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Household Environmental Impacts in New Zealand: A Case Study of Auckland

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Abstract

The New Zealand environmental context is reviewed in light of international environmental efforts and agreements about climate change with a view to understanding why environmental impacts are relevant at the household level. The global, national and local environmental management structure is discussed leading into a discussion of how household environmental impacts have been measured and by whom.

A survey was undertaken of two parts of North Auckland, New Zealand; Torbay and Helensville/Kaukapakapa in order to understand if the international goal of reducing human environmental impact is followed through at the household level. It investigated the environmental impacts of energy use and conservation, water consumption and conservation, waste and recycling, transport, and environmental awareness. Results were compared with similar data around New Zealand and worldwide.

Conclusions show the people of Helensville/Kaukapakapa and Torbay are environmentally conscious but unwilling to alter household infrastructure or behaviour unless it is deemed to be a financially beneficial option for them. Convenience is a factor in household environmental impact in both a rural and suburban context. New Zealand households could be doing more to reduce household environmental impacts, however, where cost or convenience is a barrier this survey shows that they are unwilling to do so. Results also showed that participants gain environmental knowledge primarily from media sources.

Recommendations are made that are aimed at encouraging the uptake of environmental behaviours and increasing environmental awareness. They include increasing subsidies on sustainable changes to houses and the accuracy of environmental reporting in the media and online.

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List of Abbreviations

Abbreviation	Expanded Form
CFCs	Chlorofluorocarbons
CITES	Convention on the International Trade of Endangered Species
DIA	Department of Internal Affairs
DoC	Department of Conservation
ECG	Ecosystem Conservation Group
EEA	European Environment Agency
EECA	Energy Efficiency and Conservation Authority
EPA	Environmental Protection Agency
EU	European Union
GHG	Greenhouse Gas
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
MFAT	Ministry of Foreign Affairs and Trade (New Zealand)
MfE	Ministry for the Environment
MPI	Ministry for Primary Industries
NIWA	National Institute for Water and Atmosphere
NZEPA	New Zealand Environmental Protection Authority
OECD	Organisation for Economic Co-operation and Development
PCE	Parliamentary Commissioner for the Environment (New Zealand)
PIF	Pacific Islands Forum
PPP	Polluter Pays Principle
PSR	Pressure State Response
RMA	Resource Management Act (1991)
UN	United Nations
UNEP	United Nations Environment Programme
USA	United States of America
USEPA	United States Environmental Protection Agency
WB	World Bank
WMO	World Meteorological Organisation
WWF	World Wildlife Fund

1. Introduction

Since the 1970s, the world has been increasingly aware of the impact that individuals, particularly in the developed world, have upon the environment. The United Nations has held several conferences where governments have signed up to such agreements as the Rio Declaration and the Kyoto Protocol. Smaller more regional or common interest groups such as the European Community (now Union) (EU) or the Organisation for Economic Cooperation and Development (OECD) have responded to human environmental impact with programmes for the countries that are members. Individual countries have signed up to agreement and duly responded through legislation or programmes promoting the environment.

New Zealand was a ground-breaker when it instituted legislation against nuclear power and to promote citizen input into plans involving resource use. The Resource Management Act (1991) (RMA) changed the focus of development to promote awareness of environmental impact and make use of local environmental knowledge when decisions regarding resource use and/or development were to be made. Around the same time New Zealand underwent a neo-liberal restructure centralising and regionalising environmental management decisions.

However, environmental impact can only be reduced when individuals and households make changes at the citizen level. New Zealand was, until 2012, a signatory to the Kyoto Protocol with a target of reducing atmospheric carbon production to 1990 levels. Goals such as this are only practical if households reduce their reliance upon private vehicles and/or reduce their use of solid/ fossil fuels. New Zealand relies upon fossil fuel to power most of its vehicle fleet and for 20% of electricity production. High energy use would increase the need to use fossil fuels for electricity production. Reduction of energy use or adoption of alternative forms of energy would change the total environmental impact of New Zealand.

Though small, New Zealand has been a world leader in national and local level environmental management processes. Through the RMA it has allowed for local input in development decisions with indigenous and other residents having their say about the environmental impact a project may have. In addition to local input provided by the RMA, both central and local government have programmes to encourage culture change surrounding individual environmental action. These programmes such as the "tidy kiwi" campaign, "enviro-schools" and the “Environmental Choice Tick” are believed to have had success in encouraging individual actions to reduce waste and purchase sustainable products.

In recent years, central government has acted to promote the reduction of energy consumption through the Energy Efficiency and Conservation Authority (EECA) and have been offering subsidies to eligible residents seeking to retrofit insulation to their homes. Local councils have followed suit providing incentives for local groups and local initiatives through such programmes as the Auckland Council Environmental Initiatives Fund. Local councils are also responsible for the provision of waste management programmes such as kerbside recycling, landfill, waste water treatment and public transport.

In the digital age, the range of options available to governments for educating citizens about environmental concerns is widening. How and what people understand about the environment influences the way they will relate to it. The more people understand about environmental issues the more likely they are to act to remedy them.

Ultimately, it is the individual companies, citizens and households that make decisions regarding changing their own environmental behaviour. What they decide to do will create the results desired by policy makers. Individuals collectively changing their behaviour will add up to the larger changes necessary to mitigate human environmental impact. This, however, takes time, education and knowledge of how individuals are responding to environmental issues.

1.1 Problem Statement

Successive governments have engaged in international talks and agreements, and legislated, in an attempt to remedy the increasing pressures the international community places on the environment. This is likely to be ineffective if citizens do not respond to the call to change their own behaviours and attempt to reduce their own household environmental impacts. Few studies have been undertaken to measure such behaviours and impacts.

1.2 Research Aims

To assess household environmental behaviours and impacts.

1.3 Research Objective

1. Review literature.
2. Design a survey instrument.
3. Identify case study site and implement the survey.
4. Analyse survey results.
5. Write report.

1.4 Importance of Research

Without an understanding of individual behaviours and impacts it can be difficult for policy makers to make informed decisions. Where high-level decision makers create international agreements without citizen buy-in it may be difficult to affect change overall. This research will enable policy makers and practitioners to further understand individual environmental impact and through that make decisions with relevance to households that may encourage further changes in household behaviour and impact. It will add to the developing body of literature regarding individual and household environmental behaviours and impacts.

1.5 Study Limitations

There are a number of limitations to this study. Due to time and cost constraints the sample size is limited to 200 people in each survey area were delivered surveys, reducing the power of the study. Additionally, as no volumetric data was collected, environmental impacts can only be inferred rather than directly measured.

1.6 Study Outline

This thesis consists of a literature review (Chapter 2) in which the theoretical, historical and institutional underpinnings of this study are reviewed and provides the context into which the study fits. Chapter 3 describes how the research was conducted and analysed. In Chapter 4, key results of the study are described. Chapter 5 discusses the findings in comparison with previous studies. The final two chapters discuss the conclusions and recommendations that can be drawn from the research.

2. Literature Review

2.1 Introduction

The purpose of this chapter is to provide a conceptual and historical basis into which this research fits. The research pertains to household environmental impacts. Over time the world has developed an understanding of how human activity, economic activity in particular, impacts the environment upon which it relies. This has occurred at a number of levels over time, the global level, country level, local level and individual level.

The chapter is divided into six sections. The Global Environment provides an historical context for how and why the world began to take seriously the affect of economic activity upon the global environment. Country Responses deals with how the world responded to the international environmental awakening and the failure of the "go it alone" response to a complex global issue. International Organisations and Environmental Management reviews the ways in which the world came together to tackle global environmental issues through multinational organisations. Policies and Protocols for Environmental Management explains the policy context that resulted from the coming together of the nations of the world to tackle issues, such as climate change and the issue of decreasing biodiversity. The New Zealand Context explains the policy system in which this research sits. Households and Environmental Management provides a background to the existing literature about household environmental impacts by taking a "who, when and how" approach to the topic.

The chapter as a whole reviews the ways in which the global policy system has evolved, how it has led to households and individuals taking action and through that provide background to the research. It shows that ultimately, individuals implement the actions needed to create a system based on sustainability.

2.2 The Global Environment

During the second half of the twentieth century a number of philosophers and commentators began to notice that economic activity in industrialised nations was taking a toll on the planet on which we live (Meadowcroft, 2000, reprinted in Dryzek and Schlosberg, 2005). For well over a century, since the industrial revolution, the global ecosystem had been forced to absorb the effects of a number of pollutants and various types of extraction activity (Meadows *et. al.,* 1972 reprinted in Dryzek and Schlosberg, 2005). Visible signs began to be noticed outside of the political sphere. Spangenberg (2002) describes ten environmental problems or signs that the world has come to recognise as important since the start of an international awakening to the importance of the interdependent global ecosystem within which we exist and upon which we depend. These are: "Climate Change, Ozone Depletion, Acidification, Eutrophication, Biodiversity Loss, Soil Erosion, Inland Water Protection, Waste Problems, Health Risks, Depletion of Natural Resources." He notes that these problems can all be reduced or somehow changed through a reduction in human consumption. Spangenberg notes that for consumption to take place three things must exist; materials for use, energy to power the use and space in which to consume. These three things, when taken together, constitute an environment that a human will alter, or impact. Spangenberg goes further to suggest that ultimately there are three drivers behind environmental problems, these are; energy consumption, material flows, and land use. If these three things are altered, environmental impact will change.

2.2.1 International Awakening

Slowly word filtered out of academic communities and onto the world stage as the body of literature describing an anthropogenic environmental impact began to grow. Societies began to see the importance of the interaction between economic activity and changes to the environment upon which they relied to live. Reports, such as the "Limits to Growth" in 1972, sparked a number of international initiatives at the time. However, despite the establishment of the UNEP, also in

1972, few policy solutions translated from conferences to member states, (UNEP 2012 and Noorman and Uiterkamp 1998).

During the late 1960s and early 1970s, public environmental awareness grew through events such as the first Earth Day in April 1970 (USEPA, 2012). Politicians around the world picked up on the idea that the resources we use are finite and that some of the crises that occurred at the time were related to this. Awareness campaigns grew along with public pressure on major international institutions.

Non-government organisations such as the World Wildlife Fund (WWF) had begun promoting the cause of biodiversity and other emerging organisations, such as Greenpeace, contributed to a burgeoning wave of international awareness about society's impact upon the global environment (WWF, 2012; Greenpeace, 2012).

Together, the growing awareness of the international community and the promotion of environmental issues world wide in the 1970s created a picture of "imminent catastrophe" (Beder, S., 2006). The ideas of the 1970s were ideas of using resources but only to the extent that the ecosystem could absorb the use of those resources. It was a decade promoting sustainable living and living within one's means. It was also a decade of growing awareness of what was causing the degradation of the global ecosystem. The 1970s, was followed by an evolution of ideas in the 1980s creating a decade of optimism, as the manifestations of years of exploitation of the ecosystem began to be understood more clearly (*ibid*.).

In the early 1980s, as a result of this new understanding and seeing the need to tackle the environment issue head on, the United Nations commissioned a report that came to be known as the Brundtland Report (1987). This report highlighted the importance of action where inaction previously been the case. It proposed a new view of the interdependence of not just the economy and the environment but also the environment and development. It highlighted importance of cooperation and the necessity of actions over words. The Brundtland Report is

entitled “Our Common Future” emphasising the need to approach environmental concern as a global community rather than as individuals working in an ad hoc manner towards the one goal. It noted that as the world woke up to environmental issues it ignored or compartmentalised the types of human activity that resulted in environmental degradation. The report mentioned the idea that the “crises” being dealt with in the world at the time were not separate crises, as they were being dealt with, but “interlocking crises” that needed to be handled as such (Dryzek and Schosberg, 2005).

The Brundtland Report is credited with bringing the term “sustainable development” into the main stream (Meadowcroft, 2000). It noted that three things needed to happen internationally for environmental crises to be mitigated. The world needed to make more with less, to slow the rate of the world's population and to change the way the economic North consumed, encouraging a more evenly distributed economy (Costanza *et. al.,* 2007). If these things could change economies could grow in a more sustainable manner than previously. The idea that economic activity need not impact the environment too heavily appealed to policy makers, industry and the public alike. However, it is a concept that twenty-five years on from the Brundtland Report has yet to yield results of the type claimed by some at the time (Bellagio Forum for Sustainability, 2012). For the sustainable development principle to work there must be buy-in from all stakeholders within the large and complex system within which environmental stakeholders exist.

Costanza *et al.,* (2007) summarise the situation that began to be understood as follows:

> "We have moved from an early successional “empty world” (empty of people and their artifacts, but full of natural capital) where the emphasis and rewards were on rapid growth and expansion, cutthroat competition, and open waste cycles, to a maturing “full world” where the needs, whether perceived by decision makers or not, are for qualitative improvement of the linkages between components (development), cooperative alliances, and recycled “closed loop” waste flows."

They note, however, that local solutions must be found to local problems, as is the case with environmental problems. The policy direction will be set broadly at the international and national level but must ultimately be implemented locally, by local groups or individuals.

The question is how the world at large adapts to this movement. How policy makers, governments and citizens address the changes occurring to our ecosystem as the world grew to understand it better and the technology to help in that understanding developed would prove to be a truly global question. Despite the growing understanding of the issues the world struggled to reach consensus and was slow to act. The inaction on the global stage led to individual countries taking actions of their own.

2.3 Country Responses to Environmental Challenges

The awakening of global consciousness to the environmental "crises" at hand led to a number of responses worldwide. Initially, these responses were at the nation state level, as it was believed, at the time, that the sovereignty of the state remained paramount. Here I demonstrate that whilst action at the nation state level is important, going it alone would ultimately prove fruitless.

As the global consciousness awakened to the interdependency of the economy and the environment, individual countries began to feel the pressure of an environmental awakening at the domestic level. This led to a range of approaches. Many nations turned to the creation of national bodies to combat environmental issues. Examples of federal or national environmental protection authorities could be found in countries such as the United States of America (www.epa.gov, 2012). Smaller nations, such as New Zealand, sought to place the focus more upon local management of water catchments and other local environmental concerns (to be discussed further in section 2.6). Most developed countries moved to legislate against polluters and to promote national standards of what they

believed to be healthy levels of pollution that the planet could absorb (Beder, 2006).

Countries made up of separate states under a federal system, such as Australia, adopted a state-by-state approach initially (Environment.gov.au). However, it eventually became clear that this type of fragmentation was not the most effective or efficient course of action and a similar model to the United States was eventually adopted. Australia, the United Kingdom and the United States all adopted a national environmental agency framework. However, within this framework there were major differences (Howes, 2005). The United States' EPA framework is deemed by (Howes, 2005) to have been the most comprehensive and successful of the three. The United Kingdom's framework eventually began to take much of its policy ideas from the European Union after an environmental agency for Europe was established. Australia's system is deemed to have been initially poorly constructed and mainly advisory rather than action focussed (Howes, 2005) with much work being undertaken through constitutional loopholes to protect internationally important sites, such as the Great Barrier Reef, by the federal government where states would not act.

Other than the existence of accords such as the Convention on the International Trade in Endangered Species (CITES) there were few international accords to which countries could sign up and be held accountable to in the environmental sphere (Beder, 2006). It was the start of a new era of environmental policy and thinking about the needs of the environment alongside the needs of the economy. Some countries took a top down approach, such as the United States of America through the Environmental Protection Agency and associated legislation such as the Clean Air and Clean Water Acts (1970 and 1977, respectively) (USEPA, 2012). New Zealand, on the other hand, had taken a bottom up approach for many years. A 1981 report called New Zealand's environmental policy structure "piece meal". New Zealand's environmental reforms took a number of years and, as a result of reducing local authorities by 90%, the reforms took a number of years also (OECD, 2007). Though well intentioned, environmental reform proved slow in a number of countries.

While initially some countries went it alone, groups of nations soon came together to create a common framework within which to help better understand their own. Amongst the 36 OECD countries alone, there were at least seven different legislative policy approaches and sets of priorities to tackle extremely complex environmental issues (OECD 1997). Small blocs of nations sharing common interests or geographical area, New Zealand and Australia, for example, worked together at the regional level through the Australia and New Zealand Environment and Conservation Council, which played an advisory role and would remain in existence until 2002 (Howes, 2005). Organisations, such as the OECD and the European Community, later to become the EU, opened environment directorates and were to act on a more international scale, though their membership is small in comparison to some of the larger, more global entities.

Possibly because of the many different approaches within the OECD, it showed itself to be particularly proactive about environmental issues with OECD ministers, in 1991, requesting that the organisation independently monitor the environmental performance of each member state on a regular basis (OECD, 1997). This led to the organisation developing a benchmark set of environmental indicators and policy development systems. It is famous for its internationally used, and often adapted, Pressure-State-Response framework to be discussed in detail at section 2.5.

The OECD were the first group of nations to develop a set of environmental indicators for use by their members to measure progress towards the betterment of a set of environmental issues identified first in the late 1980s/early 1990s and revised, as necessary, over the ensuing twenty-year period. The OECD environment directorate are cognisant of the idea that environmental change takes time. As a result they review environmental performance in member states approximately every ten years. The reports cover three main areas of environmental importance. These are: Environmental Management, Sustainable Development and International Commitments. The main themes are further broken down into subheadings, such as biodiversity and water quality for

example. The reports have been so successful that the OECD has been cooperating with other international organisations to develop similar reporting programmes around the world (to be discussed further at section 2.4) (OECD, 2012).

The European Union opened the European Environment Agency (EEA) in the early 1990s. The legislation for the EEA was passed in 1990 and the organisation established as an agency of the European Union, based in Copenhagen in 1993. Its mandate is twofold:

> "To help the Community and member countries make informed decisions about improving the environment, integrating environmental considerations into economic policies and moving towards sustainability.
>
> To coordinate the European environment information and observation network" – EEA Website

The EEA's primary focus is to allow the European Union to act as a block of nation states regarding environmental policies and responses. It primarily provides data about its own set of indicators to the 32 EU member states to enable them to more effectively manage their environment. It focuses on 11 environmental issues that it deems paramount in the European region, as well as issues that bridge the gap between environmental issues, economic issues and social issues (*ibid.*). Currently, nearly 20 years after its foundation, it works closely with a number of states in neighbouring regions and with a number of other international organizations and interest groups to share information and work to provide a coordinated response to what truly is a global issue.

It was noted, by various groups, including the OECD (1997), that the environmental issues of the day were not entirely global, nor were they entirely bounded by state borders. Countries such as the United States and Canada had concerns regarding air pollution and the resulting acid rain, whereas countries such as New Zealand and Australia, whilst also concerned about air pollution, were more concerned about the resultant ozone depletion and the associated human health effects from over exposure to ultra-violet light (*ibid.*). These

differing priorities would ultimately colour countries' responses to environmental concerns. There is also a similarity between country priorities colouring responses to environmental management concerns and individual responses. This will be discussed in greater detail at Section 2.7.

The fragmentation of the responses shown here resulted in the world coming together as one, in the hope of finding a worldwide consensus regarding the issues at hand, namely climate change and biodiversity loss but also other issues such as oceans management and the future of sustainable growth (Beder, 2006). Reports from both the OECD and the United Nations recognized fragmented and disparate responses to environmental issues as a problem (Brundtland, 1987). The next section will address the response of international organizations to global environmental management issues and show that over time, as countries began working together more closely on environmental management concerns and issues, their responses would evolve into the frameworks that we currently work within.

2.4 International Organisations and Environmental Management

Reports, such as the Brundtland Report (1987) and earlier reports, noted the global nature of environmental concerns such as climate change, air pollution, ozone depletion, biodiversity loss and other concerns. They noted the interdependency, complexity and cross-national reach of environmental concerns. They also noted that the environmental issues coming to the fore were issues that also crossed the economic north-south divide and required a global response to the change to the economic system of the world at large in order to fix the problem that manifested itself through environmental system damage. As a result of the Brundtland Report, a number of conferences were held and a number of international organisations have been taken centre stage on the global environmental policy/action landscape. Organisations such as the UNEP, Intergovernmental Panel on Climate Change (IPCC), the WB and previously discussed groups such as the OECD and EU became household names.

Celebrating its fortieth anniversary in 2012, the UNEP was founded in 1972. It began as a result of the global awakening to environmental issues noted in section 2.2. The UNEP's mission is:

"*To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations*." – UNEP Website (2012)

It focuses on six priority areas, these are: Climate Change, Disasters and Conflicts, Ecosystem Management, Environmental Governance, Harmful Substances, and Resource Efficiency (UNEP, 2012). Each area is interlinked, as, too, are the nations of the world with whom the UNEP works. In 1992, the UNEP hosted the first United Nations Conference for the Environment and Development (UNCED) in Rio de Janiero, Brazil. Known as the "Earth Summit", the 1992 Rio UNCED is seen as one of the turning points for environmentalism worldwide (Dryzek and Schlosberg, 2005). It is particularly famous for the speech by a young Canadian girl who pointed out to the world the changes she sees in her environment on a daily basis and her fear for the future of the planet that her children, grandchildren and so on will inherit (UNEP, 2012). The UNCED is held on a ten yearly basis. Since Rio 1992, there have been two more, one in Johannesburg in 2002, known as the World Summit on Sustainable Development, and Rio+20 held in 2012 in Rio de Janeiro. The UNCEDs and the accords that came out of them are discussed in detail at Section 2.6.

The UNEP is not solely responsible for hosting conferences. It is an advisory body on the six aforementioned priority areas. It works with scientists, governments, non-government organisations and private sector groups to develop guidelines and provide technical information to those who require it. It follows the UN ethos of collaboration and works with other groups to ensure that information flows remain open. (UNEP, 2012)

The UNEP has a number of scientific advisory groups that provide it with technical advice. These groups have been set up as and when a major global environmental issue is identified. They include the ECG, the IPCC, and the United Nations Scientific Committee on the Affects of Atomic Radiation, amongst others. The UNEP acts as convenor for these groups and provides oversight, though it does not interfere with the running or findings of each group. (UNEP, 2012)

Of particular interest to this study is the role of the IPCC. The IPCC was established by the UNEP, in collaboration with the World Meteorological Organisation (WMO), in 1988 in response to growing evidence that the earth's climate was changing, a phenomenon known, at the time, as "global warming". Its mission was to assess the state of knowledge of climate change and review the possible economic, social and environmental impacts. Since then it has become the eminent international authority on climate change and provides science based climate change policy advice to its 195 member states (IPCC, 2011, accessed 20/11/12). It is noted on the IPCC website that

"Because of its scientific and intergovernmental nature, the IPCC embodies a unique opportunity to provide rigorous and balanced scientific information to decision makers. By endorsing the IPCC reports, governments acknowledge the authority of their scientific content. The work of the organization is therefore policy-relevant and yet policy-neutral, never policy-prescriptive." (IPCC).

The IPCC acts in an advisory role to a number of countries and organizations worldwide. Having been set up in combination with the UNEP and WMO, the IPCC uses data provided to them by the WMO (IPCC, 2012). Its role is to interpret the received data from the WMO and other associated scientific organizations working with weather and climate issues from around the world. An example of one such organization is New Zealand's National Institute for Water and Atmosphere (NIWA) to be discussed further in section 2.6. The IPCC was awarded the Nobel Peace Prize in 2007 (IPCC, 2012).

The WMO, as an organization, did not necessarily need to respond to the awakening occurring around the world to environmental issues. However, it was the organization that provided much of the information upon which the global awakening was based. It was involved in a number of environmental organisations and provides support to a number of multi-lateral environmental agreements (to be discussed in the next section). The WMO provides data and support to organizations dealing with environmental issues. It also collects and collates meteorological data, in order to understand meteorological trends, from meteorological organizations worldwide. The information provided to organizations dealing with environmental management by the WMO is information that assists the global community's understanding of climate issues. It also assists the policy response to environmental concerns by presenting a clear science-based picture of developing problems (WMO, 2012). The data provided by the WMO informs the political response to environmental issues and is, to a certain extent, able to provide a measure of the efficacy of the international policy responses to be discussed in the next section.

As a result of the 1992 Rio de Janeiro Earth Summit, a number of non-UN agencies and organizations began to take notice of and take action about environmental issues. The following discusses the action that organizations outside of the UN such as the WB, the IMF, Pacific Islands Forum (PIF) and the aforementioned OECD and EU. It will also discuss the influence and response from multi-national non-governmental organizations such as the World Wildlife Fund (WWF) and Greenpeace. Organisations such as these have organised conferences, produced science-based reports, lobbied for change and been change leaders worldwide (Beder *et al.,* 2006).

Since the Rio Earth Summit in 1992 the WB has taken a keener interest in environmental issues. As part of its interest in the environment, in 1992, it installed a vice president for sustainable development and issued a directive about environmental action plans. Over the twenty years since, it has commissioned a number of reports and worked closely with other international organizations to promote and fund projects that work to enhance global

environmental efforts, particularly those with a focus on developing sustainable industries and economies (World Bank, 2012).

The IMF is an international organization that, in similar fashion to the WB, works to provide development funding to countries that require development assistance and aid. It, like the WB, started working more closely with international organizations to inform economic policy decisions relating to the environment. The IMF has focused on economic policy development since 1992 and places particular importance on macroeconomic measures to create a polluter pays system. Its focus has been policy development and advice, particularly in the fiscal sphere. It works closely with a number of other international organisations and individual nations to create policy solutions that work for them. It focuses on Climate Change and the concept of Green Growth. Though in the past the focus has been on sustainable development the world focus has shifted over the past twenty years to focus on Green Growth, a concept that has evolved from the need to make environmental solutions also economic solutions (Eyraud and Clements, 2012).

The WWF came into being around the same time as the international awakening to the global environmental problems that have come to be a focus for the world at large. Its role as an advocate for the wild animals whose existence is threatened by changes to the environment is widely recognized, as is its role in bringing biodiversity issues to the attention of policy makers and holding that attention. The WWF is also renowned for its ability to collaborate with other organizations such as Greenpeace and the academic fraternity. The WWF stepped up their efforts to promote the plight of the world's wildlife as a result of the Earth Summits and other international environment conferences (WWF website, 2012). They also sought to collaborate more fully with other NGOs and international organizations such as the WB. The willingness of organisations such as the WWF has helped to foster a spirit of collaboration amongst international governments and non-government groups (Beder *et al.,* 2006).

The spirit of collaboration and willingness to cooperate has been fostered at conferences such as the UNCED and others. The international cooperation such as the WB working with and partially funding some of the initiatives of the WWF, for example, has aided in the understanding of the environment "problem" as one that is international and should be recognised as such. Organisations such as the OECD, EEA, WB, IMF, UNEP, IPCC, WMO and WWF actively share information amongst themselves, in a similar vein to the academic fraternity, in order that the best and most up to date information is available to policy makers around the world and to groups lobbying to keep the environment and environmental management in as up-to-date and modern state as possible. Without accurate information and information sharing inefficiencies and inaccuracies in the data may occur where they would not through collaboration (*ibid.*). It is the collaboration seen from the international community of organisations and state stakeholders that has shaped the protocols and policies discussed in section 2.5.

