

Desirability of Food Waste Management in Non-metropolitan Local Government: An Exploratory Case Study of Narrandera Shire Council, New South Wales, Australia



Source: Live Tribe

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1. Introduction and research questions

Currently in Australia, it is estimated that 5.3 million tonnes of food is wasted by households, commercial and industrial sectors; which represents \$20 billion lost to the Australian economy each year and US\$940 billion lost to the global economy annually (Australian Government National Food Waste Strategy. (NFWS), 2017; Benyam et al. 2018). There is a role for local government in Australia to encourage citizens to change from a throwaway society to utilising resources more sustainably. This includes promoting a circular economy (Waste and Resources Action Program (WRAP) 2019; Hollander et al. 2017) as one alternative and in particular in the chosen research the maximisation of food waste recovery into a product that has added value as a commodity and to add value for citizens.

Using an exploratory case study approach, this research aims to identify citizens' attitudes to food waste and their desirability in supporting the implementation of a food waste strategy in the Narrandera Local Government Area (LGA). This will include finding out the willingness of citizens to pay for the service and to actually be interested in participating in a food waste program if they so desire. The questions asked will identify citizens' attitude to food waste and ask if they would support the implementation of a food waste strategy in the Narrandera LGA. They will also be asked if they would be willing to pay for the service and to actually be involved in participating in a food waste program in some way.

Food waste has been recognised in the United Nations Agenda for Sustainable Development, (2015; UN 1992, Framework Convention on Climate Change) the Australian Federal Government with its National Food Waste Strategy (Australian Government 2015; 2017), state governments waste less recycle more strategy NSW (EPA 2017), South Australia's (SA Waste Strategy 2015) and local governments increasing their involvement in the recycling of many things including food waste. Food waste trials in South Australia (RAWTEC 2019; City of Holdfast Bay 2019; City of Mitcham 2015) have been ongoing for many years and several local government bodies in New South Wales are also undergoing trials Riverina Eastern Regional Organisation of Councils (REROC) (REROC 2012; City of Sydney 2017; Lake Macquarie Council 2019).

In my role as an elected member of Narrandera Shire Council (NSC) and as a resident of the area for 27 years, I have been approached by many citizens of Narrandera Shire Council local government area (LGA) and asked why the NSC does not have an organic waste collection service and in particular a food waste collection procedure. Anecdotally, climate change and

the reduction of greenhouse gas emissions are of concern to the citizenry of my LGA. This has prompted me to undertake this research.

With this brief background in mind, the research questions for this project are:

1. What are the characteristics of food waste management in the Australian local government context?
2. Is a food waste program desirable to the residents of the Narrandera local government area?

The dissertation proceeds as follows. Section 2 examines the policy context. It argues that, as a policy problem to be addressed, food waste ought to be understood against the background of the moral imperative to achieve environmentally sustainable development and ought to be conceived as an intergovernmental problem. It examines the policy imperatives from the international, national, state and local government perspectives. Section 3 introduces the case study area, namely Narrandera Shire Council. Drawing upon this discussion, Section 4 focuses specifically on the problem of food waste, defining the problem, the management thereof and placing these in the context of the 'waste hierarchy', the 'circular economy' and 'ecological sustainable development'. Section 5 provides the methodology for the exploratory case study, scoping the methodological and evaluation literature and outlining the methodologies used in the research examining food waste management in Australia. It also details the theory underpinning the investigation and rationale for the chosen methodology. Section 6 demonstrates that there is a desirability from citizens that were surveyed to have at the very least, a green waste organic program and that generally citizens are willing to contribute financially, it also shows what citizens are currently doing with their food waste and their preferred policy options looking towards the future.

2. Policy Context

The survival of many societies, and of the biological support systems of the planet, are at risk (UN 2015; World Bank 2015; OECD 2014; Bagherzadeh et al. 2014; Commonwealth of Australia 2017). Climate Emergency. Org, (2019) report that there have been climate emergency declarations in 1008 jurisdictions and local government areas globally, representing 224 million citizens. Abdelradi (2017) states that the international community faces the challenge of providing safe food for over 9.1 billion people by the year 2050 and while currently the focus is on increasing production of food, the focus should be on reducing food waste and loss. Most of this loss is sent to landfill. The effect of sending food waste to landfill is the generation of greenhouse gases being released into the atmosphere, and the possibility of leachate contaminating water supplies is a risk to biological support systems globally.

2.1 *The International Challenge*

The UN recognises in its goals that to combat climate change urgent action is required. The UN is aiming to reduce food waste by 50 per cent by 2030 (Usubiaga et al. 2018).

Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change, Australia ratified the Paris Agreement and the Doha Amendment to the Kyoto Protocol in 2016, reinforcing its commitment to action on climate change (UN 2016; UN 2012).

Inefficient food systems and the continued waste of food worldwide is a common problem facing communities, more than one third and up to half of all food produced is lost before humans can eat it (Garcia et al. 2016, Porat et al. 2017; Manfredi and Cristobal 2016, Benyam et al. 2018). Municipal food waste is an ongoing concern for governments worldwide as they continue to lessen their environmental impact (Edwards et al. 2018).

The concept of the 'carrying capacity' of the planet can be defined as the maximum resource load beyond which the environments ability to support life for a given kind of creature (Hannigan 1948, p.4). Resources are running out and the utilisation of these resources must be re-examined to get the most out of everything.

Moreover, the idea of a 'circular economy' has been high on the political agenda around the world for some time and is being introduced as policy in many countries around the world. A

circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life. This can also be applied to food waste (WRAP 2019, Hollander et al. 2017). The expectation is that it will promote economic growth by creating new businesses and job opportunities, saving materials' cost, dampening price volatility, improving security of supply while at the same time reducing environmental pressures and impacts (Kalmykova et al. 2018).

Globally, the definition of food waste varies dependant on where the food waste occurs in the food supply and consumption chain. Nevertheless, Australia's National Food Waste Strategy (NFWS 2017) conforms to international definitions (see, for example, FAO. 2011, Benyam et al. 2018) in adopting a broad and inclusive definition of food waste that covers:

1. Solid or liquid food that is intended for human consumption and is generated across the entire supply and consumption chain;
2. Food that does not reach the consumer, or reaches the consumer but is thrown away. This includes edible food, the parts of food that can be consumed but are disposed of, and inedible food, the parts of food that are not consumed because they are either unable to be consumed or are considered undesirable (such as seeds, bones, coffee grounds, skins, or peels);
3. Food that is imported into, and disposed of, in Australia, and:
4. Food that is produced or manufactured for export but does not leave Australia (NFWS 2017, P.8).

The national policy context is discussed in more detail directly below.

2.2 Australian Government

In 1992, the Australian Government produced the National Strategy for Ecological Sustainable Development which identified that ESD represented one of the greatest challenges to government, industry, business and the community into the future. Whilst there is no universal definition of ESD, the Commonwealth Government suggested the following definition for ESD in Australia as, 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased' (DE&E 1992).

More recently, the National Food Waste Strategy (Commonwealth of Australia 2017) is explicit in Australia's commitment to reducing food waste by half by 2030 by introducing a strategy that contributes to the world's action on reducing food waste and greenhouse gas emissions. It concludes that governments, industry, business, academia, food rescue organisations and all levels of government and the community have a role to play. The Strategy (Commonwealth of Australia 2017, p.29) notes that food waste in Australia costs the economy 20 billion dollars annually.

2.3 State and Territory Governments

The NSW Environmental Protection Agency Waste Avoidance and Resource Recovery report (WARR) (2019) concluded that State and territory governments in Australia have primary responsibility for managing waste, including food waste. Activities being supported by one or more state and territory governments include:

- Community education programs such as 'Love Food, Hate Waste';
- Research programs;
- Data collection on household food waste and conducting trials on possible management strategies;
- Providing funding to the manufacturing, processing and transport industries to reduce waste in their businesses;
- Funding businesses that purchase infrastructure to process food waste on-site;
- Providing financial support for local government roll-out of residential food waste diversion through green organics bins;
- Delivering programs with businesses that sell food to demonstrate money savings by diverting food waste at source, and;
- Support for infrastructure to process food waste into soil improvement products or for bioenergy production (WARR 2019).

The NSW Environmental Protection Agency (EPA) is currently targeting the reduction of organic waste with incentives from government for programs and infrastructure to assist in this reduction. The EPA has two key programs for increasing the recycling of food and garden wastes. First, a \$27 million Organics Collections program to provide funding for new or enhanced kerbside collections. Second, the \$57 million Organics Infrastructure (Large and Small) Grants Program, which funds the construction or upgrade of organics processing facilities. By June 2018, the Organics Collections fund had awarded \$19.5 million to 49

projects to divert an additional 154,000 tonnes of organics waste from landfill each year. When completed the grants will have helped provide approximately 70% of NSW households with access to an organics collections service, up from 55% in 2013 (NSW EPA 2019).

2.3 *Local Government*

Solid waste from councils is a major contributor to greenhouse gas emissions, the bulk of these emissions are the result of landfilling, which is the primary waste disposal system in Australia and internationally (Lou & Nair 2009). This study is concerned with food waste and although dealing with this waste may decrease/increase greenhouse gas emissions; that is not the primary purpose of this research, even though it may have an effect on greenhouse gas emissions.

Local government in Australia plays an integral role in the delivery of waste and recycling services, especially to households. For its part, the New South Wales (NSW) *Local Government Act (1993)* clearly states that the function of local government includes providing waste management services. The Act classifies ‘certain of a council’s functions as service, that is, non-regulatory’.

The Act then codifies service functions of council, stating:

Chapter 6: What are the service functions of councils?

This Chapter confers on councils their service or non-regulatory functions. Examples of these functions include the provision, management or operation of waste removal, treatment and disposal services and facilities.

With respect to the transport and disposal of waste, the Act sets out:

Chapter 7, Clause 68 What activities, generally, require the approval of the council?

Part C: Management of waste

- 1 For fee or reward, transport waste over or under a public place
- 2 Place waste in a public place
- 3 Place a waste storage container in a public place.

The Act also sets out how councils are to cover the cost of management services, stating:

Chapter 15: How are councils financed?

The reasonable cost to the council of providing domestic waste management services must not be recovered by the ordinary rate. It must be obtained from the making and levying of a charge.

Changes to waste management charges are restricted as follows in this and other similar clauses:

Chapter 15, Clause 507 Variation of annual charges for domestic waste management services

The Minister may, by order published in the Gazette:

- (a) specify the percentage by which the amounts of annual charges made by councils for domestic waste management services for a specified year may be varied, and
- (b) impose conditions with respect to the variation of those charges.

Even though the NSW government has instigated the ‘Love food hate waste’ and ‘Waste less recycle more’ programs (NSW Government 2017) to date there is no specific NSW government act relating to the management of food waste.

Nevertheless, in 2018, the NSW government granted \$4.9 million dollars to 10 councils across the state for projects to improve services that recycle food and garden waste into compost (Waste Management Review 2018). The funding went towards the provision of kitchen caddies to hold food waste and make it easier for households to use the new food organics and garden organics collection systems (Waste Management Review 2018).

Other local governance areas have been more pro-active. For instance, within NSW, a group of Riverina Eastern Regional Organisation of Councils (REROC) including Coolamon, Cootamundra, Gundagai and Junee Shire Councils commenced a six month Cluster Composting Trial from 8 August 2011 to 31 January 2012. The aim of the Trial was to test the feasibility of the proposed cluster approach to composting. The Trial introduced a food and green waste kerbside collection for 200 households in each of the 4 participating shires. Over 139 tonnes of organic waste was collected during the trial period, identifying that approximately 60% of waste from households was organic. When placed in landfill, organic waste produces methane gas which has over 20 times the global warming potential than carbon dioxide. So removing organic waste helps the environment and is an essential step in building a sustainable future (REROC 2012).

