenger (sharklets)	1.823	0.17	34,967	3.7867	66,436.364
		YYZ	DFW	AKL	Premium economy	2,371	Round trip	Embraer 175	Boeing 787-9	Airbus A320 Passenger (sharklets)	2.492	0.17	7,574	5.0578	14,389.846
		YYZ	DFW	AKL	Business	3,319	Round trip	Embraer 175	Boeing 787-9	Airbus A320 Passenger (sharklets)	6.077	0.17	17,773	11.8693	33,769.108
		YYZ	DFW	AKL	First class	474	Round trip	Embraer 175	Boeing 787-9	Airbus A320 Passenger (sharklets)	7.414	0.17	3,596	14.4096	6,832.744
China	201,128	CAN	n/a	AKL	Economy	148,835	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	0.971	0.17	169,820	2.1679	322,658.789
		CAN	n/a	AKL	Premium economy	20,113	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	1.456	0.17	39,244	3.0894	74,563.781
		CAN	n/a	AKL	Business	28,158	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	3.883	0.17	97,821	7.7007	185,859.167
		CAN	n/a	AKL	First class	4,023	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	4.854	0.17	20,209	9.5456	38,397.749
Germany	61,962	FRA	SIN	AKL	Economy	45,852	Round trip	Airbus A350-900	Airbus A350-900	Airbus A320 Passenger (sharklets)	1.938	0.17	96,656	4.0052	183,645.950
		FRA	SIN	AKL	Premium economy	6,196	Round trip	Airbus A350-900	Airbus A350-900	Airbus A320 Passenger (sharklets)	2.908	0.17	22,886	5.8482	43,483.940
		FRA	SIN	AKL	Business	8,675	Round trip	Airbus A350-900	Airbus A350-900	Airbus A320 Passenger (sharklets)	7.753	0.17	58,911	15.0537	111,930.883
		FRA	SIN	AKL	First class	1,239	Round trip	Airbus A350-900	Airbus A350-900	Airbus A320 Passenger (sharklets)	9.692	0.17	12,221	18.7378	23,220.631
Japan	38,424	HND	n/a	AKL	Economy	28,434	Round trip	Airbus A350-1000	n/a	Airbus A320 Passenger (sharklets)	0.911	0.17	30,737	2.0539	58,400.100
		HND	n/a	AKL	Premium economy	3,842	Round trip	Airbus A350-1000	n/a	Airbus A320 Passenger (sharklets)	1.367	0.17	7,087	2.9203	13,465.153
		HND	n/a	AKL	Business	5,379	Round trip	Airbus A350-1000	n/a	Airbus A320 Passenger (sharklets)	3.646	0.17	17,595	7.2504	33,430.724
		HND	n/a	AKL	First class	768	Round trip	Airbus A350-1000	n/a	Airbus A320 Passenger (sharklets)	4.557	0.17	3,633	8.9813	6,901.949
Korea, Republic of	50,494	ICN	n/a	AKL	Economy	37,366	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	1.005	0.17	43,905	2.2325	83,418.613
		ICN	n/a	AKL	Premium economy	5,049	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	1.507	0.17	10,161	3.1863	19,306.684
		ICN	n/a	AKL	Business	7,069	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	4.018	0.17	25,376	7.9572	48,214.903
		ICN	n/a	AKL	First class	1,010	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	5.023	0.17	5,244	9.8667	9,964.183
Rest of Americas	23,088	MEX	LAX	AKL	Economy	17,085	Round trip	Boeing 737 MAX 8 Passenger/BBJ MAX 8/ MAX 200	Boeing 777-300ER Passenger	Airbus A320 Passenger (sharklets)	1.644	0.17	30,992	3.4466	58,885.575
		MEX	LAX	AKL	Premium economy	2,309	Round trip	Boeing 737 MAX 8 Passenger/BBJ MAX 8/ MAX 201	Boeing 777-300ER Passenger	Airbus A320 Passenger (sharklets)	2.287	0.17	6,807	4.6683	12,933.805
		MEX	LAX	AKL	Business	3,232	Round trip	Boeing 737 MAX 8 Passenger/BBJ MAX 8/ MAX 202	Boeing 777-300ER Passenger	Airbus A320 Passenger (sharklets)	5.683	0.17	16,216	11.1207	30,810.567