2.5 Policies and Protocols for Environmental Management

During the late 1980s and early 1990s, a number of conferences were held where nation states collectively attempted to reach a consensus and work towards building binding protocols and policies. This was done on both a large scale, encompassing the whole of the UN and also on a smaller, more regional or common interest, scale, such as the OECD or EEA, also. Following are some of the policy options to come out of conferences and collaborative processes supported by the international community.

2.5.1 International Protocols and Agreements

In 1985, ministers of the OECD made a declaration entitled "Declaration on the Environment: Resource for the Future". The declaration expressed the OECD's intent to work together towards a sustainable future and to bring environmental concerns into all economic policy planning. It noted a responsibility for nations to act upon environmental issues and voiced an intention to place more of a focus

upon natural resource management as a policy extension rather than an outside consideration when planning a nation's economic future (OECD, 1985), an idea that New Zealand fully embraced and will be discussed further in section 2.6.

The first major global conference and resulting action was the 1992 Rio de Janiero Earth Summit. It produced a statement from UN member states voicing their recognition of the environment as being of utmost importance expressing their desire to work together more in future on such issues. It was entitled "Agenda 21" and laid down what needed to happen in the future for human impact on the global environment to be mitigated. Agenda 21 was seen as a ground-breaking agreement and the start of a global effort to attempt to find a solution to the "interlocking crises" described in the Brundtland Report. It included four sections: these were Social and Economic, Conservation and Management of Resources for Development, Strengthening the Role of Major Groups, and the Means of Implementation. Each section came together to create an accord that encouraged countries to work towards a sustainable future remaining aware of the importance of development, resource sustainability, stakeholder groups and provided guidelines for implementing the goals of Agenda 21 (Sitarz, 1993).

The next major agreement after Agenda 21 was the Kyoto Protocol arising from the 1997 Earth Summit. It was a major step in the reduction of the human causes of global warming. The goal set down at Kyoto was to reduce global atmospheric emissions back to 1990 levels. The Kyoto Protocol was ratified by a number of countries, including Australia, New Zealand and the EU. However, it was not ratified by the United States of America (USA) or China, two of the world's largest polluters (Victor, 2001). In recent years , some countries have opted to back out of the binding emissions reduction goals set in 1997 in favour of non-binding voluntary measures. New Zealand has recently opted to remove itself from the binding goals (New Zealand Government, 2012), this will be discussed in section 2.6. Under the protocol a signatory country was allocated an emissions limit. Emissions limits created a situation where a price could be put on greenhouse gas (GHG) emissions. Many signatory nations have legislated to create emissions trading schemes as a result of the protocol. Some have also moved to increase the

number of carbon sinks in their countries. As well as nation states taking notice of the GHG problem, private sector companies have also taken on board the idea of "carbon neutrality" by planting trees to offset GHG emissions from their production process (Beder, 2006). In some cases the private sector did not wait for emissions trading schemes to be officially created and created their own, by 1999 emissions were already being traded by private companies. Beder (2006) notes that a number of countries have working emissions trading schemes, along with the EU. Within the EU some countries are also operating their own individual emissions trading schemes. New Zealand has legislated for an emissions trading scheme, however, it has not been without its share of politics surrounding who should be included in it, this will be discussed in Section 2.6. It suffices to the state that the Kyoto Protocol drew GHC emissions into the global environmental consciousness and created a platform from which emissions policy could be created. This will be discussed in detail in a later part of this section.

The OECD does not have an emissions trading scheme within it, although it does have members who have operating emissions trading schemes. The OECD focuses its efforts upon developing policy and OECD countries working together to further environmental efforts within the OECD. An example of this is the OECD Environmental Performance Review programme. At least once within a ten-year period each OECD country must submit to an environmental performance review by an OECD review panel. The review panel consists of experts from nations other than the country being reviewed. For example, the 2007 review of New Zealand was assessed by experts from Australia, South Korea and the Netherlands as well as four members of the OECD secretariat (OECD, 2007). The 2007 review of New Zealand shall be discussed in detail in the next section. These performance reviews allow countries to understand where their environmental policy approach fits within the OECD framework. They make recommendations for improvement and laude successes where approaches are successful. The recommendations of an OECD performance review are not binding but hold weight with governments as they have been made by an independent body of experts from outside of the reviewed country. As noted in section 2.3, the OECD

also works with external groups and states and has conducted environmental performance reviews for non-member states in recent times (OECD, 2012).

Groups such as the OECD work with other international organisations and state bodies to develop policy and assist with the implementation, monitoring and evaluation of such policy.

2.5.2 Policy Types and Trends

Beder (2006) notes that there have been and indeed still are a number of major policy types and trends on the global stage. Beder notes six main principles at play when developing environmental management policies. These are: the sustainability principle, the polluter pays principle, the precautionary principle, the equity principle, human rights principles and the participation principle. The following is an overview of these principles with examples of how they have been implemented internationally.

The sustainability principle is the principle that was picked up in the early global awakening to the environment "problem". The argument is that the resources of the Earth are finite and therefore the economies of the world cannot continue to expand at the pace they have been using more and more resources as economies grow. It follows that we must use only what we can while remaining able to continue to use a resource into the future. We should not over use a resource because if overuse were to occur it would no longer be available for use. For example, fishing practices in the Pacific and other regions that rely upon reef fishing have needed to be changed so that the coral reefs can still exist thus preserving the fishing industry where blast fishing, for example, had been occurring. The main idea with the sustainability principle is that people are aware of the need to preserve a resource for future use and, if aware, will act accordingly. In the 1990s "sustainability" came to mean growth in a sustainable way that will allow economies to continue to grow without running out of the resources necessary for that growth (Beder, 2006).

The Polluter Pays Principle (PPP) is a policy principle adopted by many organisations and nations around the world. The OECD adopted the principle in the 1970s and it remains in use today. It states that he who pollutes shall provide some sort or recompense for that pollution. Where an industry makes use of a natural resource and makes money for not disposing of by-products in an environmentally friendly way if should pay in the form of a fine or a through a permitting system such as the purchase of carbon credits which were mentioned earlier when emissions trading schemes were discussed (*ibid.*). Emissions trading schemes essentially work on a polluter pays paradigm where those who produce carbon sinks benefit from the necessity for polluters buy carbon credits. The polluter pays principle is used internationally in both a binding and non-binding sense. It is part of all of the UN Earth Summit declarations and affirmations as well as being a binding part of some of the EU's conventions on environmental issues. Where the principle is binding those who sign up to the agreements must abide by the polluter pays principle as part of their membership in the organisation, in this case the EU (Holizinger *et al.,* 2006*)*.

The PPP is an economic tool that attempts to fix the market failure in relation to pollution. Pollution, as a negative externality, is not traditionally included in the cost of a product or industry. By employing a principle such as the PPP the cost of pollution is incorporated into the cost of the end product, in theory, thus remedying the market failure. This principle is employed in New Zealand through the emissions trading scheme. It is discussed in detail in section 2.6.

Recent international discussions on the oil extraction process, hydraulic fracturing, also known as fracking are a prime example of the employment of the precautionary principle. Whilst the USA has not employed it in this case, other nations around the world and organisations such as the EU are employing the principle of "what we don't know may hurt us so we shall proceed carefully", some have gone so far as to ban the practice until such time as its safety is known (Lees, 2012). The precautionary principle works on the idea that if something could have an unknown detrimental effect upon the environment it should not be done until a thorough study has been conducted and certainty found. It is a principle

that can only be applied where the risks of a practice are unknown otherwise the policy is risk management and mitigation. The precautionary principle takes note of the idea that industry may not always know the exact amount of environmental impact that it is having. Where an industry is viewed to possibly be unsure of exactly what effects it is having, in the United States for example, the EPA is able to enact the precautionary principle pending proof that the practice is having the environmental impact that the industry claims it is (*ibid.*) The polluter holds the burden of proof in the case of the precautionary principle, not the governing body. All that is required by the governing body is scientific evidence of the potential for harm in order for it to enact the precautionary principle (*ibid.*). As Beder (2006) points out, however, nation states have taken a clear and pragmatic view of what constitutes scientific evidence. Canada, for example, will not employ a precautionary approach unless the evidence comes from peer-reviewed science, something that, in Canada's view, should be given "particular weight".

The precautionary principle focuses on removal of risk where risk is unknown. Many other environmental policy principles rely upon the state of knowledge being taken as read and are subject to evolution as more knowledge comes to hand. In contrast the precautionary principle relies upon people being honest about gaps in their knowledge and upon knowledge being as accurate as possible. Whilst it allows for policy evolution as knowledge comes to hand, if knowledge becomes certain, it changes from precautionary to risk management or mitigation, depending on the state of the knowledge of the risk (Beder, 2006). It is important to note that much environmental management policy relates to the state of knowledge of environmental risk and to the mitigation of those risks that exist.

It is suggested that the precautionary principle may save money in the long run. This is because, rather than take a risk and damage the environment, it is often cheaper to postpone action therefore saving the cost of a clean-up operation should an environmental impact be bad enough to require it, whereas the risk of clean-up is unknown. By waiting and focussing upon understanding the risks and then developing a risk avoidance strategy a company, industry or state is potentially saving not only their environment but also their financial bottom line

by using the precautionary principle in their environmental decision-making. (MacGarvin, M. in Harding and Fisher eds., 1999)

The equity principle recognises the importance of the shared nature of the environmental resource. It recognises not only the need to share resources with those currently living on the planet but also those who are yet to come; future generations. It focuses on the fair distribution of resources and environmental impacts both now and into the future. The equity principle seeks to secure a sustainable future for those living in the present and those that may come after them (Beder, 2006). It is essentially a fairness principle and one that ties in well with the Brundtland Report which highlighted the reality of environmental impact not solely being a first world twentieth century problem but one that impacts on the whole planet, is interlinked with development and poverty, and is intergenerational in scope. It has been called an essential part of the idea of sustainable development (Brundtland *et al.,* 1987; Giddings *et al*., 2002). By applying the equity principle it follows that all individuals, who have the means to do so, should actively seek to do so for the sake of other human beings, both now and in the future.

The human rights principle is a principle that is essential to the UN's environmental ethos. It reads that without environmental protection the human rights of life, liberty, health, education, social security and a reasonable standard of living are at risk (Beder, 2006). Successive UN reports have found that human rights and the environment are interlinked. As noted in the Brundtland Report (1987) and other major environmental reports, we cannot have a sustained standard of living level if we do not look after the resources that supply it. We cannot exercise our human right to health, if the air around us is polluted causing asthma, for example. We cannot have social security where the environment around us is so badly degraded that there are no more resources to use to generate income. We cannot have life if our planet is too hot for the human species' continued survival. The human rights principle notes the importance of the interdependence of our environment and us as humans (Beder, 2006). An environmental aspect has been added to the UN understanding of human rights as

it has become clear that the cleanliness of our environment, our air and our water is essential to our health. Essential too, to our equality, is access to clean and healthy environments. The human rights principle is only part of the many facets to environmental policy development, but should always be considered by decision makers as human existence depends upon the environment in which we exist (*ibid.)*.

The participation principle is applied heavily to environmental decision making in New Zealand through the RMA, which is discussed further in the next section. It follows on from the human rights principle in respect to the right to self-determination and political involvement. It gives citizens the responsibility of knowing that the state of their environment is and responding to the need to change where a need to change exists. It allows citizens the right to comment on what they may see as untoward environmental practice in their own communities and to take their own actions to mitigate that if need be. It gives people the right to know and the right to respond. The fundamental tenet of the participation principle is the importance of consultation. Where consultation does not occur it is difficult to bring the general public or citizens along for the environmental ride. It is difficult to convince citizens to agree to what is going on in their backyard or to change their own ways if the methods for change are not discussed with them beforehand. The participation principle enables governments and other decision makers to understand the way their citizens or members see the environment around them and to understand what is important to those whom the decision making process ultimately affects (Beder, 2006).

The participatory principle is particularly important in countries with "first peoples" such as Canada, New Zealand or Australia. The knowledge "first peoples" can provide regarding the way the environment has changed and sustainable farming and resource use can be invaluable in resource management decisions (Jollands and Harmsworth, 2007). Information regarding where salmon used to run and in what numbers provided by Canadian "first peoples", for example, can impact where a power company may place a hydroelectric power station. Or information about which plants have medicinal properties or can be consumed to

prevent dehydration in the Australian desert provided by Australia's Aboriginals may shape environmental decisions made in Australia. The input that can be provided by these, and other, interest groups is essential in the application of the participatory principle (Beder, 2006).

All six of the principles outlined above contribute to the practical measures that can be taken to attempt to create policy solutions to environmental management problems. These include education programmes, voluntary accords and covenants, regulatory or legislative measures, polluter pays measures, government subsidies for environmentally friendly technology, individual measures (Gunningham *et al.,* 1998). These are discussed in detail in the next section when New Zealand is discussed. However, without an understanding of the state of the environment being worked on no policy solution can be effective. The environment must be measured and evaluated. The policies that are attempting to remedy any problems must also be evaluated so success or failure may be seen through measurement.

The OECD recommends a pressure-state-response framework be used to measure, evaluate and take action regarding environmental issues (Bowen and Riley, 2003; OECD 1993). By identifying a pressure such as farm effluent, measuring the state of the environment, such as river water quality in a neighbouring river, and responding to that, through riparian planting for example, one is able to identify a problem and respond to it, taking note of the efficacy of the policy noting change, positive or negative by repeating the cycle several times over a period of time (see figure 1).

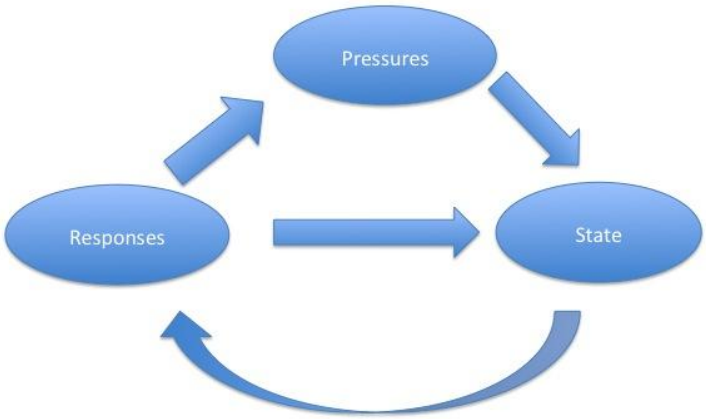

Figure 1: The Pressure-State-Response Framework, New Zealand Ministry for the Environment (2012)

The OECD measures a number of environmental indicators using this measurement and response framework. The OECD uses this framework to assess countries undergoing their environmental performance review, using it as a gold standard next to which a country's policy response to its individual environmental issues is compared. The OECD PSR framework is seen to be an international benchmark for policy development. It has been used and/or adapted to suit the needs of states and organisations around the world. It is used as both a policy development tool and a measurement tool (Bowen and Riley, 2003). Without a model such as the PSR model it is difficult to understand the impact that humans have upon the environment and the effects that policies are having upon that impact. New Zealand's environmental policy is based on the OECD framework, and is discussed in detail in the next section.

The PSR model requires responses to be made with regard to environmental impacts and changes. These responses come in the form of policy tools such as: Command and Control, Self-regulation, Voluntarism, Education and Information, Financial and Free Market measures (Gunningham *et al.,* 1998). Command and control measures require legislation to encourage industries and individuals to

take action regarding environmental issues. Examples of command and control measures include the banning of lead in petrol to improve air quality or the banning of CFCs to reduce the impact they have upon the ozone layer. Self-regulation encourages an industry to regulate itself, an example of this is the Dairying and Clean Streams Accord, which will be discussed with regard to the New Zealand context in the next section. Voluntarism is where the public sees a need and attempts to solve a policy problem on its own, an example of voluntarism would be people joining forces to clean up a beach after an oil spill. Education and information measures are those that seek to inform. They include monitoring programs and public information programs. New Zealand's use of education and information policy measures is discussed in the next section. Financial measures are those that affect an industry or individual's bottom line. Measures may include taxing pollution or subsidising an environmentally desirable management plan or technology. Such measures generally seek to resolve negative externalities or encourage practices with positive externalities. Free market measures are measures that simply leave the market to encourage good behaviour. Examples of free market measures are groups of people switching to organic produce because they no longer want to eat the chemicals sprayed onto inorganic products. The increased demand for organic products increases the price of organics thus encouraging production. However, the market is prone to failure, which is when the other measures become necessary. Gunningham *et al.*, when discussing the issue of biodiversity, suggested that the most appropriate policy response to such environmental issues is to use a combination of all six broad types of measures. The New Zealand context, to be discussed in the remaining sections uses a combination of the above policy measures to address its international and domestic obligations regarding environmental issues.

2.6 The New Zealand Environmental Management Context

Aotearoa/New Zealand is a country with a unique set of environmental issues. It is made up of islands in the South Pacific with flora and fauna that, in many cases,

are the only species of that type in the world. It has a number of flightless birds, one of which is the symbol of the nation, and a number of plants that can be found nowhere else on the planet. Its island nature allows it to be a country with strict border control, preventing unwanted pests, thus providing some protection for the diverse native flora and fauna. The population of New Zealand is small, about 4.5 million (Statistics, NZ, 2006), with approximately one quarter of the population living in the economic capital, the Auckland region. New Zealand's small population and large open spaces have allowed it to be a place of policy experimentation in the past. This section reviews the New Zealand Environmental Management Context. It looks to the past and explains the ever-changing New Zealand Environmental Context. Whilst this section focuses primarily on the late twentieth century and early twenty first century, it is necessary to first address the early history of New Zealand as a nation in order to understand the historical context that affects the contemporary environmental management context.

Aotearoa/New Zealand is a small country, composed primarily of three main islands, the North Island, the South Island and Stewart Island. The nation of New Zealand is 173 years old (at the time of writing) and, despite its relative youth as a nation, has undergone a number of changes to the way its environment is managed. When settlers first arrived in New Zealand in the early 1800s it was a land of swamps, bushlands, mountains, rivers and mostly coastal indigenous Maori communities. New Zealand had, and still does have today, a unique microcosm of almost all the major types of landscape on Earth. After the signing of the Treaty of Waitangi in 1840, European settlers began to flock to New Zealand to take advantage of fertile farmland and its temperate climate. Native forest was cleared and farms were set up on the lowlands and the highlands and settler communities sprang up around the country. This was not without struggles, however, the *tangata whenua*, people of the land (Maori), had, in some cases, their land confiscated by the Crown despite the Treaty of Waitangi. Today, 173 years on, redress is still being sought and work is on-going to rectify what has happened to New Zealand's *whenua* (land) (Selby *et al.,* eds. 2010; Memon and Perkins eds, 2000).

The Treaty of Waitangi (the Treaty) is the founding document of New Zealand and has three main clauses and principles within it. These principles are those of partnership, participation and protection. Partnership implies that Maori and the Crown are partners in the running of New Zealand. Participation implies that Maori, as the people of the land, have a right to participate and be consulted in decisions made about New Zealand. Protection implies, in an environmental context, that Maori as guardians of the land they are spiritually tied to, have a right to have their land protected. Maori values are important to New Zealand's resource management context and have an important place in the way in which New Zealand has sought to develop its environmental and resource management policies (Treaty Resource Centre, 2008)

New Zealand's landscape is regionally very different. It is divided into a number of regions due to the unique nature of the landscape and issues faced within each. Environmental management has been largely dealt with at the regional level since New Zealand began as a nation in the mid-nineteenth century. New Zealand's environmental management has gone through a metamorphosis over the past sixty years or so (McNeill, 2008). It has reduced the number of local authorities involved in environmental management by 90%. Until the late twentieth century as many as 800 local authorities took some role in environmental management (OECD 2007). These included catchment boards, local community boards, regional authorities, district and city authorities, land and soil management authorities, not to mention central government providing the legislation through which this was all managed. In the 1980s, a series of neo-liberal reforms sought to streamline the government and through that reduced the number of authorities focussing on environmental management significantly (McNeill, 2008). This, ultimately, led to the 16 regional authorities that New Zealand has today with central government oversight and an Environmental Protection Authority within the Ministry for the Environment to deal with projects of National Significance (MfE, 2012). New Zealand's primary environmental legislation, the Resource Management Act (1991), is discussed in further detail in a later part of this section.

Having addressed some of the main tenets of New Zealand's environmental management system this section explains the environmental impacts that occur in New Zealand, the main industries and the overarching reasons for environmental impact in section 2.6.1. Section 2.6.2 addresses the measurement of environmental impact in New Zealand, the ways in which it is measured and by whom. Section 2.6.3 explains the current environmental context into which this research falls, and section 2.6.4 discusses recent changes to the New Zealand context such as the new addition to the resource management scheme regarding maritime resource management and the recent withdrawal from New Zealand's binding commitment to the Kyoto Protocol.

2.6.1 Environmental Impact in New Zealand

Archaeological records show that Maori came to New Zealand somewhere between 800 and 1300 A.D. Prior to that New Zealand was a land of birds and plants, with few natural predators. Many of the birds are flightless. Records suggest that around the time Maori arrived some of the larger birds began to die out. This was the start of the environmental impact humans have on New Zealand. Maori also began small-scale communal gardens to provide food for themselves. They did this in a sustainable way in bush near their villages, which were often on the coast, and only took what they needed from both land and sea.

As Europeans began to settle in New Zealand they began changing the landscape. As noted previously, European settlers took to farming both the highlands and the low lands, as well as building walking tracks, horse tracks, passes and digging railway tunnels. This was part of the build-up of industry in New Zealand, which included such industries as gold and coal mining, logging, flax milling, farming of both sheep, for meat and wool, and cattle, for both meat and milk. The dairying industry increased in size quite rapidly after the first shipment of refrigerated goods from Port Chalmers to the United Kingdom aboard the “Dunedin”. The expansion of agriculture and the application of fertilisers is an issue that New Zealand still battles today.

Gold and coal mining were industries that brought many settlers to New Zealand (Hearn, 2002). The gold rushes in Central Otago and the Coromandel are seen, in part, to be responsible for the racial diversity of New Zealand from an early stage. Gold and coal mining jobs brought not just Western European settlers but also Eastern European and Chinese. These operations were initially either alluvial or deep underground in bush land. They were difficult to access. However, as technology evolved and more coal and gold could be mined at a faster pace the environmental impact of that extraction became larger. The mining industry made a move towards more open cast mining in the later part of the twentieth century. One such mine is the Martha Mine in Waihi. Whilst the mining company intends to create a lake out of the mine once mining finishes, there is some concern that there may be long term environmental impacts from the tailings ponds and other by-products associated with the gold extraction process (Newmont, 2012). This has been backed up by history. Parts of the Coromandel are still dealing with the impact of century old gold extraction techniques. Recently, it was discovered that a tidal community on the coast of the Coromandel Peninsula near Thames may be at risk of consumption of potentially poisonous chemicals in the soil that are associated with the mining process. The community was advised to be careful when consuming food grown in that soil and the council began a clean-up initiative. The clean-up is on-going. (Thames-Coromandel District Council, 2012). Mining will be discussed in a latter part of this section dealing with recent developments.

As New Zealand grew and electricity became common-place in people's homes the impact humans began to have upon the New Zealand environment grew. Parts of New Zealand have cold winters, with many turning to coal and wood fires to heat their homes. In some places, such as Christchurch, where the topography and weather conditions were suitable this created a problem with smog (Local Government New Zealand, 2007). The electricity industry in New Zealand is said to be 80% renewable. This developed in the second half of the twentieth century. During that time government building projects created a number of hydroelectric dams across New Zealand. This was not without its own environmental impact

flooding valleys, creating lakes where no lakes had been and changing watercourses. The project has made New Zealand a world leader in the use of renewable energy though commentators suggest that this could be improved through the use of solar energy, wind energy and should the technology become available tidal energy. New Zealand's focus upon renewable energy makes it an innovator in this area and the government is seeking to further fund research projects in the energy sector with the hope that "green technology" will bring economic gains to New Zealand (Ministry for Economic Development, 2011).

New Zealand was built upon and relies economically on agriculture (McAloon in Pawson and Brooking, 2002). The biggest industry is by far agriculture, even today. New Zealand's natural resources and landscapes lend themselves to farming. Large corridors of land were cleared and swamps drained (Park , 2002) to make way for the farms that would turn New Zealand into a country with a heavy focus on primary production. Agriculture provides jobs and income to rural towns. Currently, the farming industry that is doing the best is dairying, which is in the middle of an expansion due to high dairy prices internationally. New Zealand's largest export is dairying, exporting $12.7billion worth of dairy products in the year ending June 2012 (Statistics NZ, 2012). The industry is growing particularly in the South Island where are number of sheep to dairy conversions are occurring.

Over the past 20 years, it has become evident that the dairy industry is responsible for water quality degradation where intensive dairying is occurring. The "Dirty Dairying" campaign by Fish and Game in the early 2000s led to the dairy industry developing an industry-led dairying accord between Fonterra, the main dairy cooperative in New Zealand, and the government. This accord has been accused of being toothless and doomed to failure by academics working for Fish and Game and Forest and Bird, who joined Fish and Game in their efforts to encourage the dairy industry to reduce its environmental impact (Deans and Hackwell, 2008). The "Dirty Dairying" moniker has been challenged heavily by industry groups such as Federated Farmers, claiming that the dairy industry has been unfairly targeted and that it is not solely the responsibility of those who farm

dairy cattle to remedy the primary issue of non-point discharges, particularly in the area of nitrogen. The 2012 interim judgement by the Environment Court on the Horizons Regional Council One Plan Appeal, a multi-plaintiff appeal against the One Plan, noted that the plaintiffs were correct to note that fertilizers are added to soil by not just dairy farmers but farmers of sheep and beef also. It also noted that similar nitrogen run-off could be found in streams that are adjacent to horticultural "farms". Some have noted that this particular judgement will have implications for the whole of New Zealand in terms of the understanding of the water quality issue (Pers. Comm.: McNeill, 2012).

The forestry industry is another that has had significant environmental impacts in New Zealand in the past. The industry saw an influx of settlers to New Zealand, particularly in the north, after the signing of the Treaty. New Zealand's native Kauri and Rimu provided a source of quality hardwood that settlers took advantage of. The "mining" of trees saw a change in the biodiversity of New Zealand's bush in the early years (Halkett, 1991). These days, the forestry industry is seen to be a carbon sink of sorts but is also the source of some worry for groups such as Forest and Bird. Wilding pines are a particular issue in parts of the South Island's Canterbury region, amongst others (New Zealand Wilding Pine Management Group, 2012). The wilding pine issue is important because it affects the biodiversity of the areas where it is problematic. The variation in plant life is affected by the strangling out of native plants due to nutrient depletion from pine trees or shade provided by those pine trees. The forestry industry is said to contribute to the offset of New Zealand's emissions (Ledgard, 2003), however, its impacts on not only biodiversity, but also erosion, suggest that it might not be the saviour that some in the industry believe it to be.