Elsewhere, the Local Government Association in South Australia (LGASA) place a high priority on waste management given its importance to Councils and the challenges they face. In 2012, South Australian Councils spent \$155.4 million on waste management, equating to 8.5% of total operating expenditure by SA councils (Tate 2014, p.7). South Australia introduced a solid Waste Levy (SWL) in 1990, half of the (SWL) collections are transferred to the Waste to Resources Fund (WRF), in accordance with Section 17 of the Zero Waste Act 2004. The other 50% is used to fund the Environment Protection Authority's operations (45%) and the Environment Protection Fund (5%) (Tate 2014).

Narrandera Shire Council operates a landfill at Red Hill on the outskirts of Narrandera, the council has a two bin household garbage collection system. One for recyclables that is taken to Wagga Wagga for processing and a general waste bin that goes straight to landfill at Narrandera. Narrandera is known as the town of trees, in Autumn the amount of fallen leaves has meant that instead of residents burning this waste (as was the usual practice many years ago), the council has two leaf sucker vehicles that collect the tons of leaves and dump them at the Narrandera tip. There may be an opportunity to mix this waste with food waste and other organics to create a viable, reusable commodity (Geosyne 2016).

2.5 Local Government Theory

Oates (1972) posits that it is best for levels of service to be locally set by citizens to be the most effective and efficient therefore, even though the Commonwealth sets the policy, local government and its citizens should set the level of service delivery. If we consider management of food waste as a public good, then it can be assumed that 'it will always be efficient for local governments to provide the Pareto-efficient levels of output for their respective jurisdictions than for the central government to provide any specified and uniform level of output across all jurisdictions' (Grant & Drew 2017, pp.136-137).

Thyberg & Tonjes (2016) assert that if local government is to create policies that are sustainable regarding food waste it needs to understand that the study of food waste is important. Citizens must be educated about the implications of food waste, this can assist in changing their habits, attitudes and behaviour towards it, this in turn may reduce waste. Reasons for studying food waste should include economic, environmental and social issues.

2.4 Food Waste: An Intergovernmental Policy Phenomenon

With the aforementioned discussion in mind, food waste can be seen as an intergovernmental phenomenon. The UN has identified that food waste is a worldwide issue. As Australia is a

member of the UN, it has a moral obligation to follow their guidelines when it comes to waste management with a view to reducing greenhouse gas emissions (Oz Harvest 2014, Manfredi and Christobel 2016). The Australian government created the National Food Waste Strategy in 2017 to address this and the trickledown effect to state and local governments.

Engaging the citizens of Narrandera LGA in policy making is a sound investment and a core element of good governance (Caddy and Vergez 2001). The food waste issue was first proposed by citizens of Narrandera LGA and their involvement will allow the NSC to tap into wider sources of information, perspectives, and potential solutions, and ultimately improve the quality of decisions reached. Community consultation can contribute to building trust within the community towards local government, raising the quality of democracy and strengthening civic capacity (Caddy and Vergez 2001). REROC, (2012) identified that involving your citizens from the beginning is vital to the success of any food waste/green organic management plan.

3 Local Context

HISTORY OF NARRANDERA SHIRE

The first inhabitants of the area now known as Narrandera were the Wiradjuri Aborigines. The name 'Narrandera' is said to be derived from the Wiradjuri word 'Narrungdera' which means 'place of lizard or goanna'. The first white man to pass through the district was the famous explorer, Captain Charles Sturt. Sturt camped on the edge of the Murrumbidgee River on 10th December 1829. A memorial to the explorer is situated near the camp site (Gammage 1986).

Although not well known nationally, Narrandera benefitted greatly from well-known philanthropists Frank Duval, Dr Harold Lethbridge and Robert Hankinson. These men's donations to the community gave Narrandera a strong foundation to build upon especially in the field of health, education and history. Robert Hankinson's gift of a Royal Dolton fountain is one admired by many today in Victoria Park. (Pictured below at Figure 1).

One former resident of Narrandera who played an important role in today's society was Marie Bashir, who was the New South Wales Governor General. Marie spent all her young life in Narrandera and considers Narrandera her home (Gammage 1986).



Figure 3.1 Hankinson Fountain with council chambers in the background, Photo credit-Narrandera Shire Council

3.1 NARRANDERA TODAY

The present Narrandera Shire was formed on 1 January 1960. This was by an amalgamation of the previous Narrandera Municipality and part of the Yanco Shire. Except for the western part that was lost in 1929-30 to Leeton the present Shire is similar to the original 1906 boundary. The first Narrandera Municipality was incorporated on 18 March 1885 (Gammage 1986).

The Narrandera Township is centred on the Murrumbidgee River and the towns within the Shire include Barellan and Grong Grong. Binya village and a number of farming localities all contribute to the characteristics of the Council area.

A population of over 6,000 (ABS 2016) resides in the town of Narrandera and the villages of Barellan, Grong Grong and Binya. These communities make up the Local Government area of Narrandera Shire and part of the state electorate of Cootamundra and the new Federal electorate of Farrer (Electoral Commission 2018)

3.2 THE NARRANDERA SHIRE COUNCIL (GOVERNING BODY)

The Narrandera Shire council consists of nine councillors that were recently elected at the September 2016 elections (recently one councillor has resigned). The Narrandera shire is an undivided council area and 19 candidates stood for the election. Of the nine (9) elected

councillors, five (5) identify as Independent candidates and four (4) do not identify as any particular group or political party (Electoral commission of NSW). Five (5) of the new council are women, four (4) councillors are first time elected representatives. The Mayor and Deputy Mayor are elected by the councillors for a two year term as per the new Local Government Act 1993 amendments (NSC. 2019).

3.3 NARRANDERA LOCAL GOVERNMENT AREA

Narrandera is situated in the South West Riverina district of New South Wales.

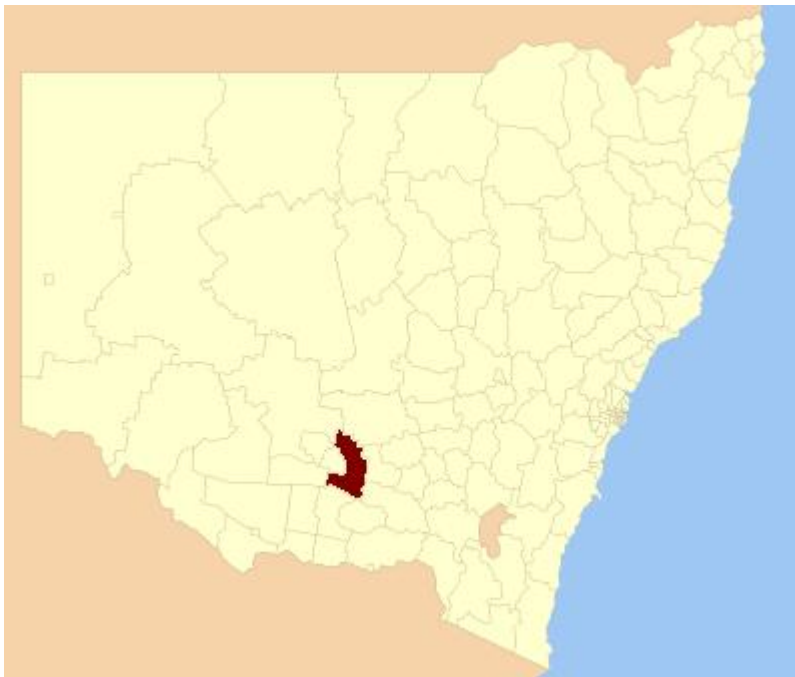


Figure 3.2. Map of NSW showing Narrandera Shire Council local government area shaded in red (Image, Wikipedia)

4. Literature Review

The objectives of this literature review is to explore and examine the literature to provide a knowledge foundation for the study and to ascertain if local government should be involved in the service provision of food waste management in any way in Australia with a focus on developing a food waste program in Narrandera Local Government Area (LGA) if citizens desire it. It will also identify gaps in the literature and issues with the management of food waste in Australia such as Lebersorger & Schneider 2011, discovered that there is not much authoritative data on food waste composition or quantities.

According to Jesson et al. (2011 p. 2) a literature review is ‘where you show that you are both aware of and can interpret what is already known and where eventually you will be able to point out the contradictions and gaps in existing knowledge’. With this in mind the questions for this literature can be articulated as such:

1. What theories, research and evidence based practices have emerged in connection with the management of food waste?
2. How is the role of local government in the management of food waste conceived and debated?
3. What are the common problems and issues with the management of food waste in Australia?

4.1 Defining Food Waste

The definition of food waste varies around the globe, quantifying global food waste has been attempted over many decades, mainly to highlight food waste in relation to malnutrition globally (Thyberg & Tonjes 2016). As food waste happens at many points throughout the food supply chain it can be hard to define. Parfitt et al, (2010) posit that it is mostly defined at the consumer and retail stage as agriculture is already classed as food for human consumption, (see also Thyberg & Tonjes 2016).

Looking through the literature, post-harvest food waste is usually referred to as ‘food losses’ and spoilage. Food loss is the decrease in food quality or quantity, which makes it undesirable for human consumption, such as marked or odd shaped fruit and vegetables that a consumer may find unattractive, (Parfitt et al. 2010; Grolleaud 2002).

The United Nations define food waste as:

Any substance, whether processed, semi-processed, or raw, that is intended for human consumption. ‘Food’ includes drink, and any substance that has been used in the manufacture, preparation, or treatment of food. ‘Food’ also includes material that has spoiled and is therefore no longer fit for human consumption. It does not include cosmetics, tobacco, or substances used only as drugs. It does not include processing agents used along the food supply chain, for example, water to clean or cook raw materials in factories or at home.

Inedible parts: Components associated with a food that, in a particular food supply chain, are not intended to be consumed by humans. Examples of inedible parts associated with food could include bones, rinds, and pits/stones. “Inedible parts” do not include packaging. What is considered inedible varies among users (e.g., chicken feet are consumed in some food supply chains but not others), changes over time, and is influenced by a range of variables including culture, socio-economic factors, availability, price, technological advances, international trade, and geography” (UN 2016).

According to the Food and Agriculture Organisation of the United Nations, 32 percent of all food produced globally was wasted or lost based on weight (FAO 2011). Lipinski et al. (2013) measured food waste and food losses by calorific value, not weight. Between ‘the farm and fork’, Lipinski et al. (2013) found that 24 percent of all food calories are lost or wasted. This results in one out of every four food calories that was produced for human consumption to be wasted.

As we saw in Section 2, the Australian Government (2017) adopts a broad and inclusive definition of food waste that includes:

- solid and liquid foods that are intended for human consumption;
- food that does not reach the consumer or reaches the consumer but is discarded;
- food that is imported into and disposed of in Australia, and:
- food that is produced and manufactured for export but does not leave Australia

The above definitions do not include food that is exported from Australia and becomes food waste in another country (Australian Government 2017).

Guillermo et al. (2016) sought to add environmental and social considerations to decision-making processes to gain more sustainable solutions of feasible waste management solutions by the categorizations of food waste, they have a similar definition of food waste, defined as food materials, including drinks that were intended for human consumption but ended up not being used for human consumption, as well as inedible parts of food. Guillermo et al. (2016) also concede that food that is sent on to food charities is also considered food waste as it has an economic loss to the food business who produced the product and any food used in other ways that is not for human consumption, such as animal feed, is also considered food waste.

Searching the literature however, did not disclose citizen’s views on what food waste is.

Benyam et al. (2019) researched citizens’ attitudes and desirability into being part of a food waste program but if citizens do not have a good grasp of what food waste is it cannot be quantified. For example, an onion peel to most citizens may be a waste or some may not consider it a waste as they deem it inedible for humans or animals and just discard it.

Whereas a chef may use the peel in a stock and add value to the peel, but again, is it classed as food waste after the stock is made or simply discarded with no thought? This is an area for more research.

Grainger et al. (2018) suggests that households in developed countries contribute the most proportion of food waste so to reduce this waste, contextual and behavioural factors must be

taken into consideration. To address this complex subject, a sound methodological approach should be taken, studies so far have been limited by a lack of uniform definition of food waste and limited by available accurate data.