		MEX	LAX	AKL	First class	462	Round trip	Boeing 737 MAX 8 Passenger/BBJ MAX 8/ MAX 203	Boeing 777-300ER Passenger	Airbus A320 Passenger (sharklets)	6.971	0.17	3,297	13.5679	6,265.114
Rest of Asia	185,528	DEL	HKG	AKL	Economy	137,291	Round trip	Airbus A330-300 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	1.484	0.17	227,079	3.1426	431,449.817
		DEL	HKG	AKL	Premium economy	18,553	Round trip	Airbus A330-300 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	2.226	0.17	53,343	4.5524	101,351.720
		DEL	HKG	AKL	Business	25,974	Round trip	Airbus A330-300 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	5.937	0.17	135,962	11.6033	258,328.445
		DEL	HKG	AKL	First class	3,711	Round trip	Airbus A330-300 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	7.421	0.17	28,167	14.4229	53,517.036
Rest of Europe	111,294	IST	DPS	AKL	Economy	82,358	Round trip	Boeing 787-9	Boeing 767-300 Passenger	Airbus A320 Passenger (sharklets)	1.971	0.17	176,328	4.0679	335,022.318
		IST	DPS	AKL	Premium economy	11,129	Round trip	Boeing 787-9	Boeing 767-300 Passenger	Airbus A320 Passenger (sharklets)	2.956	0.17	41,749	5.9394	79,322.350
		IST	DPS	AKL	Business	15,581	Round trip	Boeing 787-9	Boeing 767-300 Passenger	Airbus A320 Passenger (sharklets)	7.883	0.17	107,550	15.3007	204,345.133
		IST	DPS	AKL	First class	2,226	Round trip	Boeing 787-9	Boeing 767-300 Passenger	Airbus A320 Passenger (sharklets)	9.854	0.17	22,312	19.0456	42,393.220
Rest of Oceania	11,895	NAN	n/a	AKL	Economy	8,802	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	0.277	0.17	3,935	0.8493	7,475.793
		NAN	n/a	AKL	Premium economy	1,190	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	0.415	0.17	835	1.1115	1,586.555
		NAN	n/a	AKL	Business	1,665	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	1.106	0.17	1,821	2.4244	3,460.589
		NAN	n/a	AKL	First class	238	Round trip	Boeing 787-9	n/a	Airbus A320 Passenger (sharklets)	1.383	0.17	369	2.9507	701.972
UK	89,106	LHR	CAN	AKL	Economy	65,938	Round trip	Boeing 787-9	Boeing 787-9	Airbus A320 Passenger (sharklets)	1.993	0.17	142,625	4.1097	270,987.207
		LHR	CAN	AKL	Premium economy	8,911	Round trip	Boeing 787-9	Boeing 787-9	Airbus A320 Passenger (sharklets)	2.99	0.17	33,789	6.004	64,199.091
		LHR	CAN	AKL	Business	12,475	Round trip	Boeing 787-9	Boeing 787-9	Airbus A320 Passenger (sharklets)	7.972	0.17	87,060	15.4698	165,414.240
		LHR	CAN	AKL	First class	1,782	Round trip	Boeing 787-9	Boeing 787-9	Airbus A320 Passenger (sharklets)	9.965	0.17	18,062	19.2565	34,317.394
USA	126,019	ATL	IAH	AKL	Economy	93,254	Round trip	Airbus A321 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	1.536	0.17	159,091	3.2414	302,273.710
		ATL	IAH	AKL	Premium economy	12,602	Round trip	Airbus A321 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	2.195	0.17	35,764	4.4935	67,951.965
		ATL	IAH	AKL	Business	17,643	Round trip	Airbus A321 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	5.596	0.17	87,195	10.9554	165,670.626
		ATL	IAH	AKL	First class	2,520	Round trip	Airbus A321 Passenger	Boeing 787-9	Airbus A320 Passenger (sharklets)	6.912	0.17	17,849	13.4558	33,913.729
	1,306,571										**Totals**		**2,241,605**		**4,259,050**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