The 2007 OECD Environmental Performance Review of New Zealand noted that whilst New Zealand's agriculture and forestry sectors were innovators in the methods they had chosen to address environmental concerns and the incorporation of environmental concerns into management practices, there is still more work to be done in this regard. The review made four main recommendations regarding agriculture and forestry. These are: further

development and application of sustainable land and forest management practices; encouragement of greater compliance with resource consent conditions; clearer priorities around the reduction of Greenhouse Gas production in these sectors; and assurance of independent evaluation of voluntary covenants and agreements. The review notes that New Zealand has come a long way in its primary sector environmental management practices but also that it is far from perfect.

New Zealand is however, not solely a primary producer. It is also involved in other types of industry. Dotted around the whole of New Zealand are factories that process the primary products that New Zealand produces and some that are imported. Factories such as the Chelsea Sugar Factory on the edge of the Hauraki Gulf on Auckland's North Shore are examples of factories that have been built in a specific location for a particular reason. The sugar factory's position provides ease of transport, with cargo ships being able to tie up right alongside and in the past, it can be assumed, an ease of discharge straight into the Gulf. Laws now exist that make that no longer possible but in the past discharge from factories has been a problem worldwide (Chelsea Sugar, 2012).

2.6.2 Environmental Monitoring and Evaluation in New Zealand

The early days of environmental monitoring and evaluation in New Zealand saw overlapping regional groups all monitoring the same things in not necessarily the same ways. Different groups would come up with different results or interpretation of results and there was no clear picture of the situation regarding New Zealand's environment. During the late 1980s and early 1990s, New Zealand's governance experienced a neoliberal upheaval with changes seen across the government and governing bodies (McNeill, 2008). In part as a result of this upheaval and in part due to public pressure to be seen to be doing something about the environmental issue, the government of the day passed the Resource Management Act (RMA) (1991). The RMA created a resource management space that made use of the participation principle to include all stakeholders in the

decision making process. It gave local bodies authority to monitor the environment in their region, on the assumption that regional authorities knew their local area best and would be able to develop expertise regarding areas of particular concern to them. Regional authorities were to report their findings to the Ministry for the Environment (MfE). The regional authorities were also given decision-making powers regarding how and what things could take place in their region. For example, through their environment plans they were able to decide if a housing development would be allowed to be built beside an estuary (Memon and Perkins eds. 2000). By law they had to, and must do so now, consult local Maori and affected members of the public about whether or not a project should take place. They are allowed to issue consent to extract water, dispose of effluent, build and extract natural resources. Each regional authority has a different set of rules regarding what action it will allow to take place in its region though they follow a set framework. Resource consents may have conditions placed upon them that mean they will be monitored for compliance. The RMA is designed such that the public and other stakeholders have a role in all decisions being made and conditions placed upon a particular action. Many regional councils rely upon public information to catch those who breach their consents, as whilst they have monitoring programmes they struggle to prove who is at fault, particularly in regards to non-point discharges (*ibid.*).

At the national level New Zealand monitors twenty key environmental indicators. These indicators are a similar set to, and based upon, those of the OECD (MfE, 2012). The information regarding these indicators is collected regionally and collated by MfE. In the past this information has been collated into a ten yearly state of the environment report compiled by MfE. It was suggested in a government paper (MfE, 2010) to possibly be brought into a five yearly time frame. However, in October 2012, the Minister for the Environment cancelled the 2012 report stating that all information was available on the website and did not need to be collated into a book that used more paper than the digital information available on the website. State of the Environment Reporting in New Zealand is conducted primarily at the regional level and collated at the national level by the MfE.

The other primary environmental organisation within the central government is that of the Department of Conservation (DoC). It could be said that MfE make the policies that DoC implements. DoC and MfE are segregated from each other in so much as they have different Ministers and work towards different goals, though travelling along the same path so to speak. DoC is responsible for New Zealand's conservation efforts, focusing on biodiversity and land management. Their role includes co-ordinating native animal breeding programmes, the management of New Zealand's national park systems, management of walking tracks and huts, and co-ordination of and advice to conservation efforts both on land and at sea. DoC is also responsible for managing New Zealand's obligations to conventions such as the Convention on the International Trade of Endangered Species (CITES) as they are the department that looks after New Zealand's wildlife, particularly sanctuaries such as Tiritiri Matangi, an island in the Hauraki Gulf, off the northern coast of Auckland (Memon and Perkins eds. 2000 and DoC, 2012, Annual Report).

The governing bodies do not measure and evaluate the environment in a vacuum, however. Other organisations are involved in the measurement and evaluation of New Zealand's environment. These organisations consist of the academic community, Crown Research Institutes such as NIWA, Maori, stakeholder groups such as Forest and Bird and Fish and Game mentioned earlier, industry groups such as Dairy NZ, Federated Farmers, Straterra (the mining lobby) and others, community groups involved in conservation efforts and international lobby groups such as Greenpeace. These groups take their role in the management of New Zealand's environment seriously and attempt to work within the framework that New Zealand has to look after the environment wherever possible (Straterra, 2012).

New Zealand's environmental framework consists of not only the MfE and the DoC. It consists of a team of three Ministers plus associate Ministers, sixteen regional authorities, four unitary authorities and a number of district and city councils. Aside from the RMA (1991), there are a number of extra laws and by-laws that govern the New Zealand environmental management system. New

Zealand is also a signatory to a number of international agreements regarding environmental management. These include regional agreements in the Pacific, commitments groups that it is a member of including the OECD, and commitments to the UN declarations, agreements and protocols. There is also a unilateral stance preventing nuclear power from entering New Zealand, this includes foreign vessels and radioactive waste material (Nuclear Free Zone, Disarmament, and Arms Control Act, 1987).

New Zealand has three ministers who are primarily focussed on environmental concerns. These are the Minister for the Environment, the Minister for Climate Change Issues and the Minister of Conservation. These three work together with other stake-holding ministers, such as the Minister for Foreign Affairs and Trade, to create and implement a framework through which New Zealand is able to meet its international obligations, as well as domestic concerns. The framework seeks to understand the unique environment that New Zealand is and to know what the current situation is regarding the condition of the environment of New Zealand (MfE, 2012, Accessed November 21 2012).

As noted earlier the MfE sets the policy direction with DoC being but one player in the implementation of it. DoC employs local staff to do much of the work in areas where they are active. Costanza *et al.,* (2007) notes that local solutions to local problems are often one of the most effective policy instruments available. By employing people who live locally DoC are able to make use of local knowledge and engage with the community to achieve solutions and outcomes that are most agreeable to the population who are ultimately affected by local environmental impacts. DoC staff play an active role in the education and co-ordination of locals. They promote conservation initiatives at schools and police rules in parks regarding the presence of animals that can interfere with fragile ecosystems (Memon & Perkins eds, 2000). DoC is just one of the organisations involved in environmental management implementation in New Zealand, however, there are a number of others further down the framework.

Alongside the MfE and DoC sits the Parliamentary Commissioner for the Environment (PCE). The role of the PCE is to report to parliament upon pressing environmental concerns as an independent officer outside of parliament and outside of the government's control. They are an independent "watch-dog", as it were. The PCE has a budget of their own through which they administer their role as independent environmental commentator for New Zealand. In the past PCE reports have included; how to blend science and policy concerns together with an environmental frame of reference, commentary upon state of the environment reports, water quality and the measurement thereof, biodiversity, climate change issues and, most recently, interim findings regarding the environmental safety of hydraulic fracturing. The PCE also has scope to make submissions regarding bills in parliament where environmental concerns exist. (PCE, 2012).

The New Zealand framework consists primarily of two main ministries involved in environmental management at the central government level, although these are supplemented by others, such as Foreign Affairs and Trade, looking after the international level and internal affairs, who look after local government amongst other things. The next level of the framework, where the environment is predominantly managed is that of regional governance. Slightly below, but also parallel to, regional government is local government, such as city and district councils and in some cases community boards. Ultimately it is up to the individual citizen to conduct their own environmental management behaviour within the policies, laws and by-laws in their own area.

Regional councils, and the unitary councils that carry out the same duties in regions where it is impractical to have separate cities and districts, are responsible for the management of waterways, coastal areas, land management, in some cases parks management, bush land and also resource consents under the RMA (1991). Their role is to undertake management and monitoring of their region's environment. Each regional council has a number of elected officials overseeing the work of a number of employed staff and contractors. Prior to Auckland's amalgamation into a unitary council, the Auckland Regional Council had responsibility for a number of regional parks that were managed in

collaboration with DoC, for example. Each regional council sets the rules and chooses management and monitoring methods for their region to respond to local needs in what is a country with extreme regional variation (Memon & Perkins, eds. 2000).

A 2008 study of the efficacy of regional governments in the environmental management role for which they were designed (McNeill, 2008), indicated that due to variability of the methods used by regional governments to measure and monitor environmental concerns, there may be little overall difference between management of environmental concerns at the local level than at the central level. However, it did not conclude that the regional level of environmental management is completely ineffectual. Until recently, New Zealand's environmental management had been managed largely at a regional level with various local bodies involved in the monitoring and evaluation of soil and water quality etc. The change in the 1980s to a more stream-lined holistic approach to environmental management in the regions was seen to be a step towards divulging more power to local communities and a focus upon local environmental issues as a move towards more engagement in activities that impact people's wellbeing. McNeill judges the public value of regional authorities as seemingly greater than those of the previous authorities but that they have little to add in terms of the way in which New Zealand's environment is managed and changed for the better. He notes that this could be due to the types of elected officials on regional councils or that it could be a factor of regional differences preventing a broad based alignment of the overall system.

Under the RMA (1991) members of the public who are unhappy with resource decisions and have reasonable legal and environmental reasons to do so, such as feeling as though their concerns were not given a fair hearing, may take a resource consent to the Environment Court, created in a 1996 amendment to the RMA (OECD, 2007). The court's judges are based in Auckland, Wellington and Christchurch and present themselves in other centres as and when required. The Environment Court provides a higher point of justice for stakeholder concerns to be heard. It could also be called a keeper of the democratic rights of citizens

regarding the RMA in the environmental sphere. The Environment Court presents most decisions in writing, due to their complexity and, as is the case with the Long Bay Development on Auckland's North Shore, can assist in finding a middle ground that balances all concerns where a consent is polarising (Environment Court, 2012). Its recent interim judgement regarding the Horizons Regional Council "One Plan" regional plan suggested that stakeholders were not in agreement regarding their own environmental impact, nor the environmental impact of others. It suggested that the Horizons Regional Council should reassess whether it targeted specific groups of resource users or treated them all with an even hand. It also suggested that the council and stakeholders needed to strike a balance or come to agreement over evaluation and monitoring concerns (Environment Court, 2012). The scope of the Environment Court is large and far-reaching. Its decisions have the potential to shape the environment and planning framework in New Zealand where different interpretations of the law exist.

Stakeholders who may want to have their say on a resource application include a number of nationally organised bodies and locally organised groups. These groups include; local Maori, Forest and Bird, Fish and Game councils, industry groups such as Federated Farmers or Fonterra, locally organised groups such as the Long Bay Great Park Association, the academic community, and private citizens. Stakeholder groups are essential to the proper functioning of the RMA's process. They allow for local representation, influence and for expertise from outside of the consenting party to be presented in the consenting process. The New Zealand resource management process is a participatory process that allows for, and indeed relies upon, a culture of environmental interest and awareness in NZ's communities (OECD, 2007).

The RMA and the powers that it gave to local bodies has not been the only policy tool used in the New Zealand framework. Over the years since the global awakening to environmental concerns, New Zealand has seen a number of education programmes to encourage a culture that cares about New Zealand's environment. Campaigns such as the Keep New Zealand Beautiful campaign and "Be a tidy kiwi" campaign from the 1980s and 1990s have created a culture that

values a clean environment. In the early 2000s, the "Reduce Your Rubbish" and "4 million careful owners" campaigns focussed on the minimisation of waste and on climate change (OECD, 2007). The success of these campaigns has resulted in other campaigns and programmes. One such programme is the EnviroSchools programme. The programme started out as a local programme that then, upon receiving funding from MfE, has become a nationwide initiative. It is regional in nature, with each regional council being involved with Enviroschools in their region (OECD, 2007). In 2010 there were 715 Enviroschools in 15 regions (Enviroschools.org.nz, 2012). A 2008 report about the programme concluded that whilst some schools do not see great uptake of pro-environmental behaviour amongst their students the programme had added benefits and that it was necessary for the government to put its full weight behind the programme to ensure its success. In 2010, 28% of schools were involved in the Enviroschools programme with the bulk of those being primary schools. As with previous campaigns and programmes, the Enviroschools Foundation claims that its sustainability education is reaching into the homes of the students that take part in it and that the programme is having positive impacts upon the general learning of students taking part (Enviroschools, 2010).

Along with Enviroschools has been an energy use awareness campaign from EECA, the Energy Efficiency and Conservation Authority (OECD, 2007). This campaign about ways in which New Zealanders can reduce their environmental impact at the household and business level has, so far consisted of an advertising campaign providing tips about what sort of changes can be made to household behaviour and structure to encourage energy conservation. The advertisements direct interested citizens to a website via which they can obtain more information (EECA, 2012). As part of this campaign the government is also providing subsidies for insulation in the home. This subsidy has been made available to homeowners as it has been recognised by the government that few New Zealanders live in fully insulated accommodation. Where a house is able to be insulated and the owner qualifies for the subsidy it will allow for a home to be insulated and the total energy use of that home reduced (Ministry of Economic Development, 2011).

The government responded to a campaign by Fish and Game and Forest and Bird in the early 2000s targeting the dairy farming industry as a major culprit in the continued decline in water quality. The intensification of the dairy industry had been of concern for some time. The government's response was to encourage the dairy industry to make a voluntary agreement with the government to work to change the impact that the industry was having on the streams surrounding their farms. The agreement was called The Dairying and Clean Streams Accord (the Accord) (2003). It consisted of a number of goals to be met by 2012. A 2008 report by Fish and Game and Forest and Bird indicated that the goals were not going to be met by 2012, in part, they reasoned, because the Accord had been signed between the industry and the government only and did not consult, therefore did not include the views of, stakeholders (Deans and Hackwell, 2008). Monitoring of farms to ensure they were following through on the measures within the Accord was conducted by Fonterra and regional councils. The results regarding progress towards the Accord's goals were monitored by regional councils and the Ministry for Primary Industries (MPI). A 2011 MPI snapshot of progress, notes that much progress has been made towards the Accord's goals but that there was still much to do before the end of the Accord (MPI, 2011). The Accord, an example of a voluntary industry approach, ends in 2012 having not met all of its goals.

The New Zealand government has also introduced an emissions trading scheme in line with some its major trading partners such as Australia and Europe. It began in 2008 and is designed to create a polluter-pays system regarding emissions. The intention before a 2011 review of the scheme was to exclude farm groups initially, to allow technology to catch up to the necessary emissions reductions. However, in 2011 it was decided that farmers would remain excluded from the scheme until further notice. All other industries covered by the scheme, including; Forestry, Transport Fuels, Electricity Production, Industrial Processes, Waste and Synthetic Gases, are to be included in the scheme by January 2013 (MfE, 2012). The exclusion of agriculture from the scheme has been a source of some contention, though the government insists that it is the best economic move.

New Zealand, like many other countries, has adopted a national Environmental Protection Authority (EPA). The EPA is a relatively new development in New Zealand and brings together a number of authorities that had been individually responsible for some aspect of environmental protection at the national level. These include; the Environmental Risk Management Authority and the Emissions Trading Scheme. The EPA manages all aspects of environmental management at the national level, including the resource management of the oceans within New Zealand's exclusive economic zone, and, particularly, projects of national significance requiring resource consent (EPA, 2012).

A further nationally organised programme to encourage sustainable development and greener businesses was begun in 1989 by the then Minister for the Environment, Hon Geoffrey Palmer. Since 1990 it has annually awarded New Zealand's most sustainable businesses, rewarding them for environmental innovation, green technology and green business development. It encourages businesses with an environmentally friendly business ethos to continue to pursue that ethos. It has a number of categories that have continued to evolve over the twenty-two years of its existence. The 2012 Supreme Green Ribbon Award winner was Villa Maria Estate Wines. They were awarded the supreme prize because "*Villa Maria takes a holistic approach to environmental best practice, implementing a variety of effective initiatives nationwide. These range from growing grapes organically through to projects to reduce environmental effects of operations in the processing plant*" (MfE, 2012).

Regionally, there are a number of programmes in place for the monitoring and evaluation of environmental management. The OECD (2007) notes that regional variation is rife in New Zealand and may be both a blessing and a curse. However, regional waste management schemes are under constant development and changes to the way in which regions monitor and evaluate various industries and resource consents may result from the fall out of the One Plan Appeal judgement. Many regions and local councils have recycling schemes and a strong waste management ethos. Auckland Council, for example, provides kerbside recycling and rubbish collection to most of its ratepayers. It also has an inorganic collection

scheme running in different areas at different times of the year allowing citizens to recycle electronic goods and other large items that may not otherwise be able to due to inconvenience factors (Auckland Council, 2012). Local council schemes such as these allow individual households to take care of their waste in a convenient and cheap way.

Recently, the New Zealand government has made some changes regarding the environmental framework that it is working under. Auckland was amalgamated from what had been a total of 8 city, district and regional councils into one unitary council in 2010. This has allowed for a regional approach to environmental issues that spanned both the city and regional levels. A bill was passed that expanded Resource Management to the oceans of the exclusive economic zone in late 2012. This allows for New Zealand's extensive oceans to be managed in a similar way to the land on which it sits. In late October, 2012, the Minister for the Environment also released a statement saying that the government would not be releasing a national State of the Environment Report as planned. This occurred not long before an announcement by the government that New Zealand would be withdrawing from the Kyoto Protocol in favour of signing up to voluntary measures to deal with GHG emissions. 2012 has also seen a number of projects being protested against, these include mining on the Denniston Plateau, an area of much biodiversity; and a tunnel into Milford Sound, an internationally significant area with World Heritage status.

New Zealand's international brand relies upon New Zealand remaining "clean and green" and "100% Pure New Zealand" (Westgate, 2009). This image is reliant upon the framework that the government has set up to manage New Zealand's resources and upon public buy in to the environmental goals of the government (*ibid.*). Goals such as public participation in resource management have been met through the RMA. Campaigns and programmes such as EECA's Energy Wise campaign and Enviroschools allow the government to educate its citizens and to encourage them to get on-board with the government's goals.

2.7 Household Environmental Monitoring and Evaluation

Climate change and eutrophication increase less than proportionally with increasing expenditures. Acidification increases nearly proportionally with increasing expenditure, whereas smog formation increases more than proportionally. It appears that the mix of necessities and luxuries to which an environmental impact is related is essential in explaining the relationship. - Kerkhof *et al.,* (2009)

None of the agreements, policies, protocols or laws outlined in previous sections are any good without the buy-in of individuals and households. Individual businesses, households and individual citizens are where much of the action takes place to remedy and mitigate environmental impact (Stern, 2000), though only if multiple people engage in the same behaviours. As this study focuses on household environmental impact, this section discusses who, what and how household environmental impact is monitored and evaluated.

2.7.1 Why Do Households Need To Have Their Environmental Impact Measured?

The environmental predicament the world finds itself in is not one that has been caused by the system as a whole, nor by industry alone. It has been caused by the individual actions of the many with the resulting consequences being borne by all. Households have contributed in small but cumulative ways to all of the environmental issues faced by the world at large. The very act of adding a household to the land creates an environmental impact (Turner, 1998 in Noorman and Uiterkamp *et al.,* (1998)). The OECD (2002) note that, based on OECD data from the previous two decades, environmental impacts due to household consumption are likely to grow over the twenty years from 2002. This means that they are likely to continue to grow from the time of this report.

Turner (1998) stresses the importance of the interdependence between economic growth, consumption and environmental degradation. He notes the importance of

household consumption to economic growth and the importance of consumption choices to sustainable development. Household metabolism, he notes is as important to the system as that of industry. Turner defines household metabolism as both the demand for resources and the supply of resources. Turner notes that this flow of resources through a household contributes to the total environmental impact that a household may have. He also reinforces the idea that environmental impact is a result of population, affluence and technology.

> "Our purchasing of goods and services can also be indirectly linked to harmful environmental effects (for example, air pollution caused by manufacturing processes). Therefore, household purchases of goods and services (referred to as 'household consumption expenditure') can be used as an indirect of households' consumption of natural resources and the impact of our lifestyles on the environment." - (MfE, 2007, p.61)

The 2007 New Zealand State of the Environment Report (MfE, 2007) discusses household consumption in terms of its quality as an environmental indicator. It notes that the consumption of goods relates indirectly to the use of natural resources and the production of waste. It goes further to note that household consumption drives manufacturing and therefore primary industries. However, they also note that the monetary measure of household consumption does not necessarily relate exactly to environmental impact. The report showed an overall increase in per capita household expenditure between the previous report in 1997 and the 2007 report. It noted, however, that individual choices regarding environmentally friendly goods or services may not be reflected exactly in the household consumption measurement, though they are important in the reduction of human environmental impact.

The OECD (2002) state, in their policy brief regarding sustainable household consumption, that there are a number of reasons consumers make decisions about their consumption. The decision making process is a complex one drawing on self-interest and on social and cultural motivations. Current consumption is

driven by economic growth and lifestyle change. The way society lived before the global awakening to environmental concerns consisted of far less technology, households consumed far fewer electronic items and lived lifestyles that relied less upon consumption as status symbols (Noorman and Uiterkamp eds.,1998).

The 2007 New Zealand State of the Environment Report provides three examples of local government projects aimed at reducing household environmental impact. The Hamilton Energy Blitz was effective in reducing the total amount of energy consumed in the Hamilton area in 2007. Its goal was to raise awareness of energy use's effect upon the environment. Marlborough District Council's Sustainable Living Programme promoted sustainable living throughout the region and is intended to raise awareness of sustainable living and change lifestyle choices in the region. Green Business programmes have promoted the use of "eco-labelling" encouraging consumers to choose environmentally friendly products.

Household environmental impact has been little studied, directly. However, it can be inferred indirectly through a number of indicators such as electricity consumption, water use, waste production, recycle, transport use and environmental awareness. By understanding household habits regarding these categories interested parties may infer the likely environmental impact of an overall household. One can also infer the overall pro-environmental ethos of a household through the analysis of household habits in these categories and, potentially, willingness to change habits that may be pro-consumption rather than pro-environmental (OECD, 2002).

There are two important relevant definitions. These are those of the "household" and "sustainable consumption". The New Zealand MfE uses the definition of household used by Statistics New Zealand. It is defined as consisting of "any number of people living together in a private dwelling" (MfE, 2007). The OECD (2002) provides a definition of "sustainable consumption". It is the definition used by the Norwegian Ministry of Environment, 1994. It is defined as "*the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste*

and pollutants over the life-cycle, so as not to jeopardise the needs of future generations". These two definitions shall be used throughout the rest of this study, as well as the standard definition of "household consumption", not sustainable consumption necessarily, taken to be that of Statistics New Zealand and used by MfE as an environmental indicator. "Household consumption" is defined as including "*the goods and services we buy and use on a daily basis in our homes, from furniture to household appliances, and the electricity to run them. Household consumption also includes the food and beverages we consume and the transport we use*." (MfE, 2012) The preferred internationally comparable measure used by MfE is that of household consumption expenditure, though household consumption shall be the overarching term used in this study.

2.7.2 Measurement of Household Environmental Impacts: Who?

There are a number of groups and organisations, internationally, that are interested in household environmental impacts. These groups and organisations are organised on a number of levels. They are organised at a top level of regional and global groups such as the OECD, EU and the UN. Governments at the country and local level are also interested in household environmental impacts. Household environmental impacts are measured by individual countries, through, in New Zealand's case, national statistics organisations, as well as interested academics.

New Zealand's household consumption is measured on a three monthly basis by Statistics New Zealand. This does not directly reflect pro-environmental choices, nor does it reflect anti-environmental choices, either. It simply measures, on average, how much households in New Zealand consume.

A UK study of 673 randomly selected individuals in Exeter analysed factors influencing environmental attitudes and behaviours using waste management as a case study (Barr, 2007). The study concluded that reduction and reuse behaviours are associated with an underlying pro-environment values system,

whereas recycling was considered to be normal behaviour within the study cohort. It indicates that there is a difference between the way in which people view recycling of waste as opposed to reduction and reuse of materials.

Two further studies were conducted in Europe. One assessed the importance of environmental attitudes with regard to energy saving behaviour in Sweden (Martinsson *et al.,* 2011). Another similar study analysed the impact of environmental behaviour on household recycling in Germany (Best & Kneip, 2011).

In 2010 and 2011, Dolnicar and her colleagues at the University of Woolongong assessed Australian attitudes and behaviours regarding water consumption and conservation. Their first study found that Australians, in the majority, understood the necessity to conserve water and the need for low flow showerheads with over 80% of study participants having installed them (Dolnicar *et al.,* 2010). In 2011, a second study found that this was dependent on participants' location in Australia. Those living in the tropical north, where water is not scarce, were less inclined to conserve water, due to its plentiful nature (Gilbertson *et al.,* 2011).

Graduate students around the world have written theses about the topic of household environmental impacts. A South African study (Kamara, A. 2010) assessed domestic waste management across a range of socio economic groups in Tshwane, South Africa. It found that there was a low level of awareness of the need to sort waste at the household level and recommended strengthening environmental education in schools on that basis. Another study in America analysed the motivations for household energy consumption reduction in order to make conclusions regarding the efficacy of government policies encouraging pro-environmental behaviour (Zborel, 2009). Zborel concluded that small, easy to implement changes in behaviour were able to yield fast changes in behaviour, though they did not necessarily lead to additional awareness of why the changes were being implemented. A further thesis (Krohn, 2008) analysed motivations for recycling behaviours in Vancouver, Canada. This study showed that despite the area being affluent there were still barriers to recycling. The author proceeded to

design a kerbside recycling system for the study area to remedy the issues deemed to be barriers to pro-environmental behaviour.

A 2008 study of household environmental impacts in Palmerston North, New Zealand, by Massey University (Hay, S. 2008, unpublished) concluded that New Zealanders consider themselves well informed or somewhat well informed about the environment. There was wide adoption of easy to implement environmentally friendly behaviours such as using one's own shopping bags or making use of recycling facilities. No strong link between educational achievement and environmentally friendly behaviours at a household level could be established. Environmentally friendly behaviours that required high financial investment were found to be less widely adopted than low cost or easy steps.

Age was found to be a determinant in people's willingness to reduce energy consumption (Martinsson *et al.*, 2011) . Younger people were less likely to conserve energy than those in older age brackets. It was also noted that those living in detached houses were also more likely to conserve energy. Martinsson *et al.* found that people were more likely to act on environmental attitudes where income was enough that they could afford to do so. This could indicate that income is a factor in one's ability to change one's environmental impact. It was also clear to Martinsson *et al.* (2011) that social integration was a factor in the active reduction of energy use, thus individual environmental impact, indicating that pro-environmental behaviour may be in part culturally based.