The differences in economic development and urbanisation, lifestyles, and social and cultural dynamics between societies all affect the amount of food waste produced, this also affects the strategies, policies and legislation for those jurisdictions differently. Grainger et al. (2018) go on to suggest that it is a lack of awareness and or knowledge of consumers that is the most commonly identified driver of food waste at the household level.

4.2 *Cost of Food Waste*

Over a third of intentionally grown food for human consumption is never consumed (Guillermo et al. 2016; Shafiee-Jood and Cai 2016; Reynolds et al. 2016). This wasted food has a significant environmental, economic and social impact on our society, food waste is humankind's most challenging issue today. It is estimated that between 1/3 and ½ of all food produced is lost prior to reaching a human mouth. Parfitt et al. (2010) found that an international literature review found a massive amount of data on food waste and that estimates varied widely and that current global losses cannot be quantified, he concludes that food losses are much higher than the data reports, and that 'a firm evidence base from which to assess food waste globally is lacking'.

This is also an issue in Australia that there is no standardised measure of food waste as it depends on the demographics of an area, household makeup, norms and culture—no 'one size fits all' (Hyder 2012, p. 5) with every LGA in Australia being somewhat different to others.

Nevertheless, according to the National Food Waste baseline ARCADIS (2019) it is estimated that 227,000 tonnes of food waste was generated in the transport sector in Australia in 2016/17—although the report recognises that food waste *data* is very limited and uncertain in this sector. In the primary production sector of fruit, nuts and broad acre cropping of NSW almost 4000,000 tonnes of food waste was generated. Of all the food waste generated in NSW in 2016/17, only just over 11,000 tonnes was repurposed by food rescue agencies (ARCADIS NV 2019). ARCADIS (2019 p. 13) also concluded that

Food waste data globally is typically limited in quantity and quality, even among the countries that have undertaken the most work on definition and measurement. This is a significant challenge in Australia. Studies to date have confirmed there are no formal data

capture systems to collect comprehensive food waste generation information in any part of the Australian supply chain. Other than food rescue and moderate data in some jurisdictions on household waste behaviours, there is negligible publicly available data on food waste quantities, composition and destinations. These gaps occur in all sectors of the food supply and consumption chain.

This gap in empirical data shows a need for further research in this area.

Further, the solid waste report (2015) stated that there is also the greenhouse gas emissions that are produced when sending food waste to landfill. Placing food waste in landfill produces large amounts of the greenhouse gas, methane, harmful to the environment, one way of treating this issue is by composting as this does not produce methane gas. The NSW EPA recognised that food waste is a global issue and Australians have a responsibility to take action as contributors to the problem.

Moreover, for its part the Australian Government (2017) produced the following estimates:

- \$20 billion is lost to the economy through food waste,
- Up to 25 per cent of all vegetables produced don't leave the farm—31 per cent of carrots that don't leave the farm equate to a cost of \$60 million,
- The total cost of agricultural food losses to farmers is \$2.84 billion,
- Households throw away 3.1 million tonnes of edible food,
- Food waste costs to households vary from \$2,200 to \$3,800,
- 2.2 million tonnes of food is wasted from the commercial and industrial sectors, resulting in significant waste disposal charges and lost product costs to business.

When assessing the National Food Waste Baseline, ARCADIS, 2019 found that of the 2.5 million tonnes of food waste generated by households in the 2016/17 year nationally, 88% went to landfill with only 12% composted, with 668,000 tonnes generated in NSW alone, this adds to the greenhouse gas emissions produced by this form of disposal. This is just one of many downstream effects of sending food waste to landfill, Papargyropoulou et al. (2014) posit this has brought food waste to the forefront of the environmental agenda.

4.3 Management of Food Waste

The FAO (2017) noted that there is a difference between food loss and food waste, food loss occurs mainly in the primary production and the food production and supply systems, this may be due to lack of food handling practices, infrastructure or technical limitations during

production, post-harvest and processing. Food waste is food that is removed from the food chain that is still fit for human consumption, this may be due to public expectations of what food should look like, bad stock management or spoiled food. Better definitions and measures of food waste is needed, Reutter et al, (2017) studied the environmentally-extended input-output (EeIO) for analysing environmental and socio-economic impacts of food systems. To understand the environmental and socio-economic impacts of food waste, all inputs must be accounted for such as blue water, land use and greenhouse gas emissions.

Most data collected on food waste/loss is gained from municipalities and does not include food waste that is fed to pets, home composting or food rescue, (Reutter et al. 2017).

Australia's National Waste Policy, (2017) states in its strategies it will 'reduce organic waste including garden and food waste by avoiding their generation and supporting diversion away from landfill into soils and other uses, supported by appropriate infrastructure' (Australian Government 2018, p.15). Australia also has a National Food Waste Strategy that aims to halve Australia's food waste by 2030.

According to the 'Love Food, Hate Waste' Tracking Survey commissioned by the NSW EPA (2019) 66% of NSW residents surveyed agreed that the NSW government had a role to play in assisting residents to reduce their food waste. It does not specify local government's role in food waste reduction although local government is generally responsible for waste management at a local level.

The NSW EPA estimated that the volume of waste in NSW are as follows:

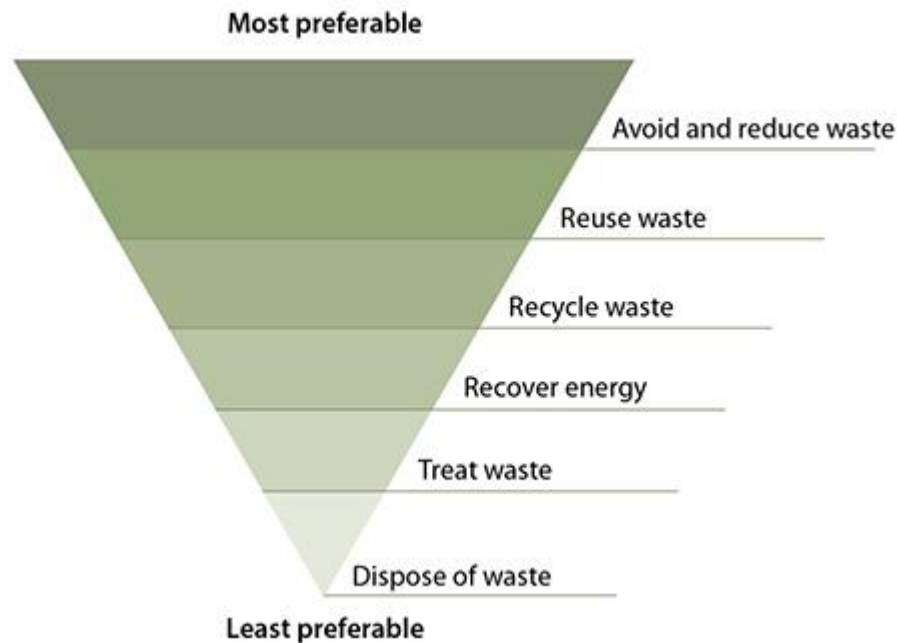
- Fresh food is the largest amount wasted, 2.18 litres per week per capita surveyed
- Leftovers account for 1.9 litres per week
- Packaged and long life food 1.39 litres per week

The NSW EPA (2017) also found that total food wastage is estimated to have reduced by approximately ½ a litre, from 5.94 litres in 2015 to 5.46 litres in 2019. Residents aged between 18 and 34 are the biggest wasters of food in NSW at 6.6 litres a week, older residents in the 55 plus age group continue to be the citizens who waste the least at 4.22 litres per week.

As shown at Figure 3, the NSW EPA has adopted a waste hierarchy, food waste has significant social, economic and environmental implications globally. The food waste hierarchy can assist in preventing and managing food surplus and waste and distinguishing different types of food waste. Papargyropoulou et al. (2014), discuss the distinctions between

food surplus and waste is crucial in the food waste hierarchy and it also distinguishes between avoidable and unavoidable waste.

Figure 4.1: Waste Hierarchy



Source: EPA (NSW).

The top of Figure 3 refers to ways of **avoiding waste** in the first place by using education programs, research and development that support better efficiencies in production methods and better packaging to lengthen and improve shelf life. As you work down the list from top (most desirable outcomes) to the bottom (least desirable outcomes) **reuse** deals with the food rescue and donations such as Oz Harvest, the repackaging of aesthetically imperfect foods into a more pleasing product or the repurposing that does not include processing for animal feedstock. **Recycle** deals with composting, using food waste in bio-digesters, worm farms and biotechnology solutions for animal feedstock.

Recover energy deals with systems where waste is incinerated or anaerobic digestion is used to produce energy. **Treatment** of waste can include the conversion of food waste into cosmetics, pharmaceuticals, and nutraceuticals. The final stage, **disposal**, is the least preferred option with waste going to landfill, incineration that does not recover any energy and food waste being disposed of through a sewer system, (Commonwealth of Australia 2017).

Shafiee-Jood and Cai (2016) posit that food loss and waste is defined as “the decrease in the quantity or quality of the edible part of the food produced for human consumption at any point along the food supply chain”. To reduce food loss, the introduction of new technologies, upgrading of infrastructure and developing more effective markets would be beneficial. Researching consumer behaviour and attitudes that creates food waste is also important to develop better strategies regarding food waste. It also seems that in the available literature, a focus is more on increasing production of food other than measures to reduce food waste/loss in crops after they are harvested. Reynolds et al. (2014) found that formal disposal of food waste in Australia usually occurs through kerbside collections organised by local government and is treated by composting or placed in landfill, this places the onus on householders to dispose of their waste in an appropriate manner, such as using the correct bin and the correct separation of their waste. Lundie and Peters (2005) studied food waste disposal through the sewer system. There is no standardised practice for food waste collection by municipalities throughout Australia, some councils have programs in place, (City of Holdfast Bay 2019, City of Sydney 2017, City of Mitcham 2015) some have municipal composting,(Armidale Regional Council 2019, Coolamon Shire Council 2017), many do not. Currently there is no food waste program in the Narrandera local government area (LGA).

4.4 Ecologically Sustainable Development

A more populated area of academic inquiry is ecologically sustainable development (ESD). Whilst this study is not focusing on greenhouse gas emissions, they are a factor in any food waste management system. Food waste valorisation is usually conducted by biological processes such as composting and anaerobic digestion. These processes use biological degradation to break down organic matter and use anaerobic and aerobic methods. The resulting biogas contains mainly methane and carbon dioxide, these processes are an efficient and environmentally friendly way to deal with food waste and are currently used extensively worldwide. Keeping this food waste out of landfill and treating by composting is beneficial to the environment, it reduces greenhouse gas emissions from landfill, (Cerda et al. 2018).

Quantifying the environmental pressures of food waste data includes blue water consumption, land use, material use and greenhouse gas emissions associated with food production. This will assist in evidenced based policy making and quantify a wide range of environmental pressures and benefits in regard to food waste (Usubiaga et al. 2018).

To better understand the environmental and socio-economic consequences of food waste, it is necessary to quantify all the inputs of food production, and the inputs that are utilised to produce those first inputs, and so on until every contribution has been accounted for (Ruetter et al. 2016, P.507)

Lundie and Peters (2005) undertook a study into alternative means for managing food waste using an environmental assessment based on life cycle assessment methodology. It looked at household in sink food waste processors and three alternatives including home composting, landfilling food waste mixed with municipal waste and centralised composting of food and garden waste by Sydney households in the medium to high density residential urban environment of Waverley in Sydney.

The environmental assessment included eight environmental indicators and impact categories. These included energy usage, climate change, human toxicity potential, aquatic eco toxicity potential, terrestrial eco toxicity potential acidification and eutrophication potential as they were most relevant to the systems they were studying. They found that if operated aerobically, home composting was the best outcome with the least environmental issues in all categories. Although home composting was found to be the best option, if not operated correctly, the risk of creating high greenhouse gas emissions that develop with anaerobic methanogenesis (the production of methane by bacteria or other living organisms) would be greater.