In analysing the impact of environmental attitudes on recycling behaviour Best and Kneip (2011) found it more likely that the presence of kerbside recycling programmes impacted people's recycling behaviour than pro-environmental attitudes. They study indicated that, in the case of recycling, whilst environmental concern and awareness was an important factor, the ease, convenience and low cost of kerbside recycling was deemed to be more of a salient factor in encouraging pro-environmental behaviours in populations. Their study showed that the presence of a kerbside scheme increased recycling activity from 75% under a more expensive drop off scheme to 84% participation.

A Dutch study (Gatersleben & Vlek, 1998) found that the Dutch, while aware of their environmental impact were not willing to alter their behaviour to reduce it. The study showed that opportunity to consume deeply affected the willingness to consume. They suggested that as consumption patterns had changed dramatically over the past fifty years so, too, had the ability to not consume or to reduce consumption of goods and services. As personal automobiles became common-place the willingness to, and indeed desire, to use them has increased. The study showed an overall increase in consumption over time and an increasing unwillingness to change behaviours to mitigate household environmental impacts. This could be an artefact of changing lifestyles or a result of a "what can one person really do" mentality.

The information gained from such studies can be used in the formulation of policy. The Swedish study noted above has implications regarding the targeting of energy saving incentives. Both studies of recycling have implications for how recycling may be encouraged, in particular through the use of kerbside recycling programs. Making pro-environmental behaviour cheaper and more convenient for households is an essential policy tool for governments needing public uptake of useful behaviours. Studies of these types that engage with practical environmental impact reduction measures and why they are taken up or not are of interest to all groups interested in reducing environmental impact as, as noted by the OECD in 2002, though industrial processes produce vast swathes of pollution and have large environmental impacts, households' and individual behaviour has a cumulative effect upon the environment. Understanding the reasons for or against pro-environmental behaviours and/or behavioural change ultimately impacts what governments choose to do to enable change at the individual or household level. Despite the growing understanding of why behaviours are taken up, however, household environmental impacts must still be understood through measurement tools.

2.7.3 What is measured?

Household environmental impacts are measured in a number of ways, regarding a number of household activities and uses. These can be broken down into several categories including; transport, energy use; water consumption; waste production; recycling and food consumption. Kerkhof *et. al.,* (2009) note that energy requirements of households have been measured both directly and indirectly since the 1970s. Studies worldwide have indicated a significant amount of energy wastage through input-output analyses. Kerkhof *et al.,* (2009) encourage the extension of input-output analyses to other types of household consumption as this may lead to new information regarding efficiency in the field of household consumption. Inefficiency, it could be argued, is not solely the domain of energy but also other types of consumption and could be deemed to be responsible for much of the impact seen to the environment in recent years.

Spangenberg and Lorek (2002) note that "despite the broad consensus regarding the need to develop and support more sustainable consumption patterns, the areas in which households can make a significant contribution to sustainable consumption are still largely unexplored. So far, no coherent actors-centred concept has been developed". The 2002 study attempts to remedy this by analysing a number of potential measurement and evaluation methods for household consumption. They argue that most accounting measures used in environmental management are inadequate for the micro measure that is households. The household is about as small a unit of environmental impact as can be measured, short of the individual. As a result, many measures of household environmental impact are based upon averages over a year, month or week rather than at the daily level. The study suggests that much of the "household consumption" included in current measures of household environmental impact are, depending on what country one lives in, in fact measures of state consumption rather than household consumption. They provide a possible alternative to all existing measures. Their alternative measurement seeks, not to completely quantify household environmental impacts, but to allocate weight to the various categories of household consumption with the goal of providing a

more accurate portrayal of the ways in which households impact the environment. Spangenberg and Lorek claim that state consumption should be left out of measures of household environmental impact that are being inferred from total household consumption. The model they propose focuses on four main areas where households can change their environmental impact. These areas are; food, construction/housing, social life and transport. They call these priority measures that allow for measurements to be more focussed on areas of actual household consumption rather than household and state consumption. The model can be applied to other areas including understanding how social factors influence environmental behaviours.

An input-output analysis method was used to quantify the total environmental impact of houses in the Netherlands (Kerkhof *et. al.,* 2009). Much of the understanding of environmental impact gained by Kerkhof *et. al.,* (2009) was based on information regarding environmental impact of goods obtained by using the Netherlands emission intensities of similar products. They focussed on five main categories of consumption; food, housing, clothing and footwear, hygiene and medical care and development, leisure and traffic. They then set these against four environmental impact categories, those of climate change, acidification, eutrophication and smog formation. The model used is based upon emissions per Euro spent on each category of consumption. The authors point out the flaw in this measurement by stating that it "implies that a sweater of 60 Euro causes twice the emissions of a sweater of 30 Euro". The idea that something of the same size and material but simply costing more would create more emissions seems counter intuitive. They suggest that when measuring household environmental impact based on expenditure it would be wise to consider the income elasticity of product categories in measurements also. They suggest, also, that more weight should be given to those consumption categories deemed to be necessities as luxury goods will not be consumed by the whole of a population and are likely to have less of an overall environmental impact, apart from petrol.

Glatersben and Velk (1998) analysed household environmental impacts through the use of a questionnaire used to understand household environmental

behaviours and through that estimate environmental impact. Their study was conducted in the Netherlands and consisted of 456 randomly selected participants. Participants were interviewed on a range of household behaviours that contribute to or reduce environmental impact. Their study showed that income and the make-up of the household were the primary influences on household environmental behaviour, and thus impact. It noted that participants were generally not well informed about the indirect energy use of their households, though they were aware of direct energy use. It also indicated that where one's quality of life would be impacted by a change in lifestyle to mitigate environmental impact, such as switching the use of a private motor vehicle for the use of public transport, participants were less inclined to want to change to more environmentally sustainable behaviours.

A range of options for the monitoring and evaluation of household waste prevention is presented by Sharp *et al.,* (2010). They begin by explaining that waste prevention, and thereby pro-environmental behaviour, cannot always be seen, we cannot know if it has happened and we cannot classify it as accidental or deliberate. One can only guess at the likelihood of the alternative having occurred if no intervention had occurred based on previous data regarding previous behaviour. However, they continue to outline methods by which it may be quantified and provide advice as to how they may be used individually or in combination with each other to, ultimately, inform policy. They particularly recommend the use of both quantitative and qualitative measures to enable a fuller understanding of the impact of active change.

Sharp *et al.,* (2010) analysed eight methods of the evaluation of waste prevention measures. These were; self-weighing monitoring and reporting, use of collection round data to accurately measure waste arisings, use of control and pilot groups, attitude and behaviour surveys including metrics, interviews and focus groups, participation surveys including enquiries to help lines, web statistics, number of registrants, publications disseminated etc, composition analysis, conversion factors, estimates and modelling, and a hybrid combination of one or more of those approaches. The paper discusses the strengths and weaknesses of each

method and concludes that all methods have their place in the monitoring and evaluation of waste reduction though some are more common than others. Analysis of projects using a hybrid approach showed that, whilst there was no standard approach, a number of studies used similar approaches in similar combinations. It shows that baseline interviews, self-weighing, local authority analysis (where the local authorities assess waste quantities over time), surveys and qualitative feedback were often seen in some combination together. They recommended that a common approach to this type of monitoring and evaluation should be developed in the United Kingdom to achieve more accurate, comparable data for the future.

A UK study (Barr, 2007) used a self-reporting questionnaire to assess waste management activities amongst the citizens of Exeter. 981 participants were randomly selected from the electoral register then approached directly. 687 participants returned their questionnaire. Questionnaires were 12 pages long and consisted of demographic information and questions regarding recycling behaviour using a 5-point scale for questions relating to behaviour. Awareness and environmental knowledge were also tested. Results indicated that recycling and reduction of waste were dependent on two different things. Recycling was seen to be a normal behaviour and would be practiced where kerbside programmes existed. Reduction of waste and reuse tended to be practiced more by people with more of a focus on environmental values.

A similar study regarding environmental behaviour was conducted in the Netherlands (Gatersleben and Vlek, 1998). The study consisted of 1746 randomly selected participants from various parts of the Netherlands. Approximately one third of the households involved were interviewed while the rest were asked to fill in a questionnaire. The study involved a number of different age groups, incomes and occupations. It yielded a high response rate and a broad understanding of household environmental impact, willingness to reduce this and how Dutch consumption patterns had changed over time.

A German study (Best and Kneip, 2011) investigated the impact of attitudes and behavioural costs on environmental behaviour. The study focussed on one particular area of environmental behaviour, that of recycling. Their investigation was conducted by postal survey, conducted on two occasions, through which they achieved a return rate of approximately 50%. The study also contained a control group for whom no extra opportunities to recycle were presented. Results indicated that ease and cost of participation in environmentally friendly behaviour was an important factor in citizens' decisions to partake of such activities.

When analysing energy saving in Swedish households, Martinsson *et al.,* (2011) used previously collected data from the University of Gothenburg. The data collected was from a large cohort of almost 4000 participants. The data used had a confidence interval of approximately 99%. The study indicated that whilst environmental values did play some role in environmental behaviours in Sweden, it was more important for an environmentally friendly behaviour to be cost efficient and convenient for citizens to be inclined to change their behaviour to involve more environmentally friendly behaviours.

In a similar study of energy use in New Zealand (Peet, 1985), used energy use data provided by Statistics New Zealand and the energy industry to gauge the likelihood that energy consumption will increase if income increases. He found that as real income increases energy use also increases. He postulated that over time as real income increases slowed, so too would energy demand. The study does not suggest the likelihood that citizens will reduce their energy use if income decreases.

A recent study in the United States (Zborel, 2009) analysed factors influencing pro-environmental behaviour. The research was conducted using an extensive range of literature from the multi-disciplinary research area. It was then backed up by interviews with experts in the fields of behavioural psychology, energy efficiency and urban planning. The results of the review and interviews indicated that small policy "nudges" were effective in achieving behavioural change, however they did not yield understanding of why a person should change their

behaviour patterns to more pro-environmental ones, only that change was easy to do. Whilst the study did not provide empirical evidence of such "nudges" as motivators, it drew heavily on secondary resources and on the knowledge of experts with empirical knowledge of the subject.

Questionnaires were used in Vancouver, Canada by Krohn (2008) to determine the extent to which ease of action impacted the use of pro-environmental behaviours. The study showed that when kerbside or more convenient programmes exist better up take of desirable behaviours may result.

In South Africa randomly selected a number of households in four suburbs of the Tshwane Metropolitan Area to be part of a study regarding the effect of environmental education upon pro-environmental behaviour (Kamara, 2006). Selected households were then visited by a team of researchers and a member of the household chosen to be interviewed. Interviews were structured questionnaire based interviews designed to understand how much each participant knew about the environment and whether that impacted their behaviour, particularly with regard to waste sorting and management. 40 households in each suburb were randomly selected. Results indicated that environmental education and income affected participants behaviour regarding the sorting of domestic waste. It is feasible to extrapolate these findings out to other pro-environmental behaviours also.

Similar to overseas, New Zealanders are more likely to take up environmentally friendly behaviours and make more environmentally friendly choices when the behaviour, and/or choice, was cost and time effective for them (Hay, 2008). Hay's study in Palmerston North, New Zealand consisted of approximately 300 households. A questionnaire was posted that consisted of demographic questions and behaviour based questions through which he could gauge the environmental impact of a household. Results showed that New Zealanders are environmentally aware but that this did not necessarily translate to changes in behaviour. He notes further than where an energy saving device was installed, it ended up being used more, thus negating the energy saving.

Hay's study was compared heavily to a study conducted by MfE (2007) who conducted a follow up study in 2008. Both studies analysed environmental attitudes and willingness to undertake lifestyle or accommodation changes to take account of environmental concerns. MfE found that in the main New Zealanders obtained environmental information from the media. Participants in the MfE studies indicated that they would be willing to make changes to their lifestyles or accommodation infrastructure to benefit the environment at the right price.

A 2001 study in Palmerston North (Tiwari, 2001) used a survey of Likert style questions to analyse the role of gender in household waste management. She found that women primarily manage household environmental impacts in Palmerston North. Her study also found that the people of Palmerston North felt that they managed their household waste well and that those with higher levels of educational qualification were more inclined to state that this was the case in their household. Tiwari's work backed up a theory that, as women make the purchasing decisions in their households, women are more likely to make environmental decisions in their households.

When measuring household impacts on the environment there is no standard, accepted, clear method of data collection, as noted by Sharp *et al.,* (2010). However, trends can be seen by comparing techniques used across a number of published studies and unpublished theses. Studies seen by the author of this study used some sort of interview or survey technique. One study used pre-existing data collected by the government with a large cohort to estimate average household environmental impacts. Another study used pre-existing literature to formulate findings as this was an easy source of information collected for many purposes with the bonus of being able to be used to estimate environmental impact. Many nationally organised bodies used information collected by the national statistics collection organisation in their country.

2.8 Summary

In the early 1970s, the world experienced an awakening to the growing environmental issues of biodiversity loss, climate change, eutrophication, inland water protection, acidification and ozone depletion. This awakening led to a number of conferences regarding environmental issues, reports, such as the Brundtland Report, and declarations, such as the Rio Declaration, and accords, such as the Kyoto Protocol by the middle of the 1990s.

Regional and common interest/economic organisations such as the EU and OECD began work on environmental issues during the early 1980s and member states began to work on developing legislation and frameworks to fit in with the organisations to which they belonged. Some nations, however, had already begun environmental protection measures in the early 1970s. The USEPA was legislated in 1971 and began its work in 1972.

The range of policy options such as command and control measures, voluntary accords, education and information, free market and financial measures provided a myriad of choices for nation states to make regarding their environmental policy paths. It was also essential for environmental policy decisions to include the public they affect, as well as taking into consideration the global implications for their actions.

New Zealand took the path of legislation for public participation, notification and control of environmental impacts. The RMA and associated streamlining of local environmental management organisations has created a framework through which New Zealanders are able to have their say about major projects in their area that may have environmental implications. It created a framework where those engaging in projects with environmental impacts were required to be open, honest about and aware of the potential environmental impacts of their project.

Environmental issues have been included in New Zealand's education system for at least as long as the RMA has been in force. Public awareness programmes have also been used to encourage behavioural change regarding energy efficiency, waste reduction and water quality.

In recent years, New Zealand has instituted voluntary accords regarding the environmental impact of the dairy industry alongside the voluntary covenants over environmentally significant lands present since the 1980s. These accords and covenants are overseen by a number of ministries, including the DoC, MPI and MfE.

The New Zealand environmental framework and international environmental agreements New Zealand is signed up to are overseen by a number of ministries including MfE, DoC, MPI, Ministry for Foreign Affairs and Trade (MFAT), as well as the Local Government minister under the Department of Internal Affairs (DIA).

The New Zealand and international frameworks are, however, useless if individual citizens do not make changes to their behaviour and consumption choices to behaviour considered to be pro-environmental. Studies have shown that change is difficult to achieve unless it is cost effective and convenient. This has been shown through studies in the UK, Netherlands, Germany, South Africa, the USA and New Zealand.

3. Method

3.1 Introduction

This section discusses the methodology used to establish household environmental impacts in New Zealand. It discusses the chosen methodology and its theoretical underpinnings.

As noted in Chapter 2, there are many approaches to the research of household environmental impacts. Although discussed in Chapter 2, these approaches are recapped in this section. It also discusses the method used to choose participants and conduct the survey. Data analysis methods and ethics information have also been included.

This study is informed by the work of Hay (2008), whose study focussed on the reduction of environmental impacts in New Zealand at the household level. A case study area was chosen as it would have been difficult to sample every region in New Zealand given the time frame. As the study repeats a previous study many of Hay's methods have been chosen for inclusion.

3.2 Research Methods Theory

Two types of research can be chosen to investigate a topic such as the one at hand. These are quantitative and qualitative. The two types are often pitted against each other and it is regularly suggested that one is better than the other. However, this has been shown to be not entirely true with much literature to suggest that when both types of research are used in concert with each other research findings are often clearer and more robust than if one or the other was chosen.

Phillber, Schwab & Sloss (1980) discuss the importance of research being two things, generalisable and able to establish a link between an action and a result.

They discuss a number of ways that these two criteria can be achieved. Each method to achieve these criteria must, however, use a sample of some description, as aside from a census, there are very few research methods that are able to assess a whole population.

The case study was one of many methods to achieve the goals of generalisability and causation. A case study looks at one unit, an organisation, university, town, or country for example. A case study can be conducted through a series of descriptive interviews, a quantitative survey of a set group within a population or analysis of secondary resources regarding solely that case. The case study allows for in-depth knowledge of a particular group, however, its generalisability may be limited due to its narrow focus on one group or topic.

3.3 Survey Method Selection

A self-measured and self-administered postal survey method was chosen. This was chosen after much debate regarding the merits of face-to-face interviews in the street. Face-to-face interviews in the street have merit in that they are able to provide an instant response and are random in terms of the randomness of the people that would be in a particular area shopping on a particular day. However, they are also time consuming and may bias the sample depending on the time of day one is seeking participants.

A postal survey was deemed more appropriate for the following reasons:

- Cost: Two aspects of cost were considered. The financial cost of face to face and phone interviews was deemed to be higher than a postal survey; although the price of postage has increased since Hay completed the study upon which this was based it was still deemed more cost effective than other methods, particularly when hand delivery methods are employed. A postal survey is also cheaper in terms of time as it allows for the researcher

to consider other aspects of research whilst participants complete and return the survey.

- Coverage and anonymity. Postal surveys enable a researcher to cover a wider range of participants with more anonymity and confidentiality. As the survey is delivered into a mailbox rather than a hand the researcher cannot know the identity of their participants. Due to the survey method and allowance of time for completion of the survey participants are able to answer more openly and honestly than they might if stood in front of a researcher where their identity could be known.

3.4 Sample Population

Two suburbs of Auckland, New Zealand, were chosen as the survey population initially. These were Torbay, as an urban area and Helensville as a rural area. However, as Helensville was a significantly smaller area in terms of the number of households a second rural area neighbouring Helensville was added to the sample, this area is Kaukapakapa. Torbay was chosen, as it is a suburb representative of much of North Auckland's urban suburbs, it has a diverse mix of middle and upper class people of multiple races. Helensville-Kaukapakapa was chosen, as the areas are comparable to Torbay in terms of make-up aside from their rural location.

Torbay is an urban suburb in the North East of Auckland, approximately 20 minutes' drive North of the central city. It has a population of about 5000 people (NZ Census, 2006). Torbay is set between the suburbs of Browns Bay to the South, Albany to the West and Okura to the North. To the East of Torbay lies the Hauraki Gulf and the islands therein. It lies within the East Coast Bays Electorate.

Helensville and Kaukapakapa are rural suburbs in the North West of Auckland at the end of the Northwestern Motorway/State Highway 16, approximately 30 minutes from the central city. Helensville and Kaukapakapa are flanked by Kumeu, Riverhead and Coatesville to the South and East, Kaipara to the North and

Aucklands North Western beaches such as Muriwai to the West. Helensville gives its name to the electorate in which the two suburbs lie.

Maps of North Auckland with the two sample areas highlighted are included in Appendix A.

Participants were randomly selected from the electoral roles for each area. Each electoral role is approximately 240 pages long with two columns on each page. Participants were selected by turning to a page roughly 15 pages into the role then taking the first name in either Torbay, Helensville or Kaukapakapa in the right hand column of each page from there until 200 names and addresses were reached. Selected participants were then sent a survey and accompanying letter on December 9, 2012 to complete and return before December 24, 2012.

3.5 Design of survey instrument

The survey instrument used was that of Hay, S. (2008), the previous study upon which this study was based. The questionnaire was reproduced and reformatted to suit current conditions and the current author's aesthetic.

The questionnaire uses a number of Likert style questions to understand how often participants engage in a certain type of behaviour and through that estimate environmental impacts for particular households.

3.6 Survey Instrument Design

The survey was informed by a previous survey containing some questions with Palmerston North centric options for answers. These were changed to better reflect the Auckland based nature of this study, for example the final question in which a Palmerston North initiative was replaced with Auckland's Environmental Initiatives Fund.

An extra question was added to gauge the extent to which Aucklanders are likely to increase their energy use to Winter levels in Summer through the use of multipurpose heating/cooling devices, such as heat pumps.

3.6.1 Pre-testing

The questionnaire was tested on 14 volunteers of a range of ages on November 29 and 30, 2012.

Volunteers were offered a choice of two formats to complete. These formats were single sided A4 at one page printed on one A4 page and single sided A4 at 2 pages printed on one page, i.e. half the size of the alternative. When 10 questionnaires were offered to members of the Albany Rotary Club, all wanted to complete the questionnaire on single sided A4 at one page per sheet. This indicated that the option with larger print was preferred by older people. A younger group of people were also concerned about the smaller size of font. One tester in her 20s said about the smaller format "I can do this quite easily on this size but I think that older people will be holding it at arm's length, squinting to be able to read it. I can't see them filling it out in the smaller format". Another, in her 30s, struggled to complete the survey in the smaller format, noting that it hurt her eyes as she apologised for not being able to fill it all out in the time frame that she had. These comments, from all age groups tested, resulted, despite a desire to save paper, in the larger format being selected for distribution to selected participants.

Other comments regarded specific questions. One commenter stated that she was uncomfortable with the question regarding income and that she always undercut how much her family earned, in part due to embarrassment at how much her household earned in total. Another stated that he always overstated it, in part due to embarrassment over how much he earns considering his profession, he felt that there was a cultural construct around how much he should earn given what he does, so he usually writes that rather than what he actually earned. However, once pointed out that no question need be answered, if the accompanying letter

was read thoroughly, if the participant chose not to. This removed the discomfort around the income demographic question.

One further comment regarded questions pertaining to changes to accommodation to save water or energy. The comment was "as a renter, I don't know how to answer this because whilst I would like to do it, I can't because I live in a flat. I would love to put insulation around my hot water cylinder for example but it is the landlord's responsibility. Perhaps have that as an option?" A decision was made not to alter any questions to include "Not applicable, I am renting", as there was a provision for participants to write in such an answer in the "Other" space. Discussing this with the commenter, she said that she found that an acceptable solution given the space available on the questionnaire page but would prefer to not have to write if it could at all be avoided, "but then I'm really lazy", she said.

As a result of testing, no changes were made to the content of the survey, though the testing process did influence the format of the survey. The final survey instrument and letter distributed with it are included at Appendix B.

3.7 Data Analysis

117 returned surveys were analysed using Excel and Minitab. These results were then compared to previous surveys and existing data, including comparisons between the two cohorts involved in the study.

Confidence can be calculated from the sample size used. In order to calculate the confidence interval is as follows.

$$n = \frac{Z^2 x(p)x(1-p)}{c}$$

Where:

n = sample size

Z = Z value (e.g. 1.96 for 95% confidence level)
p = percentage picking a choice, expressed as decimal (.5 used for sample size needed)

c = confidence interval, expressed as decimal (The Survey System, 2012)

Rearranging this gives $p \pm 1.96 \times \sqrt{((p(1-p))/n)}$.

The total population of the sample areas was approximately 10,000 households. According to The Survey System (2012), a sample size of 117 yields results that give plus or minus 9% at 95% confidence for the population of the two sample areas combined. The confidence of this survey is lower than that of Hay (2008).

When separated the sample sizes present higher confidence intervals due to smaller sample numbers (Hitnon, 2004). Torbay results can be assumed to have a confidence interval of plus or minus 11.8% based on a sample of 68 and a population of approximately 5000 households. Helensville/Kaukapakapa results based on a sample of 49 and a population of approximately 5000 households can be assumed to have a confidence interval of plus or minus 13.9%.

The probability of an experiment's representation of reality is denoted by the p-value or critical value. It enables a researcher to decide if an event is statistically significant or not. Generally, researchers consider a p-value of less than 0.05 to be statistically significant (Ashcroft and Pereira, 2003).

The statistical test used for qualitative frequency data was the Chi-squared test. The t-test was used for quantitative data such as that surrounding distance travelled and number of vehicles.

3.8 Research Ethics

During the research planning process the research plan was assessed against Massey University's human ethics regulations though a questionnaire flow chart. This showed that the project was of low risk. Therefore, rather than submit an application to the ethics committee, a low risk ethics notification was submitted on November 16, 2012. This was confirmed as approved on November 23, 2012. All surveys noted that ethics approval had been given with the contact information of the Manawatu ethics committee administrator attached.

4. Results

Following the collection of data outlined in Chapter 3, this chapter presents the results of the survey. It does so through a combination of tables, graphs and explanation. Data was analysed using the methodology outlined in Chapter 3 and has been presented here.

This chapter follows the following structure. First, the response rate of the survey is presented. Following that each section of the survey is analysed in turn. Graphs and tables have been used where appropriate to illustrate data.

Using the data presented in this chapter the following three chapters enable conclusions to be drawn. Chapter 5 discusses these results in relation to relevant literature. Chapter 6 makes conclusions from the survey data. Chapter 7 uses this data, the discussion and the conclusions that can be drawn from them to make recommendations about how to proceed from here.

4.1 Response Rate

A total of 118 surveys were completed and returned. This gave a return rate of 29.5% for the whole survey. This is 1% more than the pre-follow up return rate of Hay (2008). However, one survey, returned late, was rejected due to its lateness and an inability to fully understand the answers. This resulted in a total analysed number of surveys of 117, 29.25% of the total delivered.

Surveys returned of the 200 surveys delivered in the Torbay area totalled 68. This gives a return rate of 34% for Torbay, the suburban/urban cohort.
Surveys returned from Helensville and Kaukapakapa, the rural cohort, totalled 49. This gives a return rate of 25% for the rural cohort, as of 200 delivered, 4 were returned to sender by New Zealand Post leaving a total delivered of 196.

The overall response rate is higher than expected. Studies analysing response rates to postal surveys with no incentive or follow-up have yielded lower response rates, so a lower response rate was expected. Blumberg, Fuller and Hare (1974) examined response rates for low incentive postal surveys delivered at two different times of the year yielding responses of 19% and 11%. They noted that a cover letter increased the number of responses but were vague about how much by. Blumberg *et al.,* (1974) note further that a postal survey will have a better return if it is followed up with a reminder. The previous study on which this is based (Hay, 2008) sent a follow up letter to participating households resulting in a further 8% of delivered surveys completed and returned, however, due to cost and time constraints it was decided that no follow up would be conducted in this instance.

4.2 Demographics

The demographic data of respondents is outlined below. First overall results are analysed. Then each question is analysed on a suburban versus rural basis to determine if there are any problems regarding comparison of like with like and ensuring that the main variable between the two cohorts was the type of area in which they lived. Refer to tables 1 and 2 for more information.

Fifty-nine percent of respondents were from Torbay, the suburban cohort with 41% from Helensville/Kaukapakapa, the rural cohort. Of the 117 responses, 61% were female and 39% were male. When broken down into areas the results were not different. Torbay was 61% female and 39% male. Helensville/Kaukapakapa 61% female and 39% male. These results give an approximately 10% gender bias, however, I do not believe that this is a problem as anyone in a household who knows the environmental situation in the house was able to respond to the survey.