Most of the current literature (Rutten 2013; Guillermo et al. 2016; Reynolds et al. 2014; Parfitt et al. 2010, Lundie & Peters 2005) recommends the reduction of food waste and food losses and offers suggestions on how to do this, however, not many tackle the underlying issues that cause food waste in the first place. Rutten, (2013, p.10) posits that policy-makers globally should refer to the ‘outcomes of applied studies on the economy wide impacts of reducing food losses and food waste as an input to decide on what elements of the food chain supply to focus on’, policy makers internationally need to discuss their roles and contributions in their efforts towards reducing food waste, currently, the size of food waste and losses is driving policy when societal impacts should be the focus where they will be most cost effective. Moreover policy makers should stop focusing on targets to reduce food waste and losses, there are underlying issues and this should be the area that policy concentrates on, not addressing the causes of food loss and food waste is unlikely to result in sustained food waste and food loss reductions.

4.5 *Waste Management in Local Government*

Some regional local governments have already initiated waste policies and programs relating to food waste. In the case study for Coolamon Shire Council in NSW, REROC (2017) found some commonly perceived issues to starting an organic kerbside service were that the cost of the program would exceed the costs saved by diverting organic waste from ending up in landfill, it was also stated that there may be a reluctance by the community to sort waste and food waste in particular because of assumptions regarding odour, vermin and the effort needed to sort waste. Another assumption was that composting would be labour intensive and there would be additional cost around compliance. The study concluded that if an organics collection service was correctly planned, implemented and managed and involved the community, these barriers would be shown to be incorrect. Some key findings of the Coolamon study conclude that the introduction of small scale regional food waste and organic collection service can be environmentally and financially sound. The study also showed that a rural setting was not an impediment for the successful delivery of “progressive waste management solutions” (REROC 2017, p. 22).

Through collaboration, advocacy, financial incentives and education, the South Australian Government has been working towards meeting their target to reduce waste by 35% by 2020, so far their efforts have had a reduction of 17.32% of waste going to landfill since 2003. The intent of South Australia’s Waste Strategy, (2010) is to maximise any beneficial use of waste materials and to decrease the generation of greenhouse gas emissions and to reduce the amount of waste going to landfill. This includes the management of food waste as a central pillar in the Waste Strategy as it is recognised as a valuable resource for compost. South Australia (see Spence 2018) is also seeking to repurpose and reuse agricultural waste to make a range of value added products including food additives, pharmaceuticals and cosmetics.

In 2009–2010, six city and four regional councils in South Australia collaborated and participated in a pilot project that saw household food waste collected as part of the garden organics kerbside service. Engaging some 17,000 households, the project was the largest pilot of its type undertaken in Australia (SA Govt. 2010) Participants were issued with a bio-basket that used corn starch bin liners and a benchtop unlined kitchen caddy, the materials collected were commercially composted, the key findings of the pilot were:

- The provision and use by householders of kitchen-based collection containers can significantly increase the diversion of food waste from landfill;
- Community support for food waste collection and participation rates was high;
- Overall, the suitability of collected food waste for composting was generally high as demonstrated by the low contamination rates;
- There were negligible differences in the concentration of odour from the garden organics bins containing food and weekly-collected rubbish bins containing food;
- Of the two different bench top containers tested in the pilot, the ventilated and corn starch bag lined bio basket, and the unlined kitchen caddy, the best diversion performance was achieved using the bio basket. The bio basket with fortnightly rubbish collection achieved 54.5 per cent food waste diversion compared to 9.31 percent for the unlined caddy;
- Slightly more householders found the bio basket easier to use than the kitchen caddy system;
- Significantly more bio basket users continued to participate during the pilot than caddy users;
- The collection of food waste does not appear to pose any additional problems to waste collection services as part of a council wide system;
- The attractiveness of the bio basket system comes at an extra, albeit modest cost, to purchase compostable liner bags, and some householders may be reluctant to pay, and:
- The pilot has reinforced the importance of councils mounting a professionally managed community education campaign.

Still with South Australia, Rawtec (2018) reported on a pilot study that was also conducted in the City of Holdfast Bay, where compostable bags that could be utilised in food kitchen caddies were placed in supermarkets in the fruit and vegetable section, the study aimed to find out citizens attitudes to this alternate distribution system of issuing compostable bags. The study discovered that the alternate system of issuing compostable bags resulted in an increase of food waste collected by .40 kg per household in the areas that were surveyed and 94% of consumers would like to see the compostable bags continue to be provided and 67% preferred the option of getting bags at the supermarket.

In NSW, the City of Ryde Council (2019), in NSW is taking another approach to food waste other than a collection service. They are campaigning and educating their citizens with

workshops on waste less, save more, composting and worm farming and kitchen gardening workshops. This is a low cost approach to dealing with food waste in their local government area. Armidale Regional Council, (2019), in NSW has begun a ‘City to Soil’ food organics collection program. Residents have been supplied with a ‘Maxair’ food scrap bin and one year’s supply of compostable bags. The council is working with local food growers to improve soil fertility, thus reducing waste going to landfill, lessening greenhouse gas emissions and making a worthwhile product from waste supporting a circular economy.

A study in Queensland on citizens willingness to pay researched by Benyam et al. (2018) showed that the three top reasons for citizens to participate in a food waste recovery program was environmental and social wellbeing obligations, a potential to create local employment opportunities and a reduced feeling of guilt about wasting food. Those who chose not to participate cited they felt that they were not wasting food or had alternate options, the cost was prohibitive, and concerns about odour and vermin, similar to the findings at Coolamon Shire Council, (REROC 2017; Benyam et al. 2018).

Local government is embedded in many different types of feedback process, including local elections, service user and community participation, performance indicators and audits. As Blackman (1998, p. 59) notes, research is a ‘neglected type of feedback process for local authorities, despite its greater reliability and validity for many types of policy and service (Woods 2018).

The issue with all studies is that all local government jurisdictions are not the same, therefore, as Dollery et al. (2010), posit, that there can be no absolute standard reform as every council has unique circumstances and special characteristics. Whilst Narrandera LGA is in a rural setting similar to the Benyam et al. (2018) research and close to the REROC (2017) area, it is not the same and therefore a similar approach may or may not work in a standard form, the local context must be considered. Utilising community localism ‘to allow them to engage in decisions and actions’ (Gant and Drew 2017, p. 155) is imperative to the success of a food waste program.

4.6 Waste Management and Narrandera LGA

There are issues to consider if Narrandera Shire Council (NSC) proposes a food waste management program such as their capacity to deliver the program. Citizen participation according to Glass (1979) is vital for implementing a successful program and importance should be placed on the correct design, a food waste program must have citizens’

participation and to do this an engagement and educational strategy should be implemented by NSC (Glass 1979).

Narrandera Shire Council (NSC), (2018), currently services 2,192 domestic waste kerbside collection services and 2,148 recycling kerbside pickup services. To date there is no green waste, food waste or organics pick up service available to NSC residents. NSC resolved at its Ordinary Meeting in July, (2019) that it would investigate the introduction of a green waste organics kerbside collection service. The estimated general waste that is going straight into landfill in 2017-2018 was 1097 tonnes. This includes green organics and food waste. The NSC also has a leaf collection service, Narrandera is known as ‘the town of trees’ with hundreds of trees in the urban landscape, in autumn they generate approximately 1,568 m³ of leaf litter, this waste is stockpiled with other green organics at the Narrandera landfill site (Figure 4) and periodically chipped, this is then used as a cover for the active general waste cell. NSC offers a recycling brochure and calendar to inform residents of how better to recycle but currently does not have a dedicated waste policy and no policy in regards to green organics or food waste management. A review and masterplan (NSC 2019) is proposed to be developed in the future to address the current landfill site at Narrandera and this study will be included to identify future management of green organics and food waste.

Figure 4.2: Narrandera Shire Landfill Green Waste Area



Source: The Author.

4.7 Literature Review Summary and Conclusion

To summarise the literature, it is evident that there are many practices, models and theories when it comes to food waste. These includes measuring food waste as a calorific value, on a weight basis, on a litre per capita basis and there is no common way of defining food waste and food loss that has been agreed upon. Some studies have looked at the desirability to pay for a food waste management system, some have studied pilot programs. Benyam et al. (2019) study was especially useful as it was an Australian jurisdiction and also looked at the desirability to be involved in green and food waste management and if citizens were willing to pay for it. It used choice modelling theory and contingent valuation methods. The issue with it though is that although in Australia, every jurisdiction differs in culture, habits, climate and what norms, values and attitudes that community has. More regional research needs to be undertaken to get a clearer picture and assist standardisation of the measurement of food waste.

The literature review has shown that there are common problems with food waste management in Australia, such as there is no agreed categorization of food waste, even the definitions of food waste vary. Food Waste and food loss is a global issue, there is generally a third of food produced wasted, it is a wasted resource that is now being recognised as a valuable commodity, as a repurposed feedstock, energy source, bio fuel, soil conditioner and still can have calorific value for human consumption. Governments at all levels have a responsibility to address the issue as do consumers, industry and markets.

There is still an issue with quantifying data on food waste, some use weight, some use calorific value and there seems to no generally agreed formula to decide where in the food supply chain where food loss becomes food waste. The role of local government in food waste management should be the implementation of either education programs for their citizens or the implementation of a food waste management strategy.

Many governments have set targets for food waste reduction, but there needs to more done at the production end to become more efficient and decrease food waste at the start and all through the food supply chain. Currently there seems to be little collaboration between local governments in food waste management throughout NSW, the only link is the available grants from NSW EPA to introduce a food waste management program or to fund infrastructure. Another issue is that while the Federal and State governments have *strategies*,

to date they have no firm legislated *policies*. The proposed research study will add to the qualitative and quantitative data that has been collected and reported within the literature.

Currently the NSC does not have a green organics collection service or a food waste management plan. The current process of NSC spreading green waste over their general waste cell would seem to increase greenhouse gas emissions and a better management system should be investigated. Perceived barriers to introducing a food waste management plan can be mitigated by working with other actors in the food supply chain and citizens. Consumer attitudes and willingness to participate in a food waste program needs further research but full consultation and education of citizens should be undertaken prior to any new food waste management system being introduced if it is to be successful in the long term. We return now to the questions asked at the commencement of the literature review, namely:

1. What theories, research and evidence based practices have emerged in connection with the management of food waste?

Research and evidence based practices in connection to the management of food waste have included studies into citizens desirability into being involved in food waste management, studies have also included where and when food becomes a loss or waste and how best to deal with this, this has been led from an International, National and State levels and imposed on local government to implement

2. How is the role of local government in the management of food waste conceived and debated?

The role of local government in the management of food waste is a major responsibility and is significant socially, environmentally and economically. Councils across Australia are working to reduce the amount of waste going to landfill. There is little debate that this is a role for local governments as they are the agency most responsible for waste in general and there is an increasing expectation from citizens that their councils address the issue of food waste.

3. What are the common problems and issues with the management of food waste in Australia?

Common problems with the management of food waste in Australia include what citizens perceptions of food waste is, their desirability to pay for a food waste management program, how councils deal with the issue of smell and contamination rates in green organic/food waste bins, whether or not citizens would use a food waste kitchen caddy and the initial set

up costs of introducing a program. The main issue that I have identified is that whilst Federal and State agencies have many strategies in place, there is no firm policy or legislation in place to deal with food waste. At the recent Local Government NSW (LGNSW) Annual Conference held at Warwick Farm in October 2019, LGNSW announced their 'Save our Recycling, make waste a product not a problem' campaign. The focus with this strategy is about recyclables and the circular economy but says very little on food waste. This has come about because of China refusing to take waste from Australia, (ABC 2017) China, also the world's biggest manufacturer, decided it would no longer take what it called foreign garbage. This strategy does not include solutions for the disposal of food waste. LGNSW (2019, p.2) also found that revenue from the Waste Levy that is collected by the NSW State government is expected to increase by about 70 percent from 2012/13 to 2022/23. By the end of this period the Waste Levy revenue is forecast to have increased to more than \$800 million a year: \$100 for every woman, man and child in NSW. Yet, only a small portion, less than one fifth, of this revenue is invested back into waste and recycling programs. The state collects the funds but to date refuses to take appropriate action.