The age range of participants is not evenly distributed. Thirty-six percent of participants were over 60 years old and those aged 18 to 29 years old made up only 2% of respondents. This was the same in the rural and suburban cohorts.

Differences between the two were in the 30 to 39 and 50 to 59 age groups. The suburban cohort had 6% more 30 to 39 year old participants then the rural cohort, which, in turn, had 7.5% more participants in the 50 to 59 age range, although both of these are within the margin of error.

Ninety-three percent of participants owned their home while 7% of participants rented their accommodation. There is a 4% difference between those that own their home in the rural cohort and those that own their home in the suburban cohort, with 95.9% and 91.2% respectively. 8.8% of suburban participants rented their accommodation as opposed to 4.1% of rural participants. This contrasts with Hay (2008) which showed 83% of participants in Palmerston North owning their home and 17% renting and the overall demographics of the Auckland region which show 64% home ownership and 36% renting (State of Auckland Report Card, 2012). Both the local board report cards for the boards encompassing the areas chosen for this study show that approximately 25% rent in their board areas, indicating that those who own their house have been more likely to respond to this survey.

In terms of income, 16% chose not to answer this question. Of those that did answer, 5.15% of participants earned within each of the following income brackets: less than $20,000 per annum, between $160,001 and $190,000 per annum, and over $190,000 per annum. 28.86% of participants earned between $100,001 and $130,000 per annum, by far the largest income group. Overall, 68% of households that answered the income question earned more than $80,001 per annum. These results place the participants of the survey above the average income.

Twelve percent of participants chose not to answer regarding qualifications. Of those that did, however, approximately 50% had Bachelors or Post-graduate Degree qualifications. 22% held polytechnic or trade qualifications, 17% high school qualifications and 9% had no qualifications. 2 participants held PhDs. The rural cohort contained more households with trade qualification holders (31% in Helensville/Kaukapakapa as opposed to 15.5% in Torbay) whilst the

suburban cohort contained more households with post-graduate degree holders (36% in Torbay in contrast to 11% in Helensville/Kaukapakapa).

Racially, the two cohorts were similar with most participants (82%) being New Zealand European. 13% considered themselves to be "Other". "Other" consisted of South African, British, Syrian, other European or variations on New Zealander, or Pakeha. 3% were New Zealand Maori. Pacific Peoples and Asian (Chinese) made up 1% each of the cohort. The racial profile of this sample is similar to that of Hay, 2008.

Seventy-seven percent of participating households were either a couple or a couple with boarders or children. 44.44% were a couple with boarders or children, 32.48% were a couple. These results are different to those of Hay (2008) for whom 52% of the sample were either a couple or a couple with children or boarders.

Participants were asked to state the number of people in their household. The mean number of people per household was approximately 3 people per household. The most common number of people per household was 2. The minimum number of people per household was 1 person and the maximum was 10 people. The ten-person household was an outlier and it appears that the household consists of 3, possibly 4, generations.

Table 1: Demographic Data 1

	Suburban (Torbay)		Rural (Helensville/Kaukapakapa)		Total	
	n	%	n	%	n	%
Gender						
Male	26	38	19	39	45	38
Female	42	62	30	61	72	62
Total	68	100	49	100	117	100
Race	Torbay		Helensville		Total	
NZ Maori	1	1	3	6	4	3
NZ European	53	78	42	88	95	82

Pacific Peoples	1	1	0	0	1	1
Asian	1	1	0	0	1	1
Other	12	18	3	6	15	13
	68	98	48	100	116	100
Age	Torbay		Helensville		Total	
18 to 29	1	1	1	2	2	2
30 to 39	14	21	7	14	21	18
40 to 49	15	22	10	20	25	21
50 to 59	13	19	13	27	26	22
Over 60	25	37	18	37	43	37
	68	100	49	100	117	100
Ownership	Torbay		Helensville		Total	
Own	62	91	47	96	109	93
Rent	6	9	2	4	8	7
	68	100	49	100	117	100

	Torbay		Helensville		Total	
Income						
less than $20,000	2	4	3	8	5	5
$20,001 to $40,000	5	9	4	10	9	9
$40001 to $60000	3	5	4	10	7	7
$60001 to $80000	7	12	3	8	10	10
$80001 to $100000	12	21	7	18	19	20
$100001 to $130000	18	32	10	25	28	29
$130001 to $160000	4	7	5	13	9	9
$160001 to $190000	4	7	1	3	5	5
more than $190000	2	4	3	8	5	5
	57	101	40	103	97	99
Qualification	Torbay		Helensville		Total	
NCEA, School Certificate, or other secondary school qualification	5	9	12	27	17	17
Polytechnic qualification or Trade Certificate	9	16	14	31	23	22
Bachelors degree	15	26	10	22	25	24
Post graduate degree	21	36	5	11	26	25
No qualifications	7	12	2	4	9	9
Other	1	2	2	4	3	3
	58	101	45	99	103	100

Household type	Torbay		Helensville		Total	
Single Person	5	7	7	14	12	10
Single Person with children or boarder(s)	5	7	2	4	7	6
A couple	23	34	15	31	38	33
A couple with children or boarders	30	44	22	45	52	44
Group flatting together	2	3	1	2	3	3
Other	3	4	2	4	5	4
	68	99	49	100	117	100

4.3 Environmental Awareness

How informed do people feel they are?

Figure 2 presents information regarding the level of environmental awareness as reported by survey participants. Of 117 participants, 2 believed themselves to be poorly aware of environmental concerns. Of the rest of the participants there was an approximately even split between somewhat informed and well informed. People in the rural cohort (57%) were more likely to say they were well informed, with people in the suburban cohort more likely to say they were somewhat informed (54%). In Hay's 2008 sample 40% considered themselves well-informed, 50% somewhat informed and 6% poorly informed. This is different to these results, possibly due to the intervening four years. Over time it is possible that more people feel that they have become better informed about the environment.

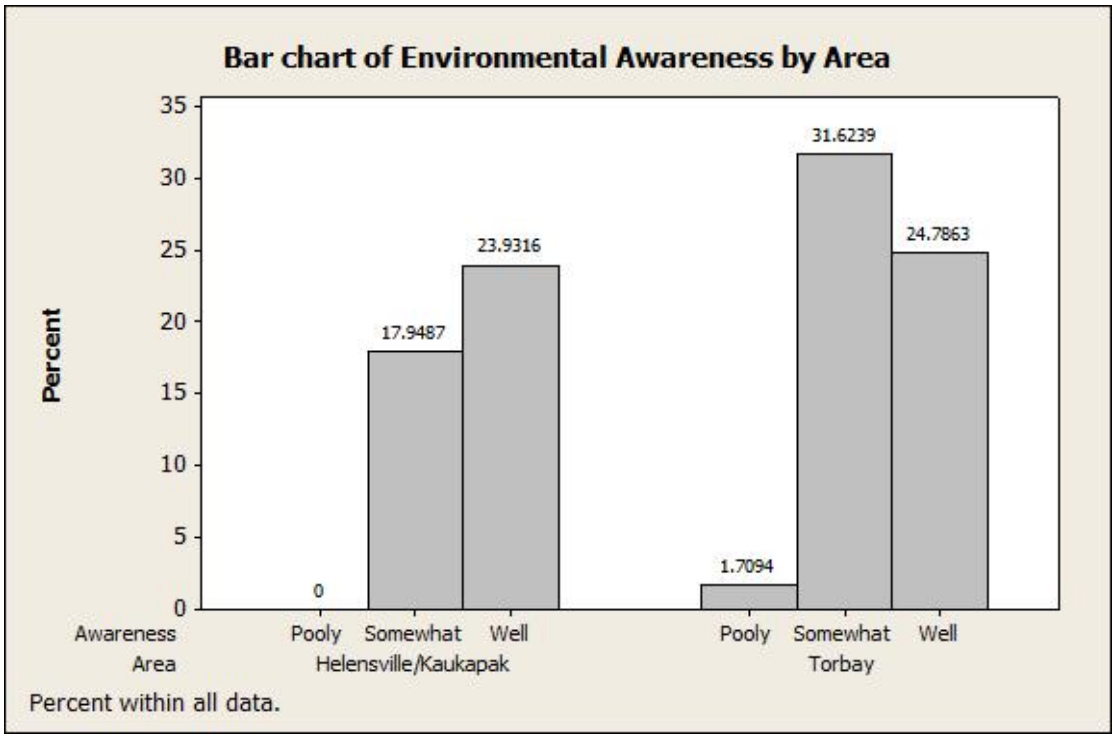

Figure 2: Environmental Awareness by Survey Area

4.4 Knowledge of Environmental Organisations

Overall, those in the rural cohort were more knowledgeable about environmental organisations and initiatives in New Zealand. Whilst the suburban cohort were more likely to know about the Energy Efficiency and Conservation Authority (EECA), however, of the organisations in the questionnaire rural participants were more likely, marginally, to know about other organisations and initiatives.

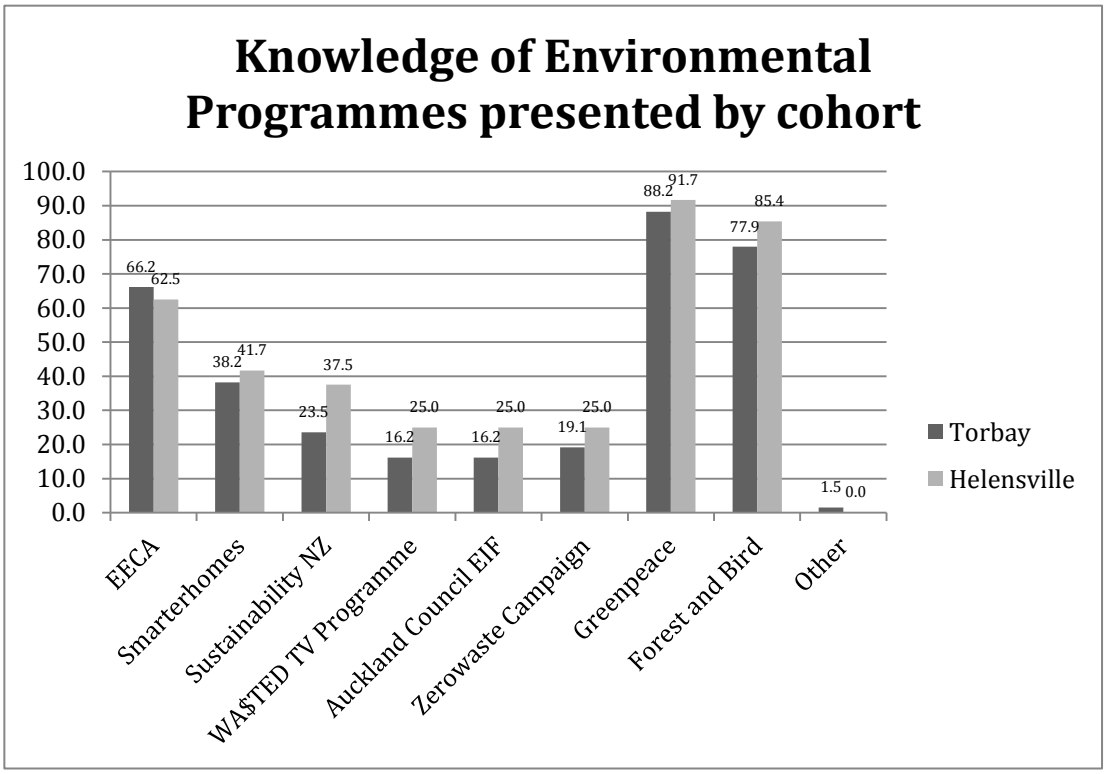

Figure 3: Knowledge of Environmental Initiatives. (Percentages)

Those organisations, initiatives and television programmes that are current were more likely to be known about. The Wa$ted TV programme was in the three least known by respondents to this survey. This programme was predominantly before 2010. However, it was left in the survey, as no other television show appears to have risen to replace it. Local initiatives such as the Auckland Environmental Initiatives Fund, operated by Auckland Council was also in the bottom three. The Zero Waste Campaign, operated by the Zero Waste Trust, now Kaipiatiki Trust, has not been active in recent years. This may account for its presence in the bottom three.

The most well-known organisations and initiatives were EECA, Greenpeace, and Forest and Bird. Approximately 90% of both the rural cohort and the suburban cohort knew about Greenpeace. Forest and Bird was known by 83% of the rural cohort, and 79% of the suburban cohort. EECA, who had a number of television advertising campaigns in 2012, were known by 67% of the suburban cohort and 61% of the rural cohort.

In comparison to Hay (2008), Greenpeace and Forest & Bird are as well known as five years ago. The Wa$ted television show is less well known, possibly due to its lack of visibility now. EECA, on the other hand is much better known than it was. This is possibly due to the television advertising campaigns it has been running regarding energy efficiency.

4.5 Where do participants learn about the environment?

The above results regarding organisations and initiatives are backed up by the results, presented in Figure 4 of a question asked regarding where participants gather environmental information.

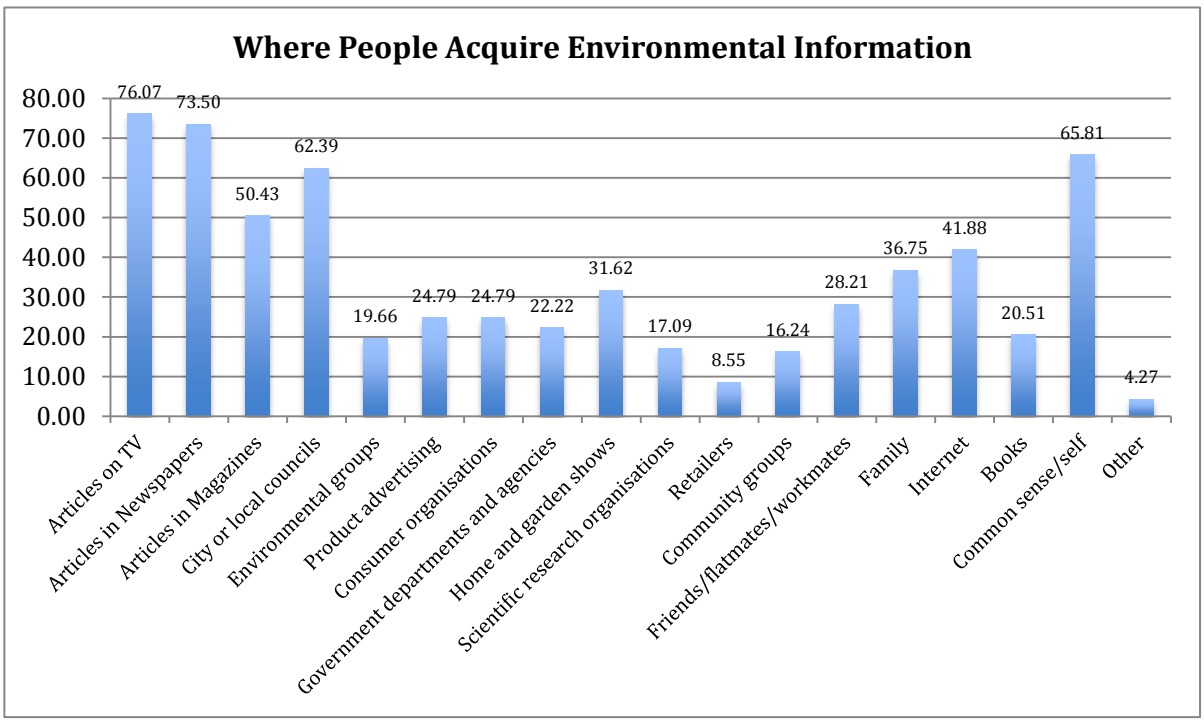

Figure 4: Where Participants Gather Environmental Information. (Percentages)

Seventy-six percent of participants look to television and 73% look to newspaper articles for information regarding the environment. After that they used common sense or self knowledge/instinct for information regarding the environment, with 65% of participants stating that they use their own common sense for environmental behaviour. Local governments were also a source of information regarding environmental behaviour, with 62% of participants stating that this is where they get some environmental information. This indicates that those organisations and groups that are able to acquire media coverage are more likely to be better known than those with a lower media profile.

Participants indicated that they did not find environmental information from retailers, books, scientists, environmental groups, community groups or product advertising, overall. Outside of the above outlined places where people go to get environmental information they did not use other sources of information overall.

4.6 Energy Consumption

Questions were asked about water heating, heating and other high-energy use behaviours.

The main method of water heating in the rural cohort was electricity at 87.76% with electricity with wetback and gas heating methods at 6.12% each. In the suburban cohort 66.28% used electricity, 30.88% gas and 2.94% used solar water heating methods as their main method of water heating. More than 50% of each cohort noted that cost was an obstacle to the adoption of the solar water heating option. 16.24% of all participants noted that there was no incentive or reason for them to adopt solar water heating. 11.11% stated that there was a lack of information available about solar water heating systems. The remainder were not interested in installation or had heard bad reports regarding performance of such systems. These results are similar to those obtained by Hay, 2008.

With regard to the reduction in energy use to heat water a range of techniques are used by participants in this survey. Approximately 85% of participants showered instead of taking a bath, three quarters fixed leaky taps and 72% of participants used cold water to wash their clothes. About half of the participants reduce the temperature of their water cylinder. Less than half of participants insulated their hot water cylinder, rinsed clothes in cold water or installed low flow showerheads. Of those that had made changes to their water heating energy use, more were from the rural cohort. These results also compare favourably with Hay, 2008.

Two heating sources predominated responses in this study. The rural cohort used predominantly wood burners, 54.17% followed by heat pumps at 22.92%. The suburban cohort used three main heating methods heat pumps first, 36.76%, then wood burners, 22.06%, followed by gas heating, 13.24%. Most heating methods required the use of electricity. Heat pumps can also be used in summer for air-conditioning, 25.96% of participants stated that they sometimes use their heat pump year round for heating or cooling. These results are different to Hay, 2008. In 2008 in Palmerston North Hay found that 51% of households heated their home using town gas supply. This is not as readily available in Auckland which accounts for the difference.

Approximately 90% of rural participants and 71.64% of suburban participants had insulation in their ceilings. Overall 79.31% of participants had ceiling insulation. This is higher than the percentage of participants with wall insulation. 73.47% of rural participants and 50.75% of suburban participants had wall insulation. Less still insulated their floors, 55.1% of rural participants and 40.3% of suburban participants stated that they had floor insulation. Insulation is more popular in this study than Hay's 2008 study. In recent years, the government, through EECA, is promoting the insulation of New Zealand homes through the use of a subsidy to those insulating their homes.

In terms of the making use of opportunities to keep heat inside one's home, 11.11% of participants had double-glazed their homes. The low uptake of this could be due to cost. "It cost my parents $10,000 to double glaze their 4 bedroom

house in Torbay." (Krystal Lynes, 2013, Pers. Comm.) Of the less costly methods, the most likely method used to keep heat inside the home was thermal curtains. In the rural cohort 59.18% used thermal curtains in their homes. In the suburban cohort this was 49.25%. Draught stops were used by 25.86% of total participants. 8.62% of participants dealt with energy use for heating by leaving their homes at a reduced internal temperature. These results were similar to Hay, 2008.

Less than 1% of participants did not know if they did anything to reduce energy use related to heating. 4.31% of the total participants in this study stated that they do nothing in this regard.

Questions were asked regarding overall energy use. Answers were on a scale of 1 to 4 with 1 being always, 2 being often, 3 being sometimes, 4 being never. 34.19% of participants stated that they always use energy saving light bulbs. 15.52% stated that they always turn appliances off at the wall. 51.72% of participants noted that they sometimes use the clothes dryer. 11.61% always use a microwave instead of an oven. 37.93% always turn lights off when they leave a room. 53.04% always use an outdoor clothesline. As noted previously 61.54% never use a heat pump as an air conditioner year round. There is little notable difference between the rural and suburban cohorts regarding energy saving habits. These results are different to Hay (2008) this could be due to a different location or greater knowledge of products such as energy saving light bulbs.

4.7 Water Consumption

Participants were asked a series of questions regarding water use. This was because, as stated in Hay (2008), there is no practical way of measuring each household in a study's individual water use. Through answers to questions around water use behaviours one can infer water use. The main reason for water use was asked. There was also a range of questions regarding measures taken to mitigate water consumption.

The cost of the installation of water saving measures was the most common (38.33%) reason for water consumption patterns in the suburban cohort. In the rural cohort many use tank water rather than the municipal supply, so "water is free" was the most common answer (26.67%), followed by cost of installation of water saving measures and habits formed over time at 22.22% each. "Habits formed over time" was the second most common reason for water use in the suburban cohort, also, at 35%. There is much contrast between rural and suburban reasons for water use. This could be due to the difference in water supply. One suburban participant noted that "water is not free, it has never been free in Auckland". These results are similar to Hay 2008, though water being free was a less common reason for water use than Hay's study.

Seventy-one percent of participants stated that the water tap was turned off while their household cleaned their teeth. 80% noted that they ensured that the washing machine was full before switching it on. 44% of participants limit their showers to 5 minutes. 43% have reduced the capacity of their single flush toilet. However, 51% of the rural cohort did so, whilst 37% of the suburban cohort did. Forty-eight percent of participants wash their car with a bucket, however 52% of rural participants did so while 45.6% of suburban participants did so, indicating differences between rural and suburban water use behaviour. However, Chi-square analysis resulted in a Chi-square of 0.475 and a p-value of 0.490, indicating that the difference is not statistically significant in this case.

Mitigation measures used were varied and often close to half of the sample doing something while half of the sample did not. Some participants with teenaged children in their household noted that whilst they would like to undertake some of the measures their teens were resistant to change, or simply defiant regarding shorter showers, fill washing loads, turning off the tap when cleaning their teeth and/or cleaning their car with a bucket. Comments included "I would *love* to see my teenagers doing this." regarding the 5 minute shower and "My son doesn't but I do." regarding washing the car with a bucket. There was also a difference between those on tank water and those on municipal supply. A number of rural

participants noted "I am on tank water so I need to be very careful with my water use".

4.8 Waste Reduction

Questions were asked regarding recycling and the reduction of waste, the results of which are presented in Figure 5.

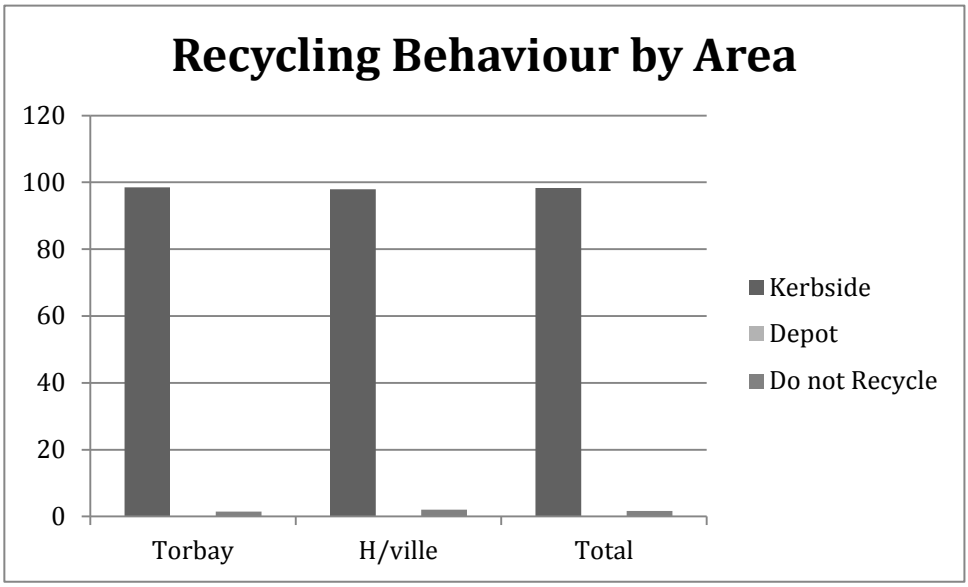

Figure 5: Recycling Behaviour by Area

Ninety-eight percent of participants indicated that kerbside recycling was their main method of recycling. The other 2% indicated that they did not recycle. There was little difference between either cohort about the main method of recycling. No participant selected delivery to depot as their main method of recycling.

A question was asked regarding what people do to reduce waste in their households, the results of which are displayed in Figure 6. Overall, 50% of participants compost food in their households. 16.67% of rural participants had worm farms, contrasted with 5.97% of suburban participants. 75% of participants made use of reusable shopping bags. There was limited uptake of discouraging junk mail in the rural cohort, however this rose significantly in the

suburban cohort. 38.8% of rural respondents and 31.34% of suburban respondents avoided excess packaging. 2% of rural respondents and 10.45% of urban respondents admitted to doing nothing in regard to waste minimisation.

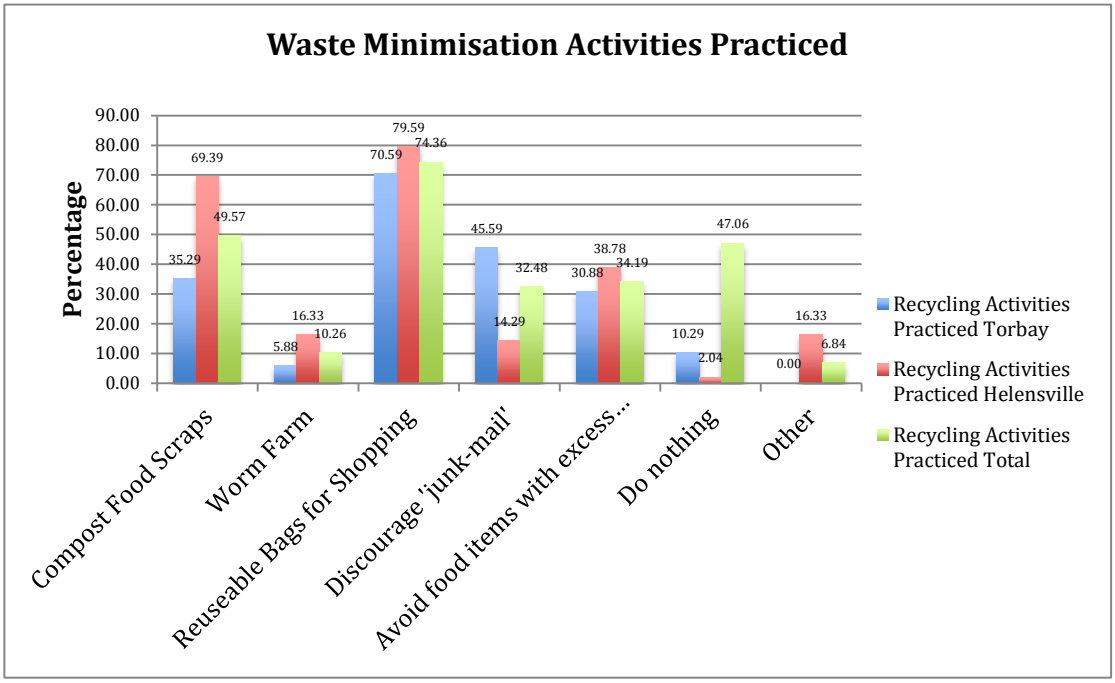

Figure 6: Waste Minimisation Activities Practiced

Recycling behaviour, as displayed in Figure 7, appears to relate to ease of recycling. For example in the Helensville/Kaukapakapa area, where paper and cardboard must be delivered to the depot 58.18% of participants state that they always recycle cardboard and 63.27% always recycle paper. This contrasts with the Torbay area where, perhaps due to kerbside paper and cardboard recycling, 91.18% always recycle cardboard and 86.76% recycle paper. Electronics and Whiteware are more difficult to recycle still, this is noticeable through the rural cohort state that only 17.02% of participants recycle electronics and 23.40% recycle whiteware. This is similar in the urban cohort. Car batteries were recycled more often than other batteries, one respondent noted that he recycles his car batteries because the vehicle service centre does it for him. The most likely to not be recycled of any item asked about were other batteries, such as watch

batteries or AA size batteries. 50% of participants stated that they never recycle batteries other than car batteries.