The NSW Government promised a major education campaign to help support kerbside recycling in 2015. However, this has not been delivered. A Waste Infrastructure Plan and a new Waste Strategy are also overdue.

5. Methodology

Whilst cost benefit analysis should be included as part of the study into the viability of introducing a food waste management program, as it is an indispensable tool for policy design and decision-making, due to the complexities involved, a cost benefit analysis will not be included in this research paper but would be an area for further research by Narrandera Shire Council at a later date.

The essential theoretical foundations of Cost Benefit Analysis (CBA) are benefits that are defined as increases in human wellbeing and costs are defined as reductions in human wellbeing. For a project or program to qualify on CBA grounds, its social benefits must exceed its social loss (Pearce et al. 2006, p.16).

The public value for a food waste program must also be considered, will a food waste management policy/program create public value? Moore (1995) posits public managers aren't merely assessed on the basis of the goods and services produced, '... they must also be able to

show that the results obtained are worth the cost... forgone in producing the desirable results' (Moore. 1995, p.57). It may be considered that food waste collection does add public value to the wellbeing of the citizenry in reducing greenhouse gas emissions and the creation of a public good, rather than just waste removal and dumping into landfill.

Content analysis will be used to define programs that already exist or have had trials. An example of this is the City of Holdfast Bay in South Australia who measured the amount of food waste bags issued rather than the physical amount of waste to collate the uptake of the program (Rawtec 2019).

An exploratory case study to research if the citizens of Narrandera local government area (LGA) would participate in a council delivered food waste management scheme. According to Dooley (2002), the purpose of most case study research is 'to answer the why and how questions'. Case studies focus on relationships and social processes in a natural setting to discover interconnections and interrelationships, and how the various parts are linked.

The methodology of this research is a scoping study to investigate what knowledge and experiences are available for review in the context of local government providing food waste management in Australia. According to Arksey and O'Malley (2005, p. 1) scoping studies can be used as a method to 'map' the research area or can be perceived as part of an ongoing process which aims to produce a more comprehensive review. Besides its role in summarising and disseminating available research findings, a key value in scoping studies is identifying gaps in the evidence base. A scoping study can also define a future research agenda.

According to Shutt (2012, p. 14) the aim of exploratory research is to 'learn what's going on here?' and to investigate social phenomena without explicit expectations. This will suit the research questions.

This includes examining intergovernmental relationships, local governments role in waste management, similarities/differences between local government areas, cost benefit analysis, public goods and public value, secondary data analysis of programs tested and/or up and running and the sociology of waste management, as well as a citizen questionnaire to ascertain if such a program is desirable to residents of Narrandera LGA. The questionnaires that citizens of Narrandera LGA will be asked to complete will give an insight to the wants needs and aspirations of those answering the questions in regard to food waste management within the NSC LGA. As Robson alludes, 'it is the usefulness of the data for the purposes of

the evaluation, and not the method by which it is obtained, which is central' (Robson 2011, p.188).

Figure 5 sets out the research strategy and, at a finer level of granularity, the constituent components, that will be used in this research project. Examining Figure 5, it is evident that Sections 1 and 2 have already been canvassed in the 'Introduction'; 'Policy Context' and 'Literature Review' (above), thereby 'setting the scene' in preparation for revisiting in the final sections of the dissertation. We now proceed to an exposition of exploratory case study Methodology.

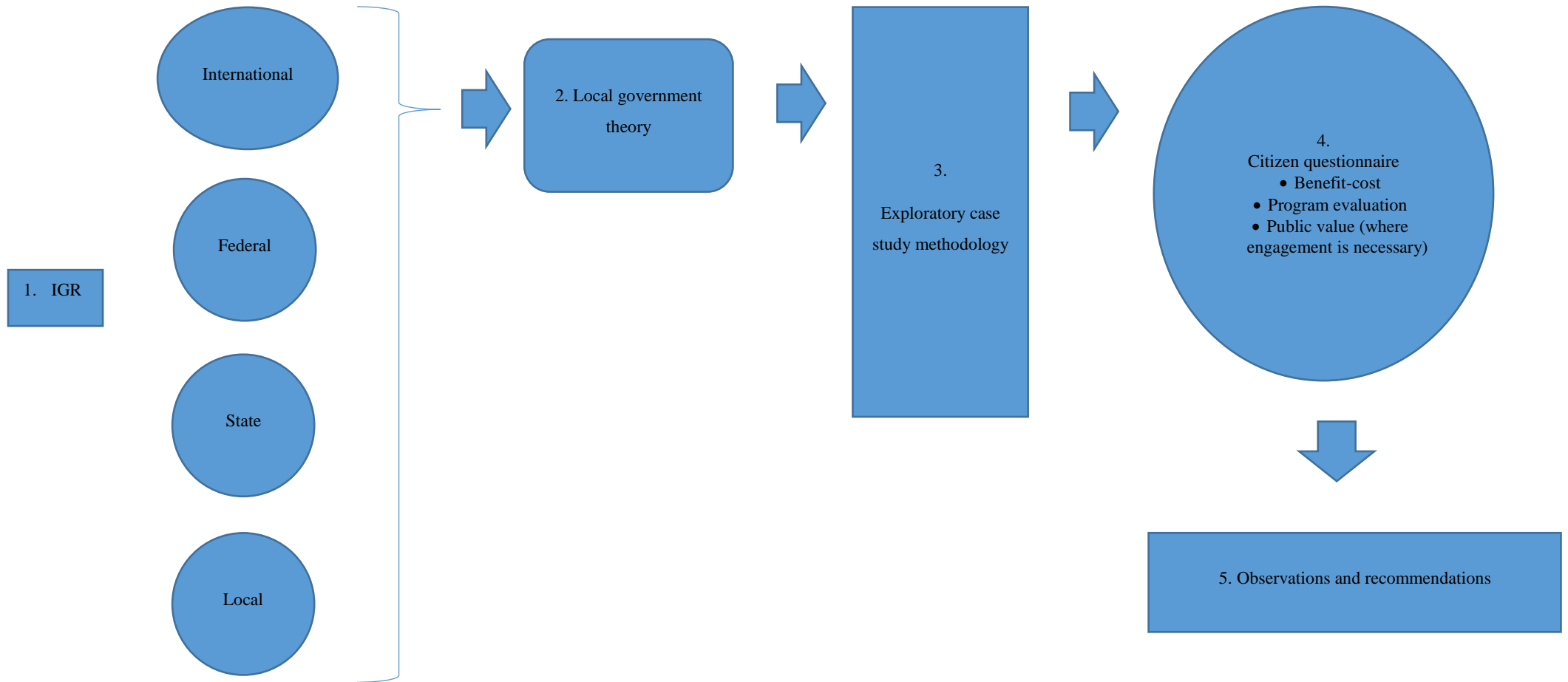
5.2 Exploratory Case Study Methodology

Referring back to Figure 5 again, given the multitude of research designs that could be considered, which design should researchers choose for their research? Generally speaking, researchers tend to select those research designs that they are most comfortable with and feel most competent to handle, but ideally, the choice should depend on the nature of the research phenomenon being studied (Bhattacharjee 2012, p. 41). An Exploratory case study with some mixed methods will be used.

Prior to undertaking any research, the question must be asked- What do you want to find out? The research question is as important as the research itself. The value of research questions assist in defining the project, assist in setting boundaries, they give some direction and they define success, in other words, did you find out the answer to the question? (Robson 2011).

I will be undertaking an exploratory case study using mixed methods with an inductive approach and citizen survey by the use of a questionnaire.

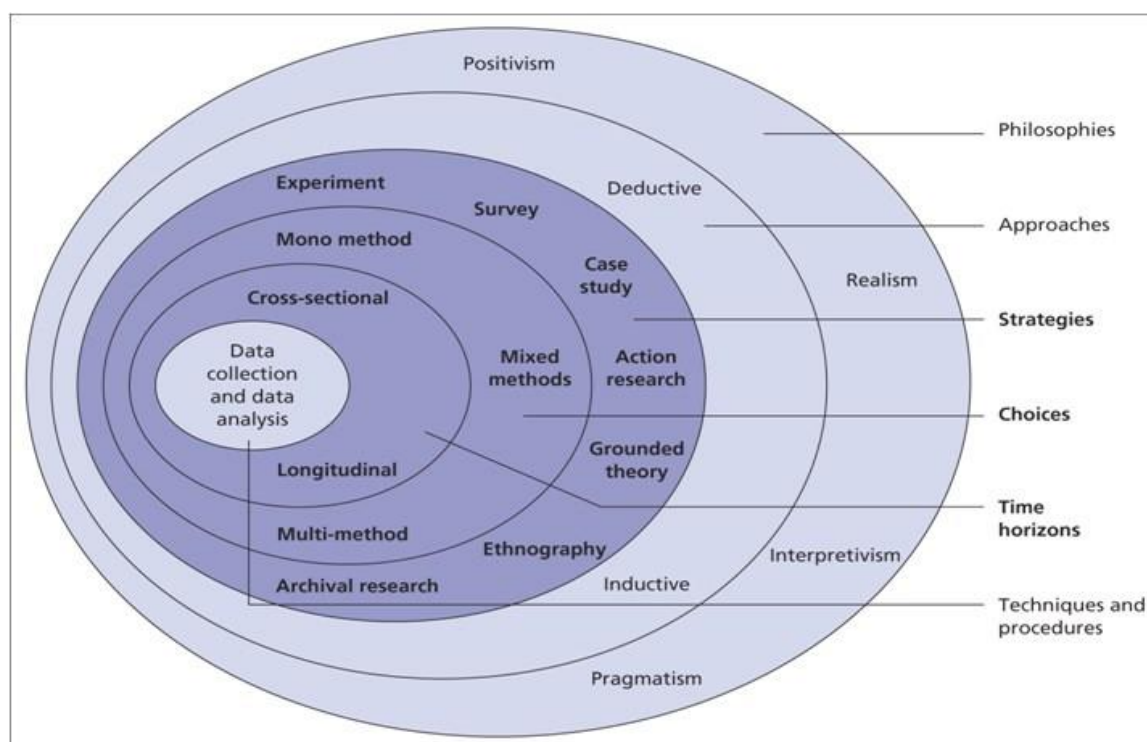
Figure 5. *Desirability of Food Waste Management in Non-metropolitan Local Government: An Exploratory Case Study of Narrandera Shire Council, New South Wales, Australia*



Source: Author.

Questionnaires are used widely by social researchers as a method of collecting data from people (Robson 2011), they provide a simple approach to the study of attitudes, values, beliefs and motivation and according to Robson “they can be adapted to collect generalizable information from almost any human population” (Robson 2011, p. 241). One way of formalising the research is to use a research onion (Figure 5.1). The research onion provides an effective progression through which a research methodology can be designed. Its usefulness lies in its adaptability for almost any type of research methodology and can be used in a variety of contexts (Bryman 2012, p.42). The research onion refers to how a researcher intends to carry out the research, for example, what method of data collection will be used.

Figure 5.1: Research Onion



Source: Saunders et al. (2007).

The use of comparative analysis in the research will enhance the understanding of food waste management currently in place in other states and local government areas therefore becoming more aware of the norms and values in other jurisdictions, it will allow the testing of theories over different areas of Australia and NSW. Comparison will prevent the over generalization of food waste programs studied and provide alternatives and other options that may not have been considered in the Narrandera LGA (Esser and Vliegen 2016).

Deductive studies have not been used in comparative research very often. A deductive study starts with theory and then subjected to empirical testing (Lindstrom. 2007, p.106). Empirical testing is not available for Narrandera council as a food waste program has not commenced.

Different approaches can be made in the research, a deductive approach, which tests the validity of assumptions that are put forward, in other words a set of hypotheses need to be confirmed or rejected is one way, or an inductive approach, which does not start with hypotheses but starts with research questions and the aims and objectives that need to be achieved. (Woods 2018). Studies may contain both quantitative and qualitative research methods. Quantitative, or experimental, research is characterized by the manipulation of an independent variable to measure and explain its influence on a dependent variable. Because comparative research studies analyse two different groups --which may have very different social contexts -- it is difficult to establish the parameters of research. This study will seek to compare data from other jurisdictions that define and measure relevant research elements in regard to food waste management (Richardson 2018).

5.3 Literature Review for Methodology

Robson, (2011, p.51), describes a traditional literature review as ‘involv[ing] systematically identifying, locating and analysing documents containing information relating to the research problem’. It exposes gaps in what is known and identifies areas of dispute and uncertainty, it helps to identify general patterns to findings and evaluates and synthesises the relevant literature within a particular field of research.

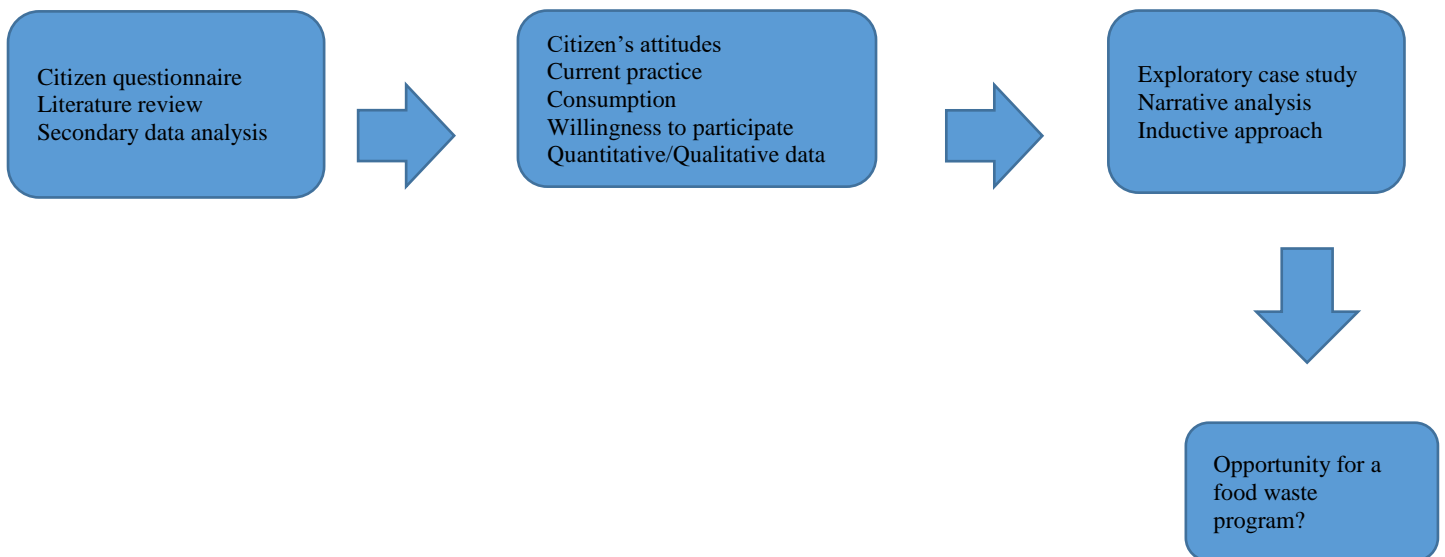
Search strategies- In researching the literature, key words used were, food waste, food waste management, food waste management in Australia, food loss, composting of food waste, food waste and local government, measuring food waste.

Inclusion criteria – Articles and publications from the year 2000 to 2019, in English, one publication from 1979 was referenced as it related to citizen participation in general and could be considered in regard to food waste. Preference was given to articles pertaining to rural areas and domestic household food waste. International, National and State food waste policies were also included to demonstrate the flow on from government policy decisions.

Exclusion criteria- Articles and publications from developing countries were not considered as I was looking for similar countries/jurisdictions to Australia that have similar economies, communities and demographics. Agricultural food waste/loss, whilst considered, was

excluded as this study is more focused on domestic food waste. Figure 5.2 outlines the conceptual framework.

Figure 5.2: Data Collection Methods; Conceptual Data; Data Analysis, Methods and Tools; Outcomes



Source: Author

As shown in Figure 5.2 data collection methods that I propose to use are in the form of a citizen questionnaire. Robson alludes that postal questionnaires typically have low response rates (Robson 2013, p. 256). I will be publishing an editorial in the Narrandera Argus newspaper and on the NSC website to inform citizens of the research and ask for their participation.

The questions are designed to answer the research questions. These will be coded using the questions asked in appendix 1, using the narrative from the answers as well as quantitative data revealed within the questionnaire.

As shown in figure 5.2, narrative analysis will be used to collate answers from the questionnaires. Narratives or stories connect events in a meaningful way for a definite audience and therefore offer insights about the world and/or people's experiences of it (Elliot 2005, p. 4).

A literature review will be undertaken to describe the issue of food waste and what has been researched in other jurisdictions as shown in Figure 5.2. Secondary analysis will be done

looking at four local government areas in South Australia and NSW to identify how other councils deal with food waste and if these policies and procedures can be used in other jurisdictions. These will include the City of Holdfast Bay, SA, REROC Council report in NSW, District council of Yankalilla, SA and the City of Sydney council, this is two city and two regional perspectives.

In outcomes in Figure 5.2, the questionnaire hopes to draw out if the citizens of Narrandera are interested in participating in a food waste strategy in any way, what their current habits regarding food waste currently are and if they are interested in changing their behaviour when it comes to handling food waste, thus creating opportunities for a food waste program in Narrandera LGA.

The population of Narrandera LGA is 5,853 people and the population of Narrandera township is 3,746 (ABS 2016). The questionnaires will be concentrated on the towns and villages of Narrandera, Grong Grong and Barellan and surrounding peri urban areas where there is a current waste collection service. A sample size of 350 people would be the optimal response rate to acquire a confidence level of 95% and it is proposed that questionnaires are available from the Narrandera Library, NSC offices and a location in Grong Grong and Barellan as well as random mailbox drops within the areas to be surveyed.

6. Results

A survey questionnaire was made available for residents of the Narrandera Shire local government area. The survey was to ascertain what motivation or behaviour may influence citizen's attitudes to food waste. 300 surveys were made available at various locations around the shire. A letter to the editor of the local newspaper, the Narrandera Argus, was published alerting residents to the survey, NSC Facebook posts were also used. I also gave a short presentation at the Narrandera Library to a group of elder citizens. Surveys were also handed out in the main street of Narrandera, local business houses, local schools and to individuals.

A total of 53 surveys were returned, one was unsuitable to be used as the consent form was not signed and not applicable was the only answers recorded, this survey was discounted.

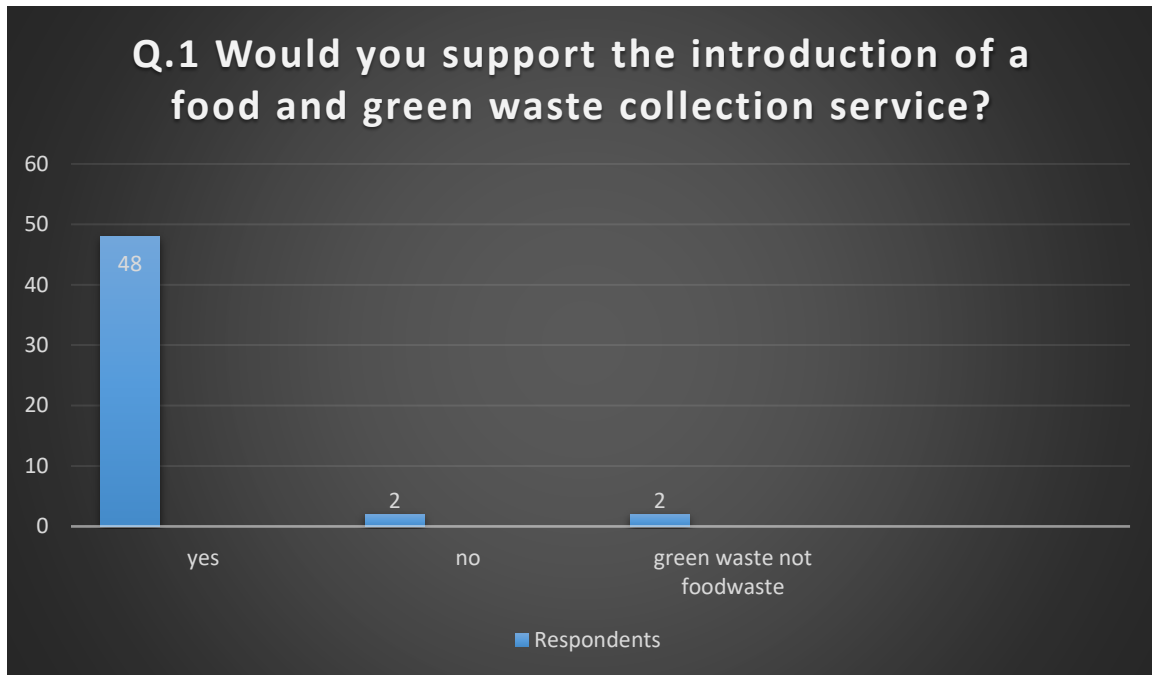
This may seem like a low response rate and in regard to the low number of respondents, selection bias may be considered. Selection bias is a type of error that systematically skews results in a certain direction (At Work 2014). Specifically, according to Olsen (2008, p. 809), 'self-selection bias is the problem that very often results when survey respondents are

allowed to decide entirely for themselves whether or not they want to participate in a survey'. Therefore it may be surmised that citizens who participated in the study were interested in the subject, this may result in self-selection bias in the resulting data. This biased data, may not well represent the entire Narrandera LGA and this should be taken into consideration when viewing the results.

For the elected members of NSC to consider a food/green waste management policy, environmental values should be considered if council is to provide environmental improvement through a green waste/food waste management strategy. To estimate environmental values, Choice Modelling (CM) has been used in this research. Bennet (2011, p. 21) posits that 'CM involves survey respondents revealing their values for environmental changes by making choices between numerous alternative future management scenarios. Through the choices made, inferences can be drawn about the trade-offs people are willing to make across environmental outcomes. By specifying one of those outcomes as a monetary cost, respondents' willingness to pay for different policies can be estimated.'

The first question in the survey asked respondents if they would support a green waste/food waste collection service. Green waste was included in the question as research has shown that the combined waste is a cost effective way of collecting this form of waste, (REROC 2017; SA Govt. 2010; Solid Waste Report 2015). The first question in the survey in Figure 6.1 it is shown that respondents preferred to support a green waste/food waste collection service, however, two respondents were supportive of a green waste collection but not food waste, even though that choice was not given.

Figure 6.1: Support for introduction of food waste and green collection service



Question #2 asked respondents how successfully their household would be able to sort organic waste from general waste. Forty seven respondents chose that it would be easily done, five indicated that they may make mistakes and nil respondents indicated that they would not make any attempt. This shows that there is a willingness from respondents to participate in a future program.

Question #3 asked respondents if they would be willing to pay more for the service, while 29 respondents agreed that they would be willing to pay more, 21 were not willing to pay more and two respondents would pay more for green waste but not food waste.

Question #4 was a quantitative question asking how many people lived in the household they were responding from. The median number of people living in households was 2.4 persons. The surveys represented 125 citizens of Narrandera local government area. This represents 2% of the total population of Narrandera LGA and as almost all of the respondents were from the Narrandera township area, a response rate of 3%.