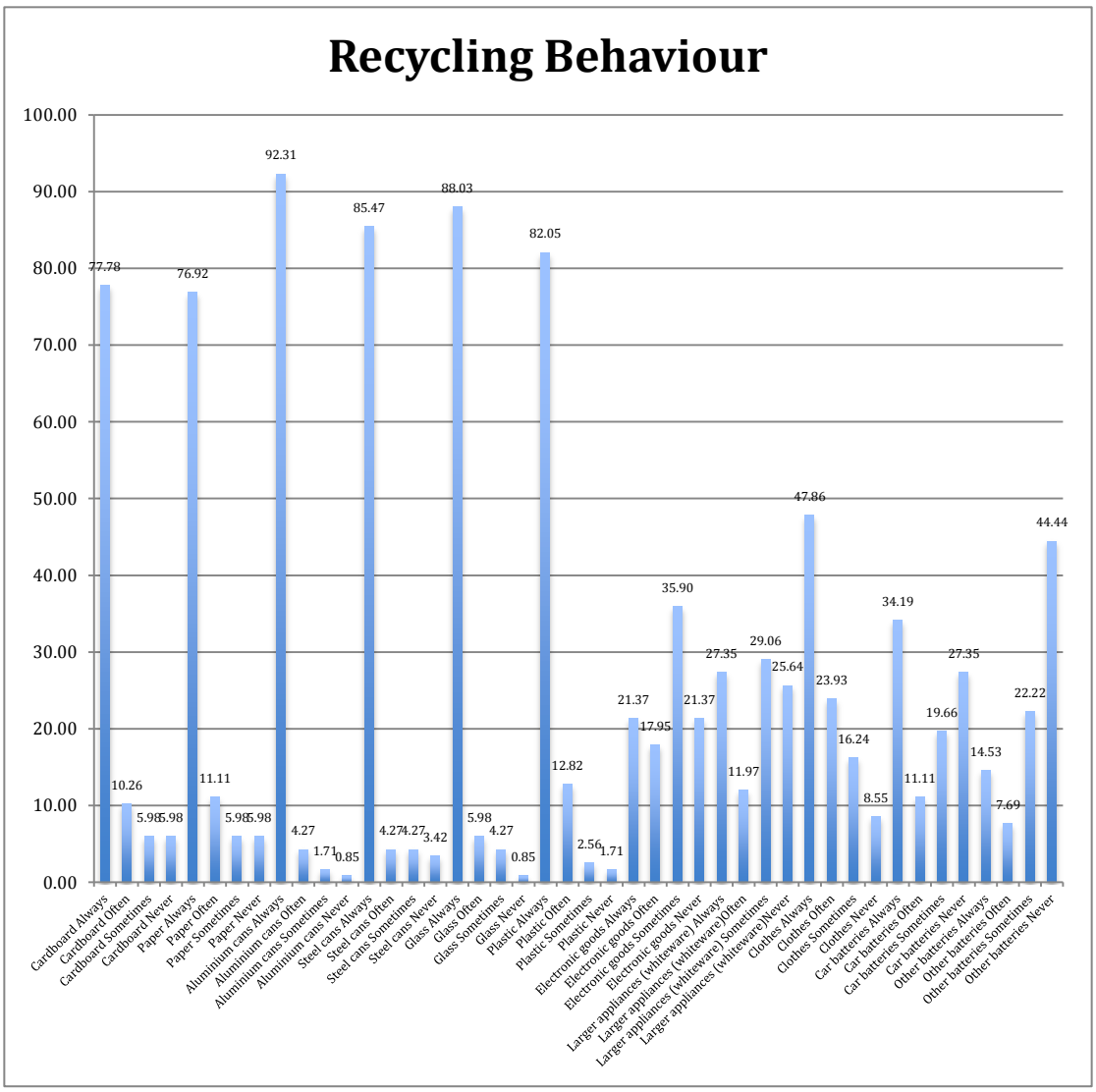

Figure 7: Recycling Activities. (Always, Often, Sometimes, Never)

4.9 Consumer Choices

Four questions were asked regarding consumer choices, these measured the frequency of the choice to buy second hand goods over new, minimal packaging, refills for reusable bottles and goods with the Environmental Choice tick. The majority of participants selected sometimes or often for three of the four questions. However, 54.87% of participants selected often and 26.55% of

participants selected always buy refills for reusable packages. This indicates that convenience and knowledge of options enable consumers to make environmental choices more frequently. For more detail regarding consumer choices see Figure 8.

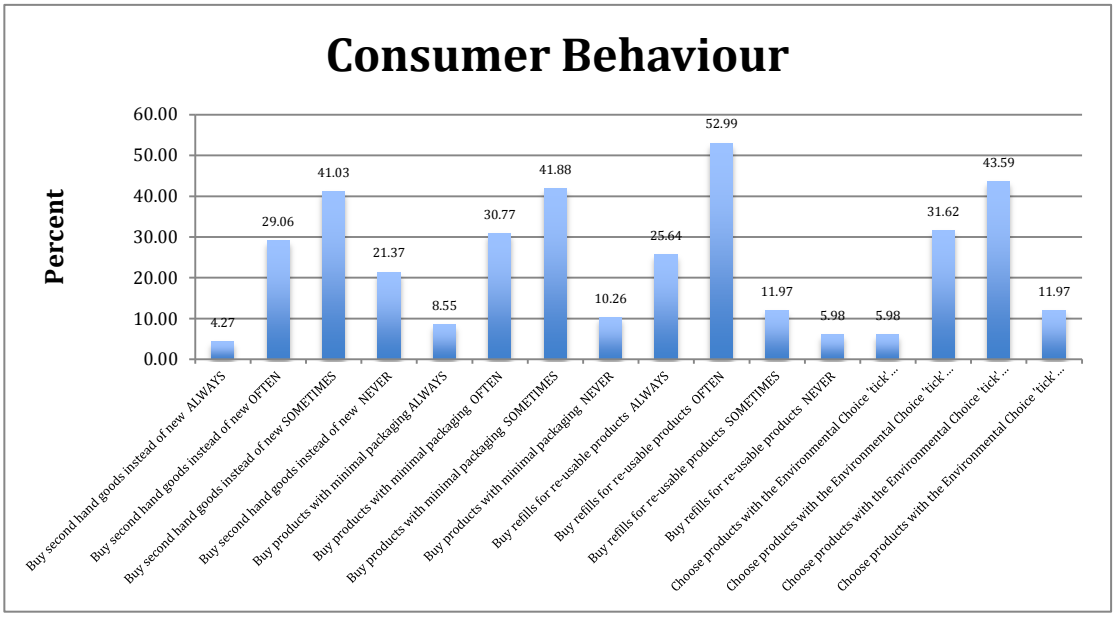

Figure 8: Consumer Behaviour

4.10 Transport Use and Behaviours

Questions were asked about private transport, distances travelled and use of alternative forms of transport the results of this are discussed below or displayed in Figure 9.

Of the total respondents 5 did not answer the question regarding the number of cars in their household. Of those 5, one in the suburban cohort noted that they did not possess a car or any form of private motor vehicle. Of those that answered the question, 61.7% of rural households had 2 cars, with 21.28% stating that they possessed one car. 53.85% of suburban households had 2 cars whilst 26.15% had one car. 12.5% of households had 3 cars and 6.25% had 4 or more cars. The mean number of cars was 2 per household overall. The mean distance travelled per household per week was 413.3 km. Based on a 2 litre, 2 door, 1997 Toyota

RAV 4, this is approximately one tank of 91 unleaded petrol. The minimum distance travelled was 0km with the maximum being 1600km per household per week.

Auckland Transport provides statistics stating that the average morning journey in a private vehicle in Auckland is 11km per commute (Auckland Regional Council, 2010). Based on a two-vehicle family travelling to and from work plus a little further per week an hypothesis was made that on average a 2 vehicle family would travel about 250km per week in Auckland. This was tested against the overall average for the North Auckland samples. With a confidence of 95% analysis in Minitab resulted in a t value of 4.45 and a p of 0.000 (this figure appears to have been rounded, as a p value cannot be zero). This indicates that North Aucklanders are not average in terms of the distances they travel in private vehicles each week. The p-value of less than 0.05 indicates the statistical significance of this result.

Seven of 117 participants stated that they possessed a motorcycle or motor scooter, one stated that they had 2 motorcycle or motor scooters, and one stated that they had 3 motor cycles or motor scooters. The maximum distance travelled per week in a motorcycle/scooter possessing household was 550km. The mean distance per week per motorcycle/scooter was 113.33km per week.

Participants were asked if they possessed other types of vehicle. 14.58% of rural participants stated that they did. These included caravans, tractors, vintage cars and an electric golf cart, amongst other types of vehicle. It should be noted that many of the vehicles stated were farm vehicles. 1.5% of suburban participants stated that they had other types of vehicle. 2 households possessed 3 other vehicles and 8 possessed one other vehicle. On average, other vehicles travelled 163 km per week per household. The maximum distance travelled by an "other vehicle" was 600km per week.

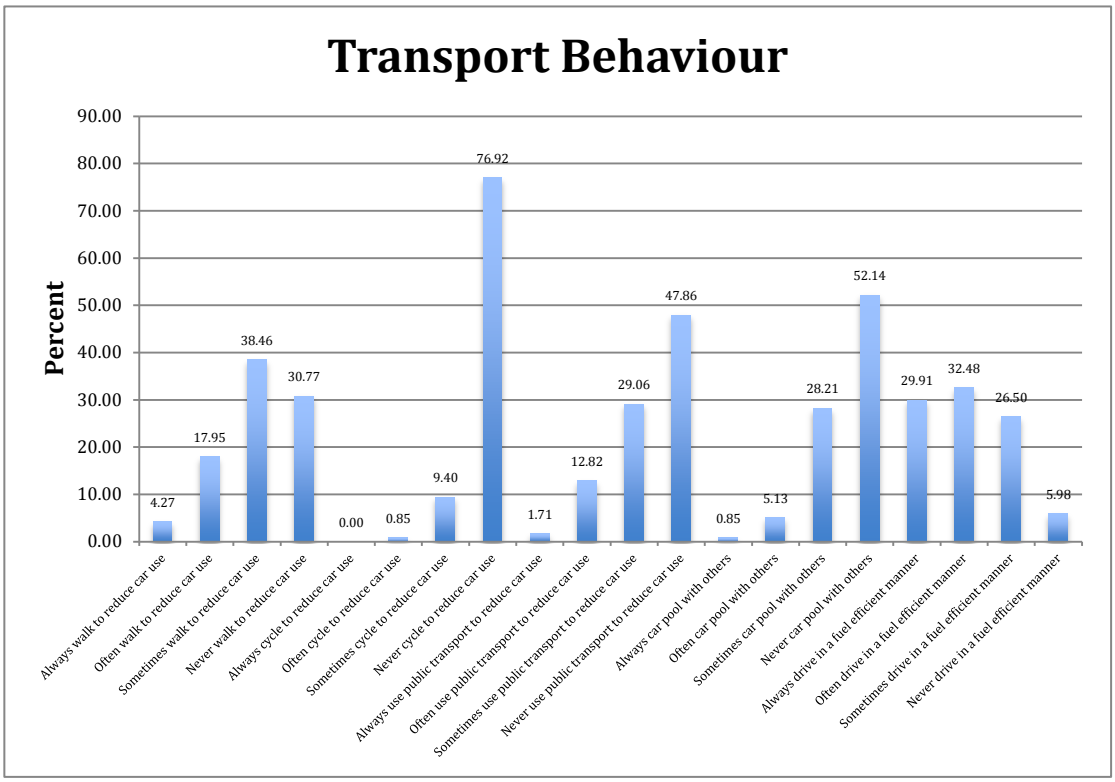

Figure 9: Transport Behaviour

Participants stated that they never or sometimes walked to reduce car use in the rural cohort. It was noted that the distances are long and there are few footpaths however approximately 18% always or often walked in the rural area. In the suburban cohort 23% stated that they often walk to reduce car use, 6% always walk to reduce car use, 42.42% sometimes walk to reduce car use and 28.79% never walk to reduce car use. The difference could be attributed to more footpaths and shorter distances in urban/suburban areas.

Eighty-eight percent of participants stated that they never cycle to reduce car use. 10% stated that they sometimes cycle to reduce car use. This could be due to the geography of the areas surveyed. However, there is no evidence to support that as nobody wrote any comments regarding cycling other than answering the question.

Public transport was rarely used by the rural cohort. Many wrote on their survey "what public transport?" beside the question. One person noted that there were very few buses or trains to the area surveyed and that they would use it if it was

more reliable and came more often. One farmer noted that his farm was 2km at least to the nearest bus stop and that the bus doesn't come often anyway so what is the point. However, 10% of rural participants stated that they always or sometimes used public transport to reduce car use. This is in contrast to the suburban cohort where 1.9% always use public transport, and approximately 70% sometimes or never use public transport. The difference appears to be due to one area having limited to no public transport available as opposed to the other where there is a regular and relatively frequent public transport system. However, Torbay's bus system is not as regular as buses closer to the central city, which could account for the 41.8% of Torbay households who never use public transport.

Sixty-nine percent of suburban participants stated that they never carpool to reduce car use in contrast with 47.62% of rural participants where 40.48% stated that they sometimes carpool to reduce car use. 27.12% of suburban participants stated that they sometimes carpool to reduce car use with 3.39% stating that they often carpool to reduce car use, 0% of suburban respondents stated that they always carpool to reduce car use. 2.38% of rural participants always carpool with 9.52% stating that they often carpool.

Driving in a fuel-efficient manner is something that many people strive towards. 31.5% of participants stated that they always drive in a fuel-efficient manner. 34.2% stated that they often drive in a fuel-efficient manner with 27.9% stating that they sometimes do. There was little significant difference between the cohorts in this regard.

Overall, results line up with Hay's 2008 study. This indicates that not much has changed regarding household environmental impact in New Zealand since 2008. This is despite increased government promotion of environmental initiatives and a higher percentage of participants stating that they feel they are well informed regarding the environment.

5. Discussion

This chapter discusses the findings of this study as presented in Chapter Four. It presents these findings in light of literature presented in Chapter Two. It also sets the stage for conclusions to be drawn and discussed in Chapter Six.

To present and discuss the findings of the study this chapter is structured in the following way. It first discusses how the results of the survey have been interpreted. Then it discusses each section of the survey in turn, referring to previous studies and publications upon which the study is based. Finally, key findings are discussed in turn, in order to draw conclusions and make recommendations.

5.1 Interpretation

Hay (2008) did not expect many differences between his Palmerston North survey and other main centres in New Zealand. This study has been conducted in a different main centre, that being Auckland. It sought to expand on Hay's work by adding a comparison of rural Auckland and suburban Auckland to the study. On comparison with Hay's study, it becomes clear that it is mostly in agreement with Hay's findings and that in the intervening four and a half years not much has changed with regard to New Zealand's household environmental impact. This study will be compared to Hay's study and the follow up study to the MfE Household Sustainability Benchmark Study that he used to compare his results to. The Household Sustainability Survey, 2008, (the MfE survey) will be used to compare overall results, as although it contained rural and urban participants it did not distinguish between the two. However, it had a much larger, more representative sample than this study and Hay (2008). Different parts of the survey results will also be compared with studies noted in Chapter 2, the literature review.

5.2 Demographics

As noted in the previous chapter the demographics of each cohort match up to each other reasonably evenly. This would make sense given that the study areas were selected for their similarities. The even spread of ages, education and income levels indicate that this study is representative of the areas in which it was undertaken.

Overall, women were more represented than men in this study. This was not too dissimilar to the previous studies conducted by MfE (2008) and Hay (2008). Tiwari (2001) analysed gender roles in environmental management in Palmerston North, New Zealand. Her results indicated that women were the most likely to have the power to influence household environmental management. The presence of more women than men participating in this survey could indicate that females, holding the environmental "purse strings", were in a better position to be able to make comment on environmental management practices/impacts for the participating households.

5.3 Household Environmental Impacts

5.3.1 Awareness

The results show that the majority of the sample felt that they were somewhat to well informed of environmental issues. This result is similar to that of Hay and the MfE survey. However, the MfE survey showed that 80% of New Zealanders surveyed felt that they were somewhat informed of environmental concerns. This is almost twice the number found in this survey.

5.3.1.2 Knowledge of Groups and Initiatives

This survey showed that over 70% of the sample acquire their environmental information from the media. 65% reported using common sense to make environmental decisions. Hay's study reported similar findings. The MfE study reports similar findings regarding the media as an information source. However, the MfE survey indicated a much lower number of participants using common sense to make environmental decisions, with 20% reporting that they used their common sense. More participants (34%) in the MfE survey indicated that they obtained information from family and friends. This could be a reflection of the relatively highly educated participants of this survey.

The MfE survey did not specifically ask participants if they knew of specific groups or initiatives so it cannot be used to compare with this study. However, Hay (2008) did ask about environmental groups and initiatives known to participants. In Hay's study the most commonly known groups were the same as in this study. However, Hay (2008) and this study differ in knowledge of other programmes. This is possibly due to programmes being more active in the media now than previously. For example in 2008 Wa$ted had recently aired on television. It is now no longer as visible on TV screens so may be less known. Though re-runs have been run recently, they are not on a mainstream channel. EECA on the other hand has had recent advertising campaigns regarding increasing the energy efficiency of one's home, focussing on the energy New Zealand could save and the money individual households could save through increases in energy efficiency.

This study asked if participants knew specifically about the Auckland Environmental Initiatives Fund operated by Auckland Council. 16% of suburban participants knew of the fund and 25% of rural participants. When Hay asked about a Manawatu regionally specific initiative 13% of participants were aware of it. This may indicate a lack of visibility for regionally operated initiatives.

5.3.2 Household Behaviour

Household behaviour is used to extrapolate potential household environmental impacts. Participants were asked questions regarding the energy consumption and conservation, water consumption and conservation, waste management and minimisation, and transport use of their household. Hay (2008) noted that differences between his study in Palmerston North and studies in other regions would not be unexpected. This is because each town has different access to resources such as gas and water. In fact, this is noticeable within the bounds of this study. The rural cohort had different access to public transport and water resources to the suburban cohort within the same city. Despite Auckland having been a single city since the 2010 local body elections, not all parts of Auckland yet have access to the exact same local government provided resources.

5.3.2.1 Energy

Questions were asked regarding energy use in each household. These covered common ways that households consume energy such as electricity use for heating water or space. They also covered the type of energy participants are using and what they do to conserve energy in their homes. The following discusses energy use in this study.

With regard to water heating there was significant variation between the rural cohort and the suburban cohort. The majority of the rural cohort used electricity to heat their water (88%), a further 6% used electricity with a wetback and the remaining 6% used gas heating systems. This is in contrast to the suburban cohort where 66% of participants heated their water using electricity, 31% using gas and 3% used a solar water heating system. The suburban cohort aligns better with Hay (2008) than the rural cohort. This could be because suburban participants have better access to gas than rural participants, as in Palmerston North where Hay noted that there is mains gas available for the 50% of people who heated their water using gas. The MfE study does not consider heating. However, in 2006 Branz undertook a study of New Zealand energy use. It showed

that 29% of heat in New Zealand was used for heating water. It also showed that 69% of heat energy in New Zealand was produced by electricity. (Branz,2010).

Some of the water heat conservation behaviour can be accounted for by personal preference, for example the 85% of participants who choose to shower rather than take a bath. It was more likely that participants were rural if they were making use of hot water conservation measures. Many of the measures noted in this study can also be used to conserve water in general.

With regard to reducing the temperature of the hot water cylinder, one test participant noted that hot water cylinders are maintained above 60°C to keep the water safe. A 2004 study in the Canadian Journal of Infectious Diseases (Levesque *et al.*, 2004) noted a double-edged sword regarding water heating. They discussed the importance of safety of children and reduction of energy use in balance with the bactericidal effect of a higher water cylinder temperature to kill *Legionella sp.*. They noted that the World Health Organisation recommend the bactericidal temperature of 60°C for hot water cylinders. Studies like these could account for the even split between those that do reduce the temperature of their water cylinder and those that do not.

There has been low uptake of solar water heating systems. This study suggests that it is due to cost. However, recently a plumber with both gas/heat pump water heating and solar water heating systems in his home, stated that he finds that the gas/heat pump technology is more efficient than the solar systems and did not recommend installation of solar water heating in my parents' family home (Pers. Comm. Bill, owner of ABC Plumbing, 2013).

Two main sources of space heating energy were used by participants in this study. These were electricity and solid energy. Rural participants were more likely to use solid forms of heat than suburban participants who either used electric heat pumps or electric heaters for space heating in their homes. This is in contrast to Hay 2008 where more people used town gas supplied heat for their homes than other options. Approximately 13% of suburban participants used gas to heat their

homes. The difference may be accounted for by the availability of gas supply, though it has been noted by one participant that the pricing structure of gas supplies in Auckland puts them off.

The use of solid energy for space heating is a concern. International data shows that climate change is a concern today. Climate change is not solely driven by industrial processes or the use of fossil fuel driven transport. Solid energy use for the production of electricity and/or heat energy is also part of the problem and reduction of this forms part of the solution. As in Christchurch, where the use of solid fuel based heating systems has been cleaned up in recent years, Auckland should be looking to reduce the use of such heating systems, as, ultimately, cleaner sources of energy, particularly heat energy, have less environmental impact (Local Government New Zealand, 2007).

5.4.2.1.1 Heat Conservation

Insulation in homes was more popular in this study than Hay (2008). It is, however, similar to the MfE survey. It should be noted that since 2008, when both studies were conducted, the government has actively promoted the installation of insulation in homes providing a subsidy through EECA for households wishing to install insulation in their homes. Grimes *et al.,* (2011) researched the impact of the use of insulation as a form of heat conservation on energy use by retrofitted homes. Their study found that those with insulation showed a reduction of energy use for space heating of approximately 5-6% based on a value of 16% of energy use being that of space heating. This indicates that insulation as part of a package of heat conservation measures would be advisable.

Other types of heat conservation measured in this study were similar to Hay (2008) though different from the MfE study. These could be due to the range of climates in New Zealand. Those in cooler climates in participating in the MfE study may have been more "savvy" with regard to methods of keeping heat in their homes. The Department of Building and Housing noted that double glazing

would likely be more prevalent in regions where the added expense would be of most use due to climatic conditions (Department of Building and Housing, 2008).

Double glazing is not mandatory in New Zealand, though the Department of Building and Housing stated in 2008 that it could make up part of a heat conservation solution to keep houses within heat loss parameters outlined in the building code. A Torbay resident noted the difference in feeling in her home after double-glazing was installed. She stated her belief that, though expensive, it is making a difference to her health and that the house is feeling quieter and has a more even temperature. (Pers. Comm. Krystal Lynes, 2013).

Differences in results regarding energy use behaviour between Hay (2008) and the current study could be due to either regional differences in climate or the increased availability of energy efficient items in the intervening period between the two studies. The MfE study did not collect information regarding energy use behaviour. However, it can be argued that this study does not fully cover energy use behaviour either. A further study analysing total energy use per household over a period of time would provide the volumetric data necessary to accurately analyse household environmental impact.

5.3.2.2 Water Consumption

Questions were asked regarding the main reasons why participants consume water in the way that they do and what measures they have taken to conserve water.

Auckland has relatively high rainfall so those on tank water in rural areas generally have few problems with running low on water. The most common reason for water use stated by participants in rural Auckland was that water is free. One participant noted that he had never had to buy water in because he is careful with it. However, in times of drought water use could become a problem in rural Auckland. It seems that suburban participants are happier to pay for the

water they use as, possibly due to being on municipal supply, their water consumption behaviours are dictated by habits formed over time. So, for example, if a person was used to taking a 30-minute shower in a high rainfall area and moved to a low rainfall area they may find it difficult to take a much shorter shower. The results compare favourably with Hay (2008). The MfE study did not specifically ask about water consumption reasons, however, the study indicated that New Zealanders did take notice of their water use and that they would not find it difficult to change to more environmentally friendly behaviours (MfE, 2008).

The cost of installation of water saving measures was a barrier to changing water consumption habits in this study. This was the second most common reason for water use remaining the status quo in this study. In Hay's study it was also the second most common reason for not changing water use habits after water consumption dictated by habits formed over time. However, this may change for the areas included in this study as Auckland Council has made changes in its water rates that have some in Auckland considering more carefully how much water they bring into their houses due to the Auckland Council charging for the processing of 80% of water coming in to a house going out of the house as waste water (Watercare, 2012). One suburban participant spoke to me after returning his survey and stated that he felt that due to the changes to the way water was being charged he needed to reconsider how he gets water for his garden given that the water he used was not leaving the garden as waste but returning to the household food chain through the vegetables produced in the garden (Scott Browne, 2013, Pers. Comm.).

In comparison to the MfE study, fewer in this study have undertaken water conservation measures on a large scale. 44% of participants in this study have short showers whilst 73% of the MfE study reported 3 to 5 minute showers. Hay's study compared favourably with this study. However, it should be noted that water conservation measures were asked at the personal level in the MfE study and the household level in this study and Hay's study. It is possible that whilst a participant may undertake a water saving measure themselves there could be

others in the household that are not doing so thus they have reported the practice not being followed. An example of this is from a note by a participant regarding the use of a bucket to wash cars "I do but my son does not". Other participants noted that despite lecturing their kids about the price of water and the preciousness of the commodity they are unable to break their kids' habits. One rural participant was particularly passionate about water and had written all around the question about the importance of water and the water saving measures she practiced such as only flushing the toilet when necessary and not showering every day. This practice is probably far from common and could be seen to go against the culture of daily showers that New Zealand appears to have.

There were few differences between water consumption and conservation measures undertaken between rural and suburban participants. This is backed up by the MfE study that found few differences between water related behaviours and attitudes between those on tank water and those on municipal supply. A more detailed study of water use in rural areas on tank water versus urban or suburban areas on municipal supply would provide a clearer understanding of whether or not differences exist between rural and urban areas.