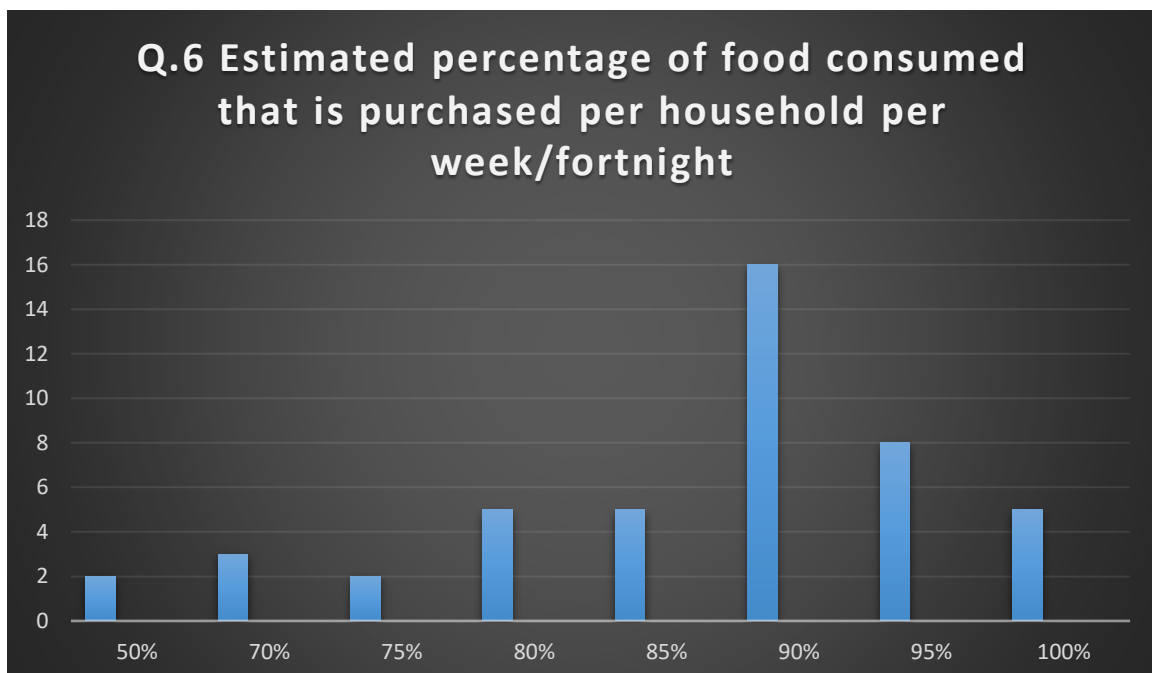
Question #5 asked respondents how they currently dispose of food waste. Figure 6.2 shows that many residents used mixed methods of disposal. It is also noted that over half of the respondents still sent food waste to landfill, 16 respondents sent all of their food waste to landfill, 21 used mixed methods of disposal, seven gave all their food scraps to animal only and seven composted only, one respondent did not answer.

Figure 6.2 How do you currently dispose of food waste?



Question 6 asked what percentage of food purchased in a typical week or fortnight was consumed in your household. Respondents were not given any prompts and were asked to estimate the percentage, six did not answer. Figure 6.3 below shows that respondents generally thought they consumed most of the food that they purchased with 42 reporting consuming 50% or more.

Figure 6.3 Estimation of percentage of food that is consumed per household



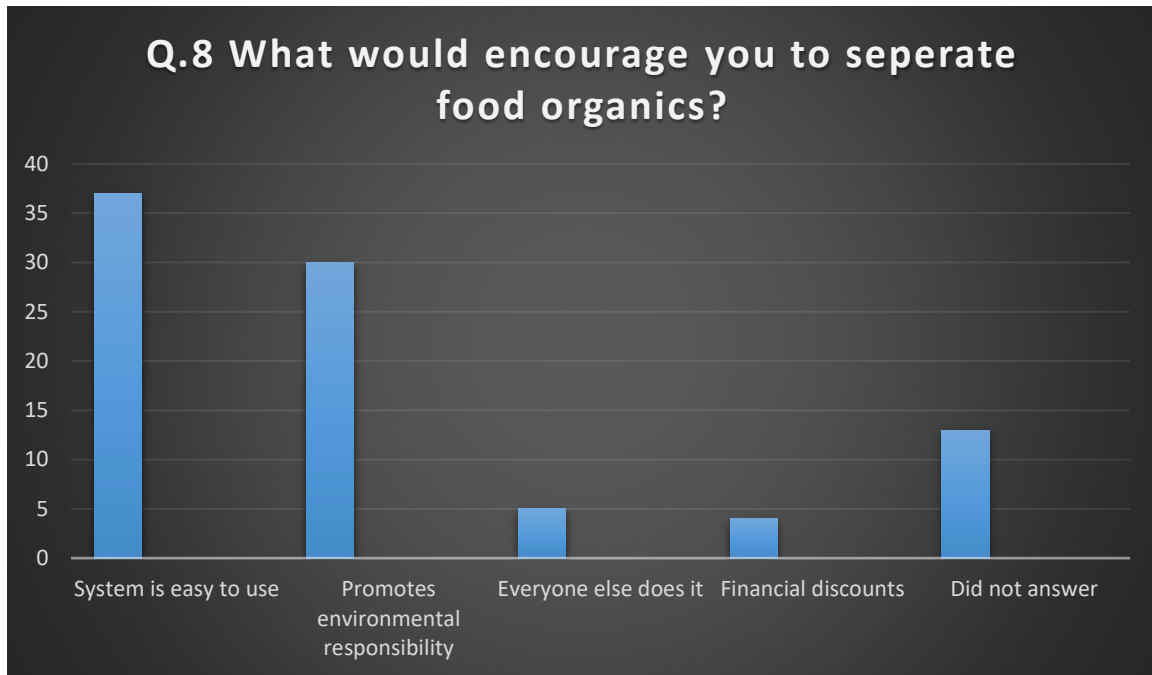
Question 7 asked if you be willing to pay for a food waste and green organics collection, how much would you be willing to pay, this was asked to ascertain the desirability to contribute to food waste management. Figure 6.4 shows that citizens are willing to at least consider some kind of financial contribution towards a program.

Figure 6.4 Willingness to pay for food waste/green waste collection



Question 8 asked citizens what would encourage them to separate their food organics, Figure 6.5 shows that an easy to use system and promoting environmental responsibility were the top two reasons. Respondents chose more than one answer.

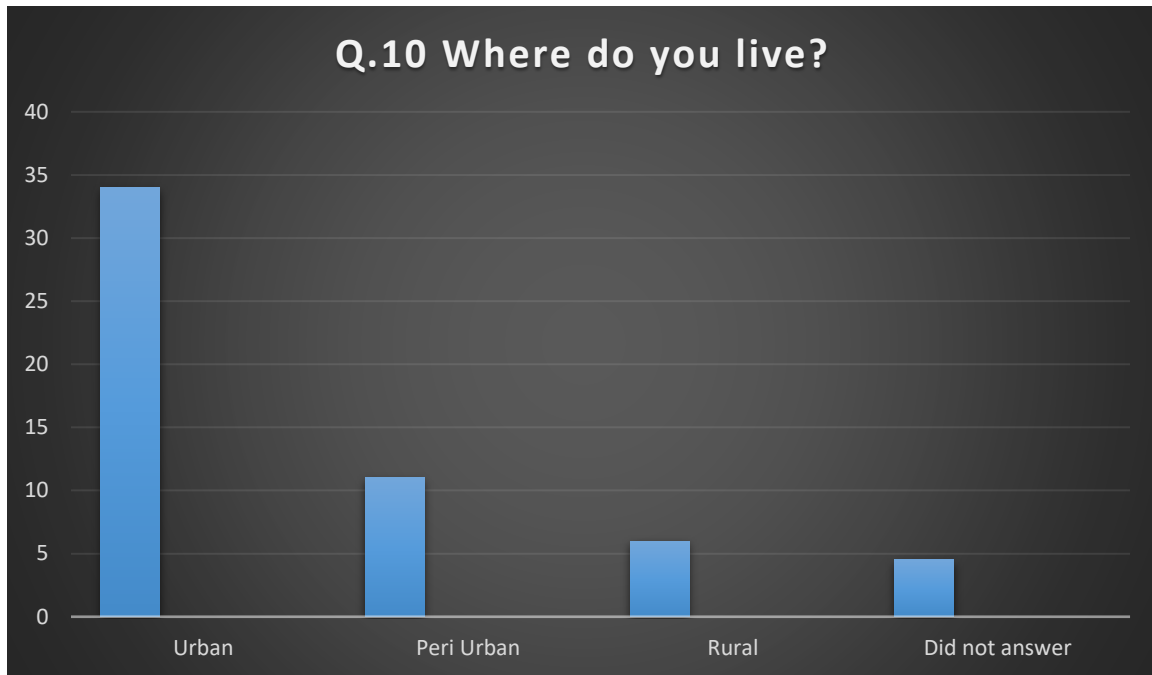
Figure 6.5 What would encourage you to separate food organics?



Question 9 asked how often you would like a bin pickup if an organic waste program was instigated. Two respondents did not answer, with 28 preferring a weekly pickup and 20 fortnightly. Some additional comments were that ‘smell may be an issue’. It has been found that a weekly pickup service for green organics and food waste and a reduction to fortnightly pickups of general waste bins can be successful (REROC, 2017).

Question 10 asked where respondents lived, urban (village, town), peri urban (Gillenhah, outskirts of village/town or rural (Farm, small acreage), this was asked to understand what citizens may be doing with their waste when they may not receive a bin pickup. Figure 6.6 below shows that the majority of respondents were in a bin pickup area.

Figure 6.6 Which part of Narrandera LGA do you live?

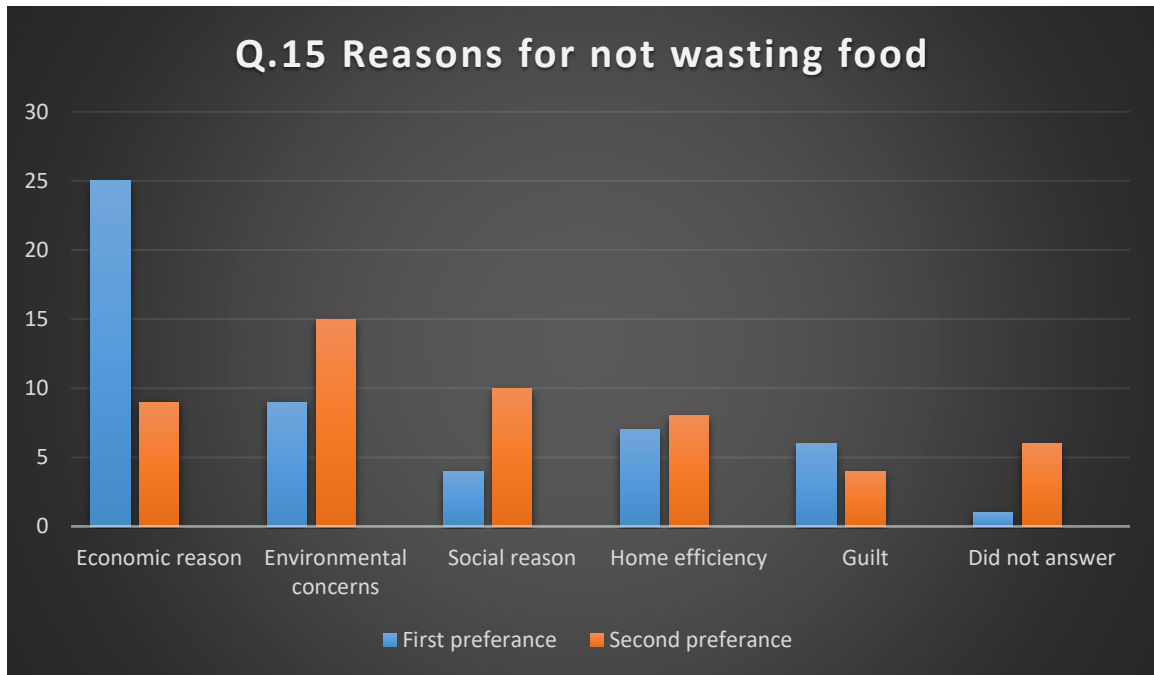


Question 11 asked if respondents would use a council supplied kitchen caddy as has been the case with the City of Holdfast Bay (2019), City of Mitcham (2015) in South Australia. Two respondents did not answer, eight said they would not and 42 said that they would use one. This shows a willingness to participate in a food waste program.