The findings of this study regarding water consumption are further backed up by two studies conducted in Australia regarding water use and consumption behaviours. Across two studies Dolnicar *et al.,* (2010) and Gilbertson *et al.,* (2011) found that Australians were aware of the need to conserve water and that 80% of participants possessed low flow shower heads in 2010. However, their 2011 study showed that water conservation was dependent on the part of Australia that a particular participant was from. A rural Victorian, for example, was more likely to conserve water than an urban North Queenslander. This, they reasoned, was due to the weather conditions in the respective areas. Those with low rainfall or drought conditions had become much more conditioned to the need to conserve water than those in tropical areas with much higher rainfall. This study, to a certain extent, backs that up. Those in the rural cohort on tank water were more likely to be interested in saving water and to have installed water conservation devices than those on a seemingly unlimited town supply.

In late January/early February 2013 there was concern over water use as much of New Zealand had had lower than average rainfall in January. It is possible that those on tank water in the study may have given a different answer had the study been conducted in late January 2013 as opposed to late November/early December 2012 due to the declaration of drought North of the Auckland Harbour Bridge in February 2013.

5.3.2.3 Waste Reduction and Minimisation

Recycling

More participants in this study indicated that they made use of the kerbside collection services provided by Auckland Council than those in Hay's Palmerston North study. 99% of this study made use of kerbside recycling as their main recycling method as opposed to 88% of the 2008 study by Hay. In this study, participants either made use of kerbside services or they did not recycle. However, some in this study noted that they also delivered some of their items for recycling to the depot. These participants were from the rural area studied. The MfE study did not specifically ask about how recycling was undertaken.

The uptake of kerbside recycling services matches up well with the study done by Krohn (2008) mentioned in chapter 2. Her study in Canada indicated that where convenient recycling services existed a higher uptake was seen in high income populations. Krohn recommended kerbside recycling programmes as one step towards higher uptake of environmental behaviour. The presence of kerbside recycling services in rural Auckland, and presence of a drop off point in Helensville for items not able to be collected at the kerbside bodes well for the continued use of recycling services in Auckland.

Waste Minimisation

According the MfE study 40% of what goes into landfill is organic waste. Questions were asked regarding the minimisation of organic waste.

49% of participants in this study composted organic food scraps. 69% of rural participants had a compost system and 35% of suburban participants. Though, overall, fewer participants composted food scraps than would be expected based on the MfE study, the rural cohort compared favourably with the MfE study. 8% more participants in this study composted food scraps than in Hay's study. 7% more participants in this study made use of worm farms than Hay's study also. 10% of participants made use of a worm farm in this study. This number is similar to that of the MfE study. Some rural participants in this study also noted that they feed food scraps to pigs or chickens.

The MfE study did not discuss the reduction of junk mail, reusable shopping bags or excess packaging. However, between the Hay study and this study there are some differences regarding these behaviours. More participants in this study are practicing all three behaviours than in Hay's study. Fewer participants are doing nothing with regard to waste minimisation. This could be due to more awareness gained by New Zealanders in the intervening time with supermarkets promoting the use of own bags etc. or to annoyance at junk mail volumes in suburban areas.

Recycling Behaviour

Standard kerbside collected recyclable materials were the most likely items to be recycled, in line with Hay's study. Electronic goods and batteries were less likely to be recycled. Clothes were not as likely to be recycled as those goods that can be collected from the kerb outside one's house. However, electronic goods are of high value and can be potentially damaging to the environment if not dealt with properly, particularly smaller batteries such as Ni-Cd batteries or Li batteries. Batteries and electronic goods have high salvage values as they have high metal

content. It would be in the interest of not just the individual but also the global environment for electronic goods to be recycled.

The MfE study did not look at the likelihood of specific goods to be recycled. However, they did ask about the willingness to recycle electronics. It was found that less than 50% of participants recycle unwanted mobile phones, recycle unwanted printers and choose electric goods made with less toxic materials. There was overall a willingness to engage in more environmentally friendly behaviours around electronic goods, and thus reduce environmental impact. It was not speculated as to why consumers did not engage in such behaviours although it could be suggested that this is perhaps due to the convenience of recycling given that such high numbers recycle where kerbside facilities exist as Krohn (2008) found.

5.3.2.4 Consumer Choices

The results of this section of this study compare favourably with Hay (2008). The economic rule of the invisible hand can dictate the availability and price of environmentally friendly products. As cost is indicated as a barrier to the installation of water and heat conservation measures, it could be inferred that it is also a barrier in the adoption of such actions as choosing to buy environmental choice tick items rather than those without. Price may also dictate people's choice to purchase refills for cleaning items where available than purchasing a whole new bottle. Price and convenience should be considered when considering second hand goods, buying minimal packaging, refills and the environmental choice tick. One participant noted that they had never heard of the environmental choice tick so was actually not sure if they purchased items with it or not, and another noted that environmental choice products were too expensive for her family. Perhaps, a campaign to promote the environmental choice tick should be considered, as many participants appeared to be unaware of the tick. The MfE study did not analyse these types of behaviours.

The Environmental Choice Tick is one of a number of independent programmes around the world that certify sustainability in order to allow consumers to make decisions regarding the overall environmental impact of the goods they consume. It is provided by the New Zealand Ecolabeling Trust. The Environmental Choice Tick website states its objectives as:

- "*Improve the quality of the environment by encouraging more sustainable processes through the design, production, marketing, & use of products which have a reduced environment impact during their entire life cycle.*

- *Offer a credible national and/or regional (e.g. Australasian) programme for environmental labelling;*

- *Work towards compliance with recognised international programmes and principles; Foster and develop international relationships with relevant recognised international networks and other ecolabelling programmes/initiatives;*

- *Establish mutual recognition agreements with other similar programmes; Work towards the harmonisation of national and/or international product specifications;*

- *Provide a clear, credible and independent guide to help eco friendly consumers and businesses identify products and services that are less harmful to the environment;*

- *Provide a market incentive to manufacturers, suppliers and retailers of environmentally preferable products and services;*

- *Encourage manufacturers, suppliers and retailers to develop products and processes that are in compliance with published green product specifications;*

- *Promote responsible procurement policies by central and local government, other organisations and business;*

- *Establish and maintain strategic relationships with government, business and non government organisations which have common environmental and product performance interests*" - New Zealand Ecolabelling Trust, 2013.

They have sustainability specifications for more than thirty product groups. Specifications are under constant review so they state that having the Environmental Choice Tick is not guaranteed from year to year. Ecolabeling in New Zealand was initiated in 1989 by a government discussion paper. The environmental choice tick was launched in 1992 (DEFRA, 2008) through the government backed New Zealand Ecolabeling Trust which has mutual recognition agreements with other such labeling schemes internationally (www.enviro-

choice.co.nz). The low numbers of people who actively seek out the tick indicate that it is not as well known as something its age should be.

5.3.3 Transport Use and Behaviours

Transport use impacts are difficult to quantify as those with vehicles have different fuel capacities and efficiencies. The price of fuel has increased significantly since the 2008 study however, not much appears to be different. Participants appear to be driving in a fuel-efficient manner as much as possible. However, this is the only one, of the five, transport use behaviours adopted by participants in this study. Like Hay's Palmerston North study participants appear reluctant to walk, cycle, or carpool to reduce car use. They also, where public transport is available seem reluctant to adopt that on a regular basis.

Public transport is an issue that is much debated in political arenas at the moment. As the price of fuel has increased the Green lobby has pushed the government to abandon roading projects and focus on public transport. The current government is reluctant to do this, particularly with rail, as they believe that the cost benefit analysis does not stack up. Participants in the rural cohort of this study note that public transport is neither available nor reliable when it is. From my own experience using public transport in the suburban area of this study, it is more convenient and more time efficient to use a private car than the bus as it takes me directly to where I want to go at the time that I wish to go there. Public transport may be seen by suburban participants to be inconvenient despite being available. This could be different for those living in inner city suburbs where public transport is more frequent and where the choice of public transport is more diverse such as the rail that exists South and West of central Auckland. The MfE study showed low willingness to adopt public transport as a means to travel to work. In 2008, 23% of those surveyed and in employment were willing to adopt public transport as their means to travel to work.

The average distance travelled by households in this study was over 400km per week. This could be under-estimated as the question may have been interpreted as per car rather than total. However, 400km per week is a larger number than would be expected if participants were living close to their places of employment or using alternative forms of transport to travel to work. With the MfE study indicating that low numbers of people are willing to change their behaviours this appears to be unlikely to change. A New Zealand Transport Agency report (2011) revealed that according to the 2006 census Aucklanders travel a median distance of 5.3km per private vehicle trip. This would be expected to be higher for those living in rural areas or further from the city. This study did not assess trips, rather total distance travelled per week. However, if the survey were to be run again an average number of trips per household and the average distance travelled may be a more effective measure of participants relationship to private transport.

Transport contributes a significant amount to global climate change. While New Zealand is small, New Zealanders own 599 cars per 1000 people according to the WB. This is decreasing over time however it is within the top ten car owning countries in the world. A 2007 review (Chapman, 2007) noted that the transportation sector made up 26% of total global emissions. The review suggested that changes needed to be made at the technological, political and behavioural levels to have an effect on overall emissions.

6. Conclusions and Recommendations

This chapter takes note of previous chapters, in particular chapters four and five, to draw conclusions regarding household environmental impacts in North Auckland, New Zealand. These have been reached by analysing gathered data in relation to literature reviewed in Chapter Two and comparison with previous study. From these conclusions recommendations are made.

The chapter is divided into six sections, also presented in Table 2, these are: Environmental. Financial, Economic, Social, Institutional and Technical. It draws on the key conclusions and recommendations presented in Table 2.

6.1 Environmental

Participants in this study felt that they were well informed of environmental issues. However, they were unaware of a number of government and local government initiatives that have been undertaken or introduced in recent years. Also, relatively less recent information was unknown to participants. If an organisation or initiative is not easily visible to citizens through the media or other marketing avenues it is possible that citizens will not know about nor pay any attention to it.

Participants seem unaware of government-initiated programmes and some participants wrote hostile comments about both Greenpeace and Forest & Bird. This shows a lack of knowledge of potentially beneficial sources of information and of the work that organisations such as Greenpeace and Forest & Bird do that goes unreported such as engagement with the community regarding environmental issues and collecting data regarding biodiversity in New Zealand's forests. Whether initiatives and organisations are thought of warmly by participants was not part of this study, however the strong response from one

participant would indicate that at least some in New Zealand feel strongly about the way in which some environmentalist groups promote their message.

It is recommended that, as most participants stated that they acquired environmental information from the media, the media be encouraged to run articles regarding environmental impact and how New Zealanders can reduce their environmental impact on a semi regular basis. This could remind New Zealanders that what they do individually ultimately impacts the goals of New Zealand and the international community. It could also assist in awareness of government initiatives, at both the local and central levels. Environmental groups should be encouraged to consider their public image and adjust accordingly.

The number of participants making use of kerbside recycling is encouraging. It indicates that when environmental impact mitigation is convenient New Zealanders are more likely to make use of it. If recycling of batteries other than car batteries, for example, were more easily accessible more people would make use of that option. The same can also be said for the recycling of electronics. Currently, in North Auckland, electronic waste must be taken to an electronic waste recycling drop off point on a certain day at a certain time in a certain location that is not necessarily convenient for many people. One must make a concerted effort to recycle electronic waste and it is clear from this study that participants are not making the effort to do so. It is recommended that the Auckland Council consider developing its recycling scheme to include an easier system for disposal of electronic waste.

The overall environmental impact of the households in this study can be gauged using household behaviours. Whilst it does not appear that participants are using inordinate amounts of water and are making efforts to conserve both water and energy, if a water shortage or power shortage were to occur tomorrow it appears as though it would be difficult for many families to adjust quickly to such a circumstance. The same can be said of fuel. If every petrol station were to suddenly be out of fuel tomorrow, most households in this study would struggle to cope as they are travelling large distances by private car each week. In order to

remedy this, central and local governments could encourage the preparation of citizens for such shortages should they occur in the future. This could focus around school programmes, including through the Enviroschools programme, and public advertising campaigns.

6.2 Financial

Participants stated, in their hand written comments on the surveys, they would like to do more for the environment but that it was difficult to convince their families to do so. They also indicate through their answers to questions that cost is a barrier to the implementation of many water and energy conservation measures that could be implemented and when done on a large scale could significantly reduce New Zealand's overall energy use. Environmentally sustainable goods should be encouraged through the reduction of cost. This could be achieved through either a subsidy or a tax on products deemed to be environmentally unsound, thus making more sustainable products appear more financially viable.

6.3 Economic

Participants drove approximately 400km per week per household in private cars. This is a significant amount of their total fossil and other solid fuel use in a week. Much of New Zealand's electricity is created using renewable hydroelectricity with a solid energy back up for approximately 20% of the power used. If every household reduced its total distance travelled in private transport by 10% in a week, this could not only reduce environmental impact but also reduce people's fuel bills. This is not to say that it would reduce the total environmental impact of transport by the same amount however, as the transport sector does not only include private transport.

The reluctance of participants to make use of public transport was unsurprising. New Zealanders have a "love affair" with the car and the public transport in the

suburban area surveyed, whilst more regular than the rural area, is not as regular as areas closer to the central city, nor does it cover every route with the same regularity. Public transport in Auckland would need to be improved significantly for even those in the suburban cohort to make use of it. It is a balance between environmental concerns and convenience and currently it seems that convenience outweighs environmental concern.

A publically funded carpool website is recommended. This could bring together those wishing to carpool in a local area. The use of carpooling would reduce the overall economic cost of private vehicle use to the consumer. It would also reduce overall environmental impact of the use of private transport.

Participants noted economic reasons for low uptake of many of the environmental behaviours considered in this survey. This was no different to a 2008 study undertaken in Palmerston North, despite an economic downturn in the intervening period. Citizens are encouraged to continue engaging in environmental behaviours despite the current economic climate.

6.4 Social

This particular study focussed on two relatively high income and high homeownership parts of Auckland. It is well known that Auckland has a range of socio-economic circumstances within its very large region. It would be useful to build up a picture of the differences in environmental attitudes, behaviours and adaptations across the socio-economic spectrum as this could have implications not just for Auckland or New Zealand but also New Zealand's lower socio-economic Pacific Islands neighbours and any environmental assistance for them.

6.5 Institutional

A number of institutional conclusions and recommendations are presented in Table 2. For more information regarding these please see the table.

The global response to climate change has so far focussed on governments agreeing to cut emissions back to 1990 levels and beyond. Other international environmental agreements are focussed at the national and international level. Governments, be they international, national, regional and local, can make as many agreements and commitments to targets as they wish but if there is limited environmental response by households it will be difficult for the international community to see significant and rapid mitigation of climate change at the global level.

It should be noted from Table 2 that local governments hold much sway regarding the building of sustainable houses as legislated for in the RMA and in the Building Act. A significant percentage of the cost associated with building homes comes from the resource consent process and obligations placed on homeowners/developers by local government. Local governments should recognise the benefits of sustainable buildings and encourage them through either a reduction in "red tape" costs or through incentive programmes.

6.6 Technical

Rain barrels for watering gardens were not popular. One participant called them a "mosquito breeding ground". Rain barrels would take the pressure off water resources used to water gardens and would help to reduce water bills. They would also reduce the environmental impact of gardens and help out in the event of a water shortage. Rain barrels or water tanks are already used in rural areas and when combined with other water saving measures may assist in reducing the overall impact of municipal water taken from rivers and other catchments.

As very few suburban participants had installed rain barrels on their properties, this should be encouraged. Rain barrels provide opportunities to store or conserve water, particularly in times of drought. Other water saving options not in this survey, though noted by some participants, are to conserve water through

the use of "grey water" from laundries and showers to be reticulated to gardens or into toilets. Under ground water tanks and/or grey water reticulation systems should also be encouraged for new builds.

Energy conservation does not appear to be a priority for participants. Few participants noted that they cope with reduced temperatures in their homes. Few participants insulated all parts of their homes that could be insulated. Those participants with no ceiling cavity in which to put insulation are at a disadvantage as they are unable to prevent unnecessary heat loss through the roofs of their homes. Insulation allows householders to save energy, and through that money, as it keeps the temperature in buildings more stable. The same may be said of double-glazing although retrofitting double-glazing comes at an even higher cost than retrofitting insulation.

Both local and central government should look at the initiatives in place to encourage changes to the way homes are heated and energy conserved, or harnessed. Solar water heating was investigated in this study, however, it could be extrapolated to include solar energy in general. An initiative to lower the cost of solar energy use or installation, in particular for new builds or large-scale renovations, should be considered. Double-glazing is not currently mandatory in New Zealand (DBH, 2008) but should be allied with EECA's current insulation subsidies and should be made mandatory for new builds, particularly in colder regions.

Few participants in suburban areas made use of compost systems for the recycling and reduction of food scraps. This was different to the rural context. However, suburban residents may benefit from a compost system as they seek to develop gardens or vegetable gardens. Reusable shopping bags were the most popular of waste minimisation activities. Discouraging junk mail was shown to be more popular in the suburban area than the rural area despite it potentially allowing rural residents to make fewer trips to the recycling depot. Participants did not always use recycled clothing or other goods, did not place a focus on the

minimisation of packaging and did not place priority on goods with the Environmental Choice tick.

This study also shows that this small group of randomly selected participants are not as adaptable as they may need to be in the event of a major climate disaster or shortage of energy. This is an artefact of culture. Australians are more interested in water conservation than the New Zealanders in this study appear to be. A study of over 1000 people in 2010 showed that 88% of Australians had installed low flow showerheads amongst other water saving behaviours (Dolnicar, 2010). This could be due to more Australians having experienced serious drought conditions in their lifetimes creating a better understanding of the need to conserve the water thereby building it into their culture.

6.7 Other

Overall, it seems that whilst people believe themselves to be well or moderately informed of environmental issues they do not see an incentive to spend the necessary money to invest in tools or make other sacrifices that could mitigate household environmental impacts in New Zealand.

There is little New Zealand based literature around this type of survey and little Auckland region specific information. For this reason I recommend that the Auckland Council, along with MfE, consider replicating this study on a larger scale on a regular basis. Building a body of Oceania specific literature would be of interest to all in the region.

It is further recommended that the MfE follow up its 2008 Household Sustainability Survey, which surveyed similar environmental impacts to this survey.

Table 2: Research Findings and Recommendations

Category	Current Situation	Findings	Recommendations
Environmental	The global climate is recognised to be changing.	Participants considered themselves to be somewhat or well informed about environmental issues.	Environmental education opportunities should be maintained or increased.
	A number of groups and programmes exist to educate citizens about the need for sustainable management of resources.	Participants were aware of major environmental groups, programmes or initiatives. Those advertised on TV or with a higher media profile were most known to participants.	Public relations campaigns and media campaigns should be engaged in to increase the profile of all environmental schemes.
	The methods through which people gain information are growing in number and changing.	Participants sought knowledge from or were influenced by media outlets such as television, newspapers or magazines primarily.	The media should be prudent about its environmental reporting and ensure that information is presented in a clear, accurate and engaging manner.
	Recycling has become common practice.	Kerbside recycling was practiced most commonly as the main form of recycling.	The range of items that can be recycled at the kerb should be increased.
		Participants were least likely to recycle small electronic goods and batteries than other items that could be recycled.	Small, easy access, small electronic goods recycling depots should be opened in local areas.
	Energy production is a major contributor to climate change.	Participants attempted to engage in heat and energy conservation activity where costs were able to be kept low.	The financial benefits of lower energy use should be encouraged.

	Access to potable water may become more difficult as climates change.	Water saving measures were installed by participants where possible.	The use of water saving measures should continue to be encouraged.
		Low flow showerheads were unpopular with participants.	Low flow showerheads that do not compromise on water pressure should be investigated.
		Participants believed that there was no shortage of water.	Water use should be displayed to people on a global rather than local scale.
	Human environmental impact is believed to contribute to climate change, particularly in industrialised countries.	Participants believed they are aware of environmental issues.	Further study should be conducted around the belief of the general public in anthropogenic climate change.
	Awareness of environmental concerns is growing worldwide.	Participants believed themselves to be aware of environmental issues.	Further study should be conducted regarding awareness and actual behaviour.
	The Environmental Choice Tick is a programme that verifies sustainability of products sold.	The Environmental Choice Tick was not well known or often purchased by participants.	The Environmental Choice Tick should run a public relations programme to become better known.
Financial			
	Rural residents in New Zealand are often not on the water grid for them there is no financial cost for water. Urban residents are charged for water.	Participants were more likely to attempt to save water where there was a charge for it. However, those on tank water where aware of the potential to run out of water.	No change necessary.

	Retrofitting houses with insulation, double glazing, solar water heating systems, or water saving measures presents a considerable financial burden to home owners.	Cost was cited as the most common reason for environmentally friendly energy/water saving measures being retrofitted to homes.	Cost reduction measures such as subsidies should be encouraged and/or continued.
	The cost of environmentally sound home products is high.	A participant noted that Environmental Choice products are expensive.	The environmental choice tick could be subsidised, at least initially, by the government.
Economic	New Zealand has experienced economic recession for a number of years.	There was little difference between pre-recession and post-recession inclination to participate in environmental activity.	Environmental choices should continue to be encouraged regardless of the economic climate.
	New Zealanders are aware of the cost of products they purchase.	The environmental choice tick products were noted to be more expensive than others.	The environmental choice tick could be subsidised, at least initially, by the government.
	There are significant long term savings for families willing to spend the money to retrofit their homes with environmentally sustainable equipment.	Participants stated that the cost of retrofitting their home or cost in the initial building stages was a barrier to them installing such energy or water saving devices in their homes.	Energy and water conserving measures that require retrofitting in homes or a high initial outlay at the building stages should be reduced in price and encouraged.
	Auckland Council and its associated organisations charge for the disposal of waste to landfill through the purchase of council	Participants are actively trying to reduce waste and making use of kerbside recycling services provided by Auckland Council and	Council should continue to provide recycling services as part of rates paid by householders while charging for disposal to landfill as

	waste bags or "wheelie bins". The cost of kerbside recycling is included in rates.	its subsidiaries.	the economic incentive to recycle may encourage citizens of Auckland to reduce wates.
	The price of fuel is a cost of private vehicle ownership and is increasing.	Participants did not carpool to reduce car use.	Local communities could start a carpool register or website, whereby, whilst maintaining privacy, those interested in sharing their fuel costs or reducing their environmental impact could be brought together in order to carpool where practical.
Social	The Auckland City Council provide public amenities at subsidised prices such as public transport.	Public transport was not widely used by participants. It was not the preferred option. It was noted as almost non-existent in the rural cohort.	Public transport with similar convenience to private vehicle use should be considered and encouraged. Where the infrastructure does not exist it should be installed.
	Two broad demographics exist in New Zealand. These are rural and urban.	There is little difference between the environmental activities undertaken by either group in greater Auckland.	This should be further investigated outside the Auckland Council area.
	A wide range of racial and socioeconomic groups exist in Auckland.	These groups were not isolated for study in this study.	Further study should be conducted regarding racial and socioeconomic groups' impacts on household environmental management.

	Public transport may have social implications as well as environmental. It allows those without a car or license to travel to their destination and allows communities to come together through shared experiences.	Public transport was not widely utilised by participants who had private vehicles.	Public transport should be made more convenient in study areas to encourage greater use in light of benefits that are not solely environmental.
Institutional	The New Zealand government encourages citizens to consider reducing heat energy use.	Participants were aware of the high profile EECA energy conservation schemes. They were less likely to be aware of the smarter-homes programme.	The government should further promote programmes that are older and less visible than the programme du jour.
	Auckland Council provides recycling opportunities at the kerbside and the depot. They also provide waste management opportunities with the goal of reducing the amount of waste produced.	Kerbside recycling was widely used by participants.	Waste management programmes should be continued and diversified in ways that are of similar convenience to kerbside recycling.
	The New Zealand Government has signed up to a number of agreements at the international institutional level. These encourage governments to reduce greenhouse gas emissions.	On average, participants drive 440km per week per household in the study area. This equates to approximately one tank of petrol per household per week.	Lower emissions vehicles should be encouraged. Cleaner burning fuels should also be encouraged. Residents should be encouraged to use public transport options.
	Local councils hold much sway	Some participants have been able	Local council should recognize the

	over the types of houses and environmental measures may be taken on large and small scales through the Resource Management Act and the Building Act.	to include environmental measures in the building process for newly built homes. However, one informant, not in the survey specifically, noted that when she built her "eco-bach" there were barriers created by the council in terms of what they had to include on their property, thus pushing up the price of the building.	benefits of homes that are 'off the grid' or possess significant environmentally friendly traits and prioritise and incentivise these through either the reduction of "red-tape" or other incentives to encourage environmentally sustainable buildings.
	Enviroschools are a government endorsed non-profit organisation charged with the task of providing environmental information and education programmes to schools.	Though not specifically studied in this survey, the programme makes up a part of the environmental education and institutional framework in state schools in New Zealand should they choose to opt in. Over one third of participants stated that they acquired environmental information from family. It is unknown whether this is children, siblings, parents or extended family. If children, Enviroschools may be part of that.	The government should continue to endorse the programme and encourage high quality environmental education in schools. Further research should be conducted regarding the impact of the Enviroschools programme outside of the classroom.
Technical	Changes in technology are allowing easier access to environmental information than previously.	Participants stated that their primary sources of environmental information were the news media, magazines, and the internet. It can	Environmental scientists, groups and the government should ensure that accurate and balanced information is presented in the

		be assumed that previously this would have been from books and brochures provided by local or central government or environmental groups.	media and presented prominently. They should lobby for accurate information to be presented online and ensure that environmental information is available in easily accessible/visible places on their own websites.
	Double Glazing has become more accessible in New Zealand	Participants were hesitant to double glaze their homes due to the cost and its non-compulsory nature.	The cost of double glazing could be brought down with monetary incentives or it could be made compulsory in parts of New Zealand where climate demands a greater focus on heat conservation.
	Solar power has become more accessible	Solar power in particular was not researched in this study.	Further research should be undertaken to establish the uptake of solar power in New Zealand.
	Solar water heating has become more readily available.	Uptake of solar water heating systems was low in this study.	Further research should be conducted regarding the reasons why this was so. Cost was a noted factor, however, plumbers are less inclined to recommend it than other systems.
	Solar water heating with wetback has become available.	Solar water heating with wetback was not specifically asked about in	Research into the uptake of such technology should be conducted.

		this study.	
	Dual flush toilets have become common place.	There was wide uptake of dual flush technology in the sample.	The government should encourage the replacement of old single flush toilets and the retrofitting of dual flush toilets.
	Low flow shower heads are available in New Zealand and popular in Australia.	The installation of low flow showerheads was not common in this study.	Particularly in times of drought, which New Zealand was experiencing at the time of writing, the government should promote the installation and use of low flow showerheads or showerheads that have an option of being low flow.
	Insulation is increasingly popular in New Zealand and is becoming easier to retrofit.	There was high uptake of ceiling insulation in this study. However there was a division between the two groups regarding wall and floor insulation.	Rather than solely promoting the use of ceiling insulation the government should work to promote the uptake of wall and floor insulation, an holistic approach to insulation.
	Grey water systems allow used but safe water to go be moved to the toilet or garden.	Whilst this was not explicitly surveyed, some participants commented that they collect grey water.	More education around how grey water can and should be used is warranted. Efficient grey water systems should be investigated.
	Hybrid and electric vehicles are	Vehicle type was not specifically	Further research should be

	becoming increasingly available and cheaper.	researched by this survey.	conducted into the types of vehicles people possess and distances travelled in electric, hybrid and fossil fuel powered vehicles.
	Materials used to build homes are changing towards more sustainable materials such as bamboo.	This was not specifically investigated in this survey. However, information regarding these materials is generally available from stores and manufacturers. Retailers and product advertising were amongst the least likely sources of environmental information in this study.	Sustainable materials should be promoted through more trusted sources of information.
	Smart phone and internet applications allow people to find an estimated measure of their environmental impact.	This was not specifically investigated by this study.	Further research should be conducted into the use of smart phones applications as a source of environmental information and producers of such applications should attempt to ensure that they are accurate and based on good science.

References

ABC Plumbing - Bill (2013) Personal Communication

Anderson, T.L & Huggins, L.E. (2008) *Greener Than Thou: Are you really an environmentalist?* Hoover Institution Press, Stanford, California

Ashcroft, S., Pereira, C., (2003) *Practical Statistics for the Biological Sciences*. Palgrave Macmillan, New York

Auckland Council, (2012) *Environmental Initiatives Fund*. http://www.aucklandcouncil.govt.nz/EN/newseventsculture/communityfundingsupport/grantsfunding/environmentheritage/pages/environmentalinitiativesfund.aspx , Accessed 20 November, 2012.

Auckland Council (2012) *Rubbish and Recycling* http://www.aucklandcouncil.govt.nz/en/environmentwaste/rubbishrecycling/Pages/home.aspx Accessed 20 November, 2012

Auckland Council (2012) *State of Auckland Report Card: Demographic Report: Hibiscus and Bays Local Board - July 2012*.

Auckland Council (2012) *State of Auckland Report Card: Demographic Report: Rodney Local Board - July 2012*.

Auckland Regional Council (2010) *Auckland Regional Land Transport Strategy 2010-2040*

Australian Government Department of Sustainability, Environment, Water, Population and Communities (2012) *Home Page* http://www.environment.gov.au Accessed November 2012

Barr, S. (2007) Factors Influencing Environmental Attitudes and Behaviours: A UK Case Study of Household Waste Management. *Environment and Behaviour* 39:4 435-473

Beder, S. (2006) *Environmental Principles and Policies: An interdisciplinary approach.* University of New South Wales Press, Sydney

Best, H., Kneip, T. (2011) The Impact of Attitudes and Behavioural Costs on Environmental Behaviour. A natural experimentation on household waste recycling. *Social Science Research* 40 (2011) 917-930.

Bellagio Forum for Sustainable Development, (2007), *Sustainability Plus? Global Challenges 20 Years After Brundtland* http://bfsd.server.enovum.com/en/content/view/215/ Accessed 2 January, 2013

Blumberg, H.H., Fuller, C., Hare, A.P., (1974) Response Rates in Postal Surveys *The Public Opinion Quarterly*, Vol. 38., No. 1. (Spring 1974) pp.113-123

Borkley, P., Glachart, M., Levesque, F. (1998) Voluntary Approaches for Environmental Policy in OECD Countries: An Assessment.

Chapman, L. (2007) Transport and Climate Change: A Review *Journal of Transport Geography* 15:5 (September 2007) 354-367

Chelsea Sugar (2012) *Chelsea Sugar and the Environment* http://www.chelsea.co.nz/content/about-sugar/sugar-environment/default.aspx , 2012, Accessed 01/12/12

Costanza, R., Cumberland, J., Daly, H., Goodland, R., Norgaard, R., (2007) *An Introduction to Ecological Economics: Chapter 4.* In: Encyclopedia of Earth. Eds. Cutler J. Cleveland Accessible at http://www.eoearth.org/article/An_Introduction_to_Ecological_Economics:_Chapter_4#gen22 Accessed December 22, 2012

Deans, N. & Hackwell, K. (2008) *Why has the Dairying and Clean Streams Accord not delivered cleaner streams?* Prepared for Forest and Bird and Fish and Game New Zealand

Dolnicar, S. & Hurlimann, A. (2010) Australians' Water Conservation Behaviours and Attitudes. *Australian Journal of Water Resources*, 14 (1), 43-53.

Dryzek, J.S. & Schlosberg, D. eds. (2005) *Debating the Earth: The Environmental Politics Reader*. Oxford University Press.

Environment Court (2010) *Long Bay Interim Report*. Decision No. [2010] NZEnvC 319

Environment Court (2012) *How Cases Come to Court* http://www.justice.govt.nz/courts/environment-court/about-the-environment-court Accessed December 2012

Environment Court (2012) Proposed One Plan Appeals - Interim Decision. Decision number: 2012 NZEnvC 182 between Manawatu-Wanganui Regional Council and Appellants.

European Environment Agency (2012) *International cooperation - European Environment Agency* http://www.eea.europa.eu/about-us/international-cooperation Accessed 25 November 2012

Eyraud, L & Clements, B., (2012) Going Green *Finance & Development*, June 2012, Vol. 49, No. 2

Froude, V.A. (2011) Wilding Conifers in New Zealand: Status Report. Prepared for the Ministry of Agriculture and Forestry.

Giddings, B., Hopwood, B., & O'Brien, G., (2002) Environment, Economy and Society: Fitting Them Together Into Sustainable Development. *Sustainable Development*, 10, pp. 187-196

Gilbertson, M., Hurlimann, A. & Dolnicar, S. (2011) Does water context influence behaviour and attitudes to water conservation?. *Australasian Journal of Environmental Management*, 18 (1), 47-60.

Google (2013) *Google Maps.* www.maps.google.com. Access January 2013

Government of the United States of America - US Environmental Protection Authority (2012) *Learn the Issues - USEPA* http://www.epa.gov/gateway/learn/ Accessed 21 November 2012.

Gunningham, N.; Sinclair, D. & Gabrosky P. (1998) *Smart regulation: Designing environmental policy.* Clarendon Press; New York: Oxford University Press Chapter 2: 'Instruments for Environmental Protection' pp. 37-91

Halkett, J. (1991) *The Native Forests of New Zealand* G.P. Publications, Upper Hutt

Hay, S.B. (2008) *Reducing Household Environmental Impacts - A New Zealand Case Study.* Honours Dissertation. Unpublished. Massey University.

Hinton, P.R. (2004) *Statistics Explained 2nd ed.* Routledge Press, New York.

Holzinger, K., Knill, C., Lenschow, A., (2006) *A Turn toward Soft Modes Governance in EU Environmental Policy – Viewed from a Policy Instruments Perspective* A paper prepared for the International Conference "Governance and Policy Making in the European Union" Accessible at http://web.uvic.ca/jmtrg/Papers_files/Osnabruck%202006.pdf

Intergovernmental Panel on Climate Change (2012) *Organisation* http://www.ipcc.ch/organization/organization.shtml#.URq3pqVnRgs Accessed 21 November 2012

Johnson, M., Fryer, K, Ragget, N., (2009) *Household Sustainability Survey 2008: A report for the Ministry for the Environment*, Accessible at http://www.mfe.govt.nz/publications/sus-dev/household-sustainability-survey-11-2008/household-sustainability-survey-2008.pdf

Kaipatiki Project (2011) *Zerowaste New Zealand: About Us* http://www.zerowaste.co.nz/zero-waste-1/about-us-2/ Accessed December 6, 2012

Kamara, A.J. (2006) *Household Participation in Domestic Waste Disposal and Recycling in Tshwane Metropolitan Area: An Environmental Education Perspective.* Master of Arts Thesis. Unpublished. University of South Africa

Kerkhof, A.C., Nonhebel, S. & Moll, H.C. (2009) Relating the environmental impact of consumption to household expenditures: An input-output analysis. *Ecological Economics* 68 (2009) 1160-1170

Krohn, L.-A. (2008) *Affluence and Recycling: Measuring environmental attitudes and environmental participation in a high income population.* Royal Roads University, Canada.

Ledgard, N. (2003) *Wilding conifers – New Zealand history and research background*. Presentation to workshop 'Managing wilding conifers in New Zealand – present and future', Chateau on the Park, Christchurch, August 11, 2003

Lees, Z. (2012) Anticipated Harm, Precautionary Regulation and Hydraulic Fracturing, *Vermont Journal of Environment Law* Vol. 13, 2012 pp. 575-612

Local Government New Zealand (2007) *Making Good Decisions* October 2007

Lynes, Krystal, (2013) Personal Communication

MacGarvin, Malcolm (1999) The Precautionary Principle, Science and Policy. in Harding, R. and Fisher, E. (eds.) 1999. Perspectives on the Precautionary Principle. The Federation Press, Sydney

Martinsson, J., Lundquist, L.J., Sundstrom, A. (2011) Energy Saving in Swedish Households. The (relative) importance of environmental attitudes. *Energy Policy* 39 (2011) 5182-5191

McNeill, J. (2008) *The Public Value of Regional Government: how New Zealand's regional councils manage the environment* A dissertation in partial fulfillment of PhD in Politics, Massey University, Turitea, New Zealand

McNeill, J. (2012) Personal Communication July 2012

Memon, P.A. & Perkins, H.C. eds. (2000). *Environmental Planning and Management in New Zealand.* Dunmore Press, Palmerston North.

Newmont (Waihi Gold) (2012) *From Open Pit to Recreational Lake* http://www.waihigold.co.nz/environment/rehabilitation/from-open-pit-to-recreational-lake/ (Accessed November 2012)

New Zealand Government - Department of Conservation (2012) *Annual Report for the Year Ended 30 June, 2012*. Wellington.

New Zealand Government - Environmental Protection Authority (2012) *EPA Home Page* http://www.epa.govt.nz/Pages/default.aspx Accessed 20 November, 2012

New Zealand Government - Ministry for Economic Development (2011) Green Growth Advisory Group: *Greening New Zealand's Growth*.

New Zealand Government - Ministry for the Environment (2007) Environment New Zealand 2007.

New Zealand Government - Ministry for the Environment (2012) *Green Ribbon Awards: 2012 Winners* http://www.mfe.govt.nz/withyou/awards/green-ribbon-winners-2012.html Accessed 15 December, 2012

New Zealand Government - Ministry for the Environment (2012) *Questions and Answers about the Emissions Trading Scheme* http://www.climatechange.govt.nz/emissions-trading-scheme/about/questions-and-answers.html Accessed 30 November 2012

New Zealand Government - Ministry for Primary Industries (2011) *The Dairying and Clean Streams Accord: Snapshot of Progress 2010/2011*

New Zealand Government (1987) *Nuclear Free Zone, Disarmament, and Arms Control Act, 1987*

Noorman, K.J., Uiterkamp, T.S. (eds) (1998) *Green Households?: Domestic Consumers, Environment and Sustainability.* Earthscan, London.
OECD (1985) *Declaration on Environment: Resource for the Future* Accessible at http://acts.oecd.org/Instruments/ShowInstrumentView.aspx?InstrumentID=68&InstrumentPID=65&Lang=en&Book=False

OECD (1997) *Environmental Performance Reviews: A Practical Introduction*. Paris. Accessible at http://search.oecd.org/officialdocuments/displaydocumentpdf/?cote=OCDE/GD(97)35&docLanguage=En

OECD (2002) Towards Sustainable Household Consumption: Trends and Policies in OECD Countries.

OECD (2007) Environmental Performance Review: New Zealand

OECD (2012) *Reviewing Environmental Performance* http://www.oecd.org/env/environmentalcountryreviews/reviewingenvironmentalperformance.htm#scope Accessed November 23, 2012

Parliamentary Commissioner for the Environment (2012) *Functions and Powers* http://www.pce.parliament.nz/about-us/functions-and-powers/ Accessed November 2012

Pawson, E. & Brooking, T. eds. (2004) *Environmental Histories of New Zealand.* Oxford University Press, Victoria.

Peet, N.J. , Carter, A.J. , Baines, J.T. , (1985) Energy in the New Zealand household 1974–1980 *Energy* Volume 10, Issue 11, November 1985, Pages 1197–1208

Phillber, S.G., Schwab, M.R., & Sloss, G.S. (1980) *Social Research* Peacock Publishers

Rosling, Hans (2011) "The Magic Washing Machine," TED lecture accessible on http://blog.ted.com/2011/03/21/the-magic-washing-machine-hans-rosling-on-ted-com/

Selby, R., Moore, P., Mulholland, M. (eds.) (2010) *Maori and the Environment: Kaitiaki* Huia Publishers, Wellington, Aotearoa

Sharp, V., Giorgi, S., and Wilson, D.C. (2010) Methods to Monitor and Evaluate Household Waste Prevention. *Waste Management and Research* 2010: 28: 269-280

Sitarz, D. (1993) *Agenda 21 : the Earth Summit strategy to save our planet / introduction by Paul Simon* , Earth Press Boulder CO

Smarterhomes New Zealand (2012) *Smarterhomes: Why choose a smarter home?* http://www.smarterhomes.org.nz/why-smarter-homes/why-choose-a-smart-home/ Accessed December 1, 2012

Spangenberg, J.H., Lorek, S., (2002) Environmentally sustainable household consumption: from aggregate environmental measures to priority fields of action. *Ecological Economics* 43 (2002) 127-140.

Stern, P.C. (2000) New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior, *Journal of Social Issues*, 56: 407–424

Straterra, (2012) http://www.straterra.co.nz/Green+Mining, Accessed 01/12/12

Thames-Coromandel District Council (2012) *Phase Three - Health Assessment - Natural Background Testing* http://www.tcdc.govt.nz/Your-Council/Council-Projects/Completed-Projects/Moanataiari-Project-Phases-1---3/Phase-3-Health-Risk-Assessment/ Accessed December 2012)

The Enviroschools Foundation (2012) *Enviroschools: Environschools Stats* http://www.enviroschools.org.nz/our_organisation/about-enviroschools/enviroschools-stats Accessed 15 December 2012

The New Zealand Ecolabelling Trust (2013) *Environmental Choice New Zealand - Eco-friendly products*. http://www.enviro-choice.org.nz Accessed 01 January 2013

The Survey System (2012) *Sample Size Formula* http://www.surveysystem.com/sample-size-formula.htm Accessed November 2012

Treaty Resource Centre (2008) http://www.trc.org.nz

United Nations Environment Programme (2007) *Global Environmental Outlook (GEO) 4: Environment for Development*. Accessible at http://unep.org/geo/geo4/report/GEO-4_Report_Full_en.pdf

United Nations Environment Programme (2012) *Perspectives on Rio+20: Severn Suzuki* Accessible at http://www.unep.org/environmentalgovernance/PerspectivesonRIO20/SevernSuzuki/tabid/55518/Default.aspx (Accessed December 2012)

Victor, D.G. (2001) *The Collapse of the Kyoto Protocol and the Struggle to Slow Global Warming* Princeton University Press.

Westgate, J. (2009) *Brand Value: The work of ecolabelling and place-branding in New Zealand Tourism*. Ministry of Tourism Research Scholarship Report

World Bank (1992) *Economic Growth and Environmental Quality: Time Series and Cross Country Evidence*. World Bank. Washington D.C. Accessible at http://books.google.co.nz/books?hl=en&lr=&id=UQ3sA9v_dr8C&oi=fnd&pg=PA1&dq=OECD+country+environmental+responses+in+the+1980s&ots=aZntFKpc0S&sig=hyBxEahOY9FntyI0cFbA_ymDZO4&redir_esc=y#v=onepage&q&f=false

World Bank (2012) *Passenger Cars (per 1000 people)| Data| Table* http://data.worldbank.org/indicator/IS.VEH.PCAR.P3/countries/1W?display=default Accessed 1 February 2013

World Commission on Environment and Development (1987) *Our Common Future: From One Earth to One World*.

World Wildlife Fund (2012) *History: WWF* http://worldwildlife.org/about/history Accessed 19 November 2012

Zborel, T. (2009) "Nudging" our way to sustainability?: How behavioral science can inform policies promoting pro-environmental behavior at the household level. Master of Arts Thesis. Unpublished. Tufts University.

Appendix A - Maps showing where the sample was taken

Figure 10: Map showing New Zealand (Google, 2013)

Figure 11: Map showing Auckland (Google, 2013)

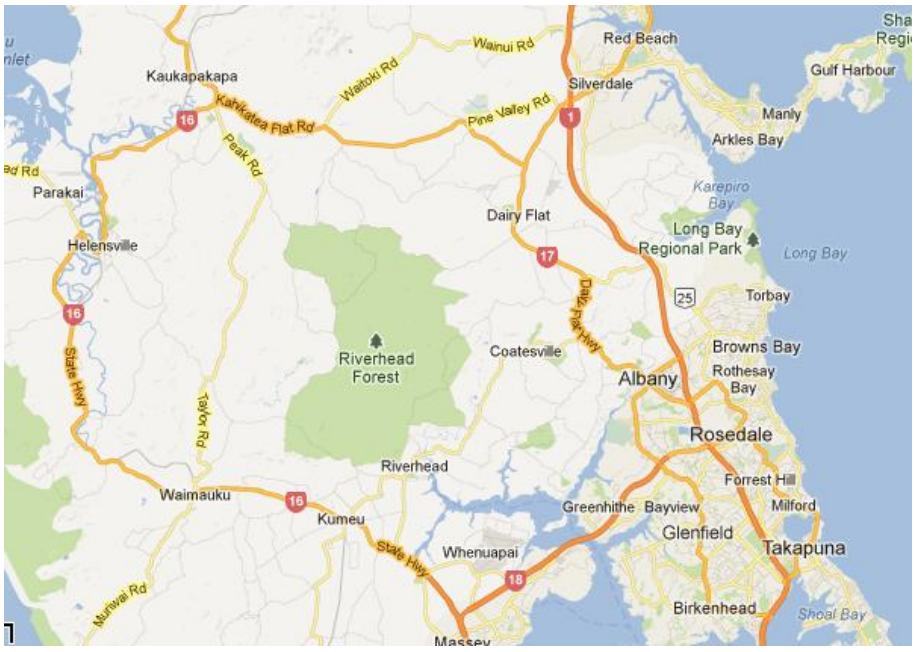

Figure 12: Map showing North Auckland (Google, 2013)

Figure 13: Left: Map Showing Helensville and Kaukapakapa; Right: Map Showing Torbay (Google, 2013)

Appendix B - Survey and Accompanying Letter

Re: Student thesis on Households and the Environment

Dear Sir/Madam:

What is this survey about?
The aim of this survey is to assess individual behaviour and the associated environmental impacts at the household level.

Who is the researcher?
Ms Raewyn MacGregor is part of the Master of Environmental Management Programme at Massey University, Palmerston North. She studies extramurally in Auckland.

Who should fill in this survey?
The homeowner, lease holder, spouse or partner aged 18 years or over with appropriate information regarding household consumption behaviour.

Confidentiality
The information you provide will be treated confidentially and anonymously and will only be used for the purpose of this study. Completion and return of the questionnaire implies your consent to participate in this research. You have the right to decline to answer any particular questions.

Free post return
Free post envelopes have been provided for you to the return of the survey. Please return your completed survey by **24 December, 2012**.

Project Contacts
If you have any questions regarding this research please contact either myself or my supervisor.

Raewyn MacGregor
(09) 473 2928
raewyn.macgregor@gmail.com

Associate Professor John Holland
(06) 350 5565
J.D.Holland@massey.ac.nz

This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director (Research Ethics), telephone 06 350 5249, email humanethics@massey.ac.nz

Assessing Resource Use at the Household Level

DEMOGRAPHIC INFORMATION

1. What sex are you? (circle letter)
a. Male
b. Female

2. To what age group do you belong? (circle letter)
a. 18 to 29
b. 30 to 39
c. 40 to 49
d. 50 to 59
e. over 60

3. To which ethnic group do you belong?
a. NZ Maori
b. NZ European
c. Pacific Peoples
d. Asian (state: _____)
e. Other (state: _____)

4. Do you own or rent the dwelling in which you live?
a. Own b. Rent

5. What is your total household annual income before tax?
a. less than $20,000
b. $20,001 to $40,000
c. $40,001 to $60,000
d. $60,001 to $80,000
e. $80,001 to $100,000
f. $100,001 to $130,000
g. $130,001 to $160,000
h. $160,001 to $190,000
i. more than $190,000

6. What is the highest educational qualification in your household? (circle one letter)
a. NCEA, School Certificate, or other secondary school qualification
b. Polytechnic qualification or Trade Certificate
c. Bachelors degree
d. Post-graduate degree
e. None/No qualifications
f. Other (state: _____)

7. Which of the following best describes your household?

a. Single person	(Total No. ...1...)
b. Single person with children or boarder(s)	(Total No. .....)
c. A couple	(Total No. ...2...)
d. A couple with children or boarder(s)	(Total No. .....)
e. Group flatting together	(Total No. .....)
f. Other (state) _____	(Total No. .....)

8. Please indicate the sex, age, and number of people in your household. (insert numbers)

Sex	Under 18	18 to 29	30 to 39	40 to 49	50 to 59	60 plus
Male(s)						
Female(s)						

ENERGY USE

9. How do you heat your water cylinder?
a. Electricity
b. Gas
c. Solar with electric booster
d. Electricity with wetback
e. Other (state) _____

10. What is the biggest obstacle for you in adopting solar heated hot water? (circle one letter)
a. Not interested
b. Unaware/Lack of information
c. Bad reports of solar water heaters
d. Cost
e. No incentive/reason to do it
f. Other (state) _____

11. Which of the following hot water saving measures do you practice? (circle any that apply)
a. Reduce temperature in hot water cylinder
b. Put an insulation wrap around your hot water cylinder
c. Use cold water for rinsing dishes
d. Use cold water for washing clothes
e. Have showers instead of baths
f. Fit low flow shower heads.
g. Fix leaking taps

12. What is the main source of heating in your house?(circle one)
a. Electric bar heater
b. Electric fan heater
c. Heatpump
d. Gas
e. Portable gas - LPG bottle
f. Wood burner
g. Open fire
h. Other (state) _____

13. Which of the following heat conservation measures does your home have in place? (circle any that apply)
a. Ceiling insulation
b. Wall insulation
c. Floor insulation
d. Double glazing
e. Thermal curtains
f. Draught stops on external windows and doors.
g. Reduced internal temperature
h. Nothing
i. Don't know

14. How often do you currently do the following? (circle number)

(1 = always 2 = often 3 = sometimes 4 = never)

a. Use energy efficient light bulbs	1	2	3	4
b. Turn appliances off at the wall	1	2	3	4
c. Use the clothes dryer	1	2	3	4
d. Use microwave instead of conventional oven if possible	1	2	3	4
e. Turn off lights, appliances and heaters when leaving rooms	1	2	3	4
f. Use outdoor clothesline for drying clothes and towels	1	2	3	4
g. Use the heat/cool pump during the whole year	1	2	3	4

WATER CONSUMPTION

15. Which of the following water saving measures does your household practice? (circle any that apply)

a. Fixing leaking taps
b. Turn off tap while brushing teeth
c. Limit shower to five minutes or less
d. Reduce water capacity of single flush toilet
e. Make sure washing machine loads of clothing or dishes are full
f. Use a bucket to clean the car
g. Do nothing

16. Which of the following water saving measures has your household made? (circle any that apply)

a. Fitted low flow shower head
b. Installed dual flush toilet
c. Replaced old appliances with new water efficient models
d. Installed a rain barrel to save water for the garden
e. Done nothing
f. Other (state) _____

17. What is the <u>main</u> barrier to the adoption of water saving measures in your household?

a. Water is free (no charge for use)
b. There is no shortage of water
c. Water use dictated by habits formed over time
d. Cost of installing water saving devices
e. Consumers' right to use as much water as they wish to
f. Have not considered it
g. Lack of interest

WASTE AND RECYCLING

18. What is your <u>main</u> method of recycling? (circle one letter)

a. Curbside collection
b. Deliver to a recycling depot
c. Do not recycle

19. Which of the following activities does your household regularly practice? (circle any that apply)

a. Composting food scraps
b. Worm farm
c. Use re-useable bags for shopping
d. Discourage 'junk mail' delivery
e. Avoid food items with excess packaging
f. Do nothing
g. Other (state)

20. How often does your household recycle the following items? (circle number)

(1 = always, 2 = often, 3 = sometimes, 4 = never)

a. Cardboard	1	2	3	4
b. Paper	1	2	3	4
c. Aluminium cans	1	2	3	4
d. Steel cans	1	2	3	4
e. Glass	1	2	3	4
f. Plastic	1	2	3	4
g. Electronic goods	1	2	3	4
h. Larger appliances (whiteware)	1	2	3	4
i. Clothes	1	2	3	4
j. Car batteries	1	2	3	4
k. Other batteries	1	2	3	4

21. How often do members of your household do the following? (circle number)

(1 = always, 2 = often, 3 = sometimes, 4 = never)

a. Buy second hand goods instead of new	1	2	3	4
b. Buy products with minimal packaging	1	2	3	4
c. Buy refills for re-usable products	1	2	3	4
d. Choose products with the Environmental Choice 'tick'	1	2	3	4

TRANSPORT

22. Motor vehicles in your household, and kilometres travelled per week.

Vehicles in household	Number	Kilometres travelled per week
Car(s)		
Motorbike/Motor Scooter		
Other (state) _____		

23. To what extent do members of your household regularly practice the following? (circle number)

(1 = always, 2 = often, 3 = sometimes, 4 = never)

a. Walk to reduce car use	1	2	3	4
b. Cycle to reduce car use	1	2	3	4
c. Use public transport to reduce car use	1	2	3	4
d. Car pool with others	1	2	3	4
e. Drive in a fuel efficient manner	1	2	3	4

AWARENESS

24. How well informed is your household regarding steps one can take to care for the environment? (circle one)

a. Well informed
b. Somewhat informed
c. Poorly informed

25. What are the main sources of information used by your household on waste minimisation, resource use and environmental issues? (Circle any that apply)

a. Articles/stories on TV
b. Articles/stories in newspapers
c. Articles/stories in magazines
d. City or local councils
e. Environmental groups
f. Product advertising
g. Consumer organisations
h. Government departments and agencies
i. Home and garden shows
j. Scientific research organisations
k. Retailers
l. Community groups
m. Friends/flatmates/workmates
n. Family
o. Internet
p. Books
q. Common sense/self
r. Other (state) _____

26. Which of the following groups or initiatives are you aware of? (Circle any that apply)

a. Energy Efficiency and Conservation Authority (EECA) Energywise Campaign
b. Smarterhomes www.smarterhomes.org.nz
c. Sustainability New Zealand website www.sustainability.govt.nz
d. WA$TED TV Programme
e. Auckland Council Environmental Initiatives Fund (EIF)
f. Zerowaste Campaign
g. Greenpeace
h. Forest and Bird
i. Other (state) _____