Question 12 asked if respondents would be willing to pay for bags for the kitchen caddies, two did not answer, 15 said no and 35 said yes. Once again, respondents are generally willing to participate and offer some financial assistance. Question 13 asked if respondents thought that collecting and composting food waste would benefit the environment, two did not answer, 15 said no, 35 said yes. This shows that most residents are aware of the environmental issues with the disposal of food waste. Question 14 asked if respondents were concerned about the amount of food purchased but not consumed; one did not answer, one was not concerned and 50 were concerned. The majority of respondents are concerned with the financial loss of food not consumed and the following question describes why.

Question 15 asked respondents to list the three most important reasons to avoid wasting food, Figure 6.7 shows the top two reasons that citizens were concerned with were economic reasons and environmental concerns.

Figure 6.7 What are your reasons for not wasting food?



Question 16 asked to what extent citizens be interested in reducing food waste further? Figure 6.8 shows that most respondents are concerned to some degree in reducing food waste.

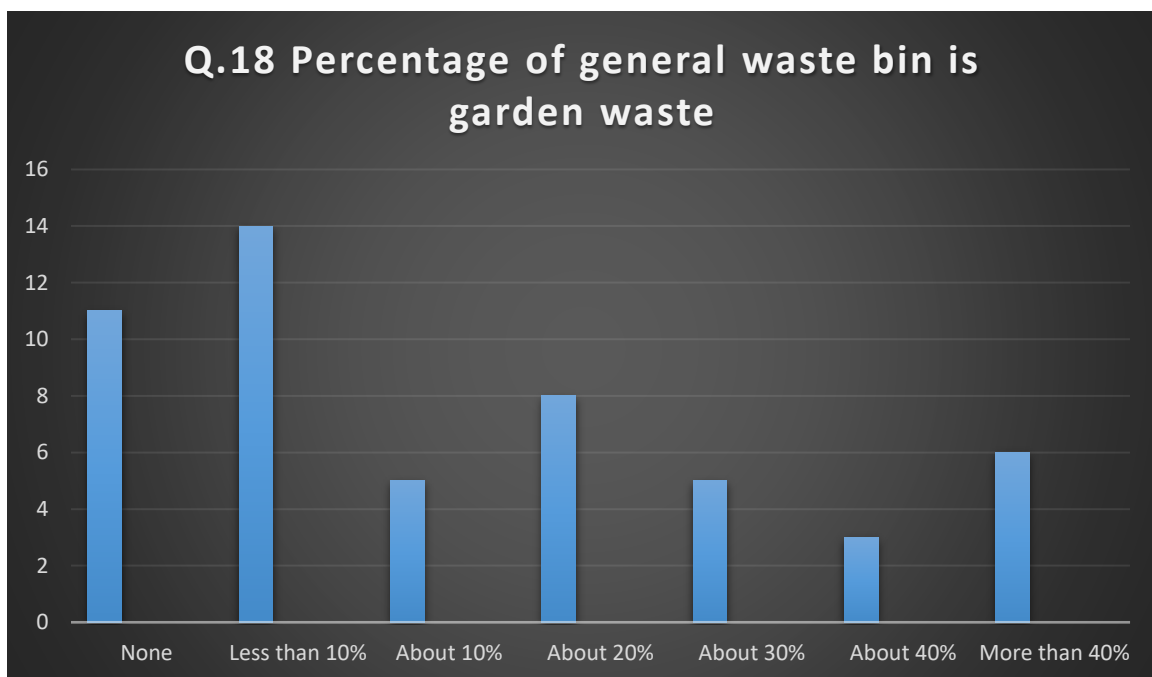
Figure 6.8 To what extent would you be interested to reduce food waste further?



Question 17 asked respondents that thinking about an average week, what percentage of your general waste bin is food waste? 13 said none, 14 less than 10%, 11 about 10%, 6 about 20%, 3 about 30%, 4 about 40% none above that, one did not answer.

Question 18 asked what percentage of the general waste bin is garden waste, this was asked as garden waste (green organics) can be collected in a complimentary way with food waste, at Figure 6.9 it is evident that many respondents compost but there is still a flow of green waste going to landfill.

Figure 6.9 Estimated percentage of waste that is green waste



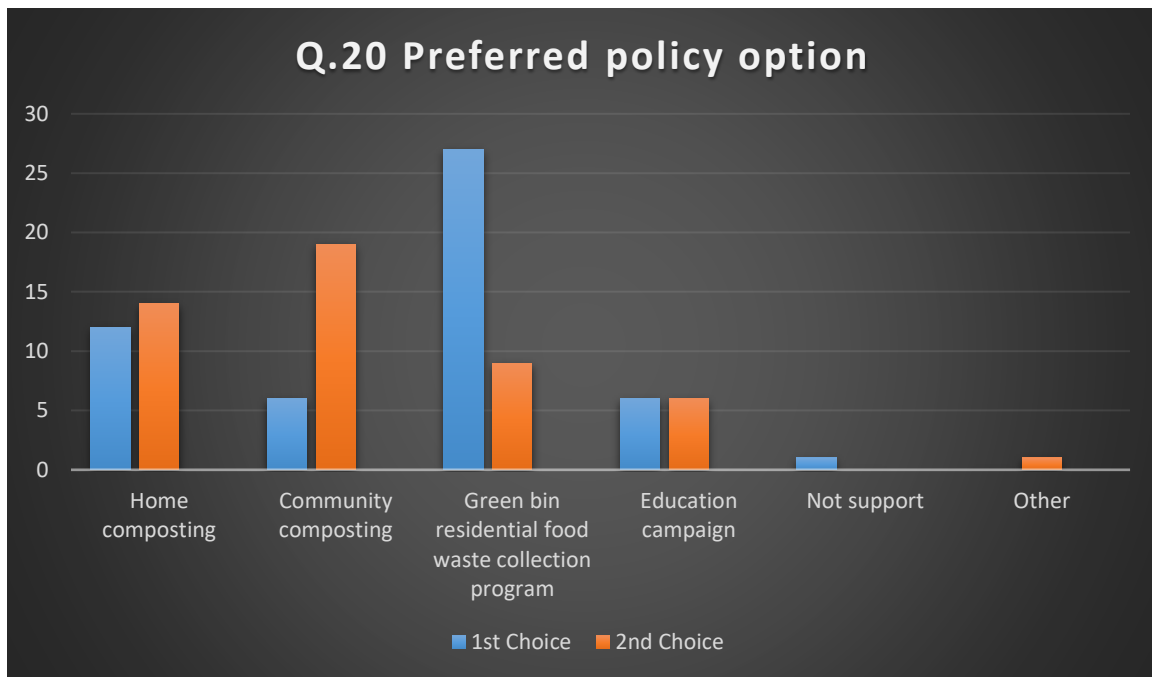
Question 19 asked what the three most important reasons to avoid food waste going to council landfill were, Figure 6.10 shows the top two answers.

Figure 6.10 Top reasons for avoiding food waste going to landfill



Question 20 and the last question in the survey asked respondents about their preferred policy options, this choice modelling approach involves survey respondents revealing their values for environmental changes by making choices between numerous alternative future management scenarios (Bennet, J, 2011). Figure 6.11 shows that a green bin residential food waste collection program is well supported as is community composting, but if community composting is desired, then a green waste service should be introduced.

Figure 6.11 Support for green waste food bin



Other comments and suggestions from citizens that responded to the survey were...

"I support a green waste collection but think our rates are sufficient to supply this option"

"We would like a green waste service but have no need for a food waste bin"

"I hate food waste but don't have time to do composting and don't have any animals to feed it to, a green waste service or community composting service would be amazing"

"I would like a green bin for garden waste"

"The introduction of a third bin could trigger the downsizing of the general waste bin to 120 litres, but this would require further consultation"

"Education on composting and recycling would be beneficial"

7. Observations and Recommendations

Food waste is the ‘new black’ according to Bell (2019) reporting in the Australian agribusiness magazine, *AgJournal*; it seems that there is a new awareness of the issue of food waste. If a food waste management program/strategy is to be considered by NSC, it is better that a program comes from a council perceived as successful, it increases the attractiveness of the new initiative (Lawrie 2018 [UTS presentation]) For example, waste management in South Australia has been seen as an example of litter reduction, value adding to waste, waste to energy, creating the circular economy, Green Industries SA supports householders, business and industry to keep South Australia's resource recovery and waste diversion rates the highest in Australia and to continue striving for *zero waste* (SA Govt. 2019) and some areas of NSW are starting to follow suit.

The citizens of the Narrandera local government area seem to be interested in keeping their area up to date with greenhouse gas emissions reduction as well as considering food waste as a valuable resource. Even though the federal government has a policy to reduce food waste, it has not been well advertised: ‘Locals can do it better than a central government, by better matching the preferences of individual citizens and increasing their individual welfare, there may be flow on effects for economic growth through impacts on work effort, savings and private investment’ (Ryan and Woods 2015, p. 2).

Localism has a part to play in the implementation of any local program, Evans, Marsh and Stoker (2013, p. 405) define localism as: ‘an umbrella term which refers to the devolution of power and/or functions and/or resources away from central control and towards front-line managers, local democratic structures, local institutions and local communities, within an agreed framework of minimum standards’. Through this research, the choice of a food waste program can be achieved at the local level, setting service levels in consultation with the residents of NSC.

7.1 Observations

This research started with the questions:

1. What are the characteristics of food waste management in an Australian local government context?

2. Is a food waste program desirable to the residents of the Narrandera local government area?

The characteristics of food waste management in an Australian local government context is that many have implemented food waste trials, programs and initiatives. Whilst encouraged by central government, no formal legislation or dedicated funding has been given to local government for food waste management even though they are the authority that is responsible for waste management. In regard to is a food waste program desirable to Narrandera Local Government Area, the following observations are offered:

1. The survey results show a willingness of respondents to participate in at least a green waste collection service with some willingness for a food waste program, respondents also show some desire to pay something for the service.
2. Citizens are aware that there is a food waste issue and its effect on the environment.
3. Local government as the entity responsible for waste management services should be the instigators of any such service or program.
4. The survey shows that composting is popular, either at home or a desire to community compost to produce quality compost for home garden and public spaces.

7.2 Recommendations

1. That NSC begin consultation with citizens in regard to introducing a green waste bin service and access the NSW EPA Waste Less, Recycle More grant funding to instigate a program and infrastructure if needed
2. That NSC also include consultation on the reduction of the general waste bin to 120 litres
3. That NSC consider a trial run in a designated area for food waste collection
4. That NSC investigate if it has the capacity to compost at the Narrandera landfill site or offer the waste to another entity
5. That NSC consider an educational promotion on the reduction of food waste
6. That NSC conduct a cost benefit analysis of composting at the Narrandera landfill site that may be beneficial to residents and the council in supplying quality compost for home or public space use.
7. That NSC review its handling of green waste to exclude contaminants.

7.3 *Usefulness to Your Work and the Sector as a Whole*

The usefulness of this research is to see if the Narrandera Shire Council and other rural councils can deliver an affordable food waste management program that brings social and economic benefits not only to the citizens of the LGA, but also to the health of the planet.

This research could be adapted to other smaller rural council areas, identify if a food waste program is desirable to residents in general and raise the awareness of food waste in Australia, promoting better practise for councils, value adding to a waste stream and adding longevity to landfill sites by way of waste stream diversion.

A food waste management program is in line with ESD regulation and the National Strategy for Ecological Sustainable Development.

According to Long and Garbarino (1981, p. 392) ‘knowledge is not useful until someone disseminates it...the medium of dissemination must be appropriate to the target audience and ... the information must be made intelligible to the audience.’ Most research texts highlight the point that dissemination of research findings is part of the research process (Wood, 2018). The findings and implications of this research will be presented to NSC to assist in planning for future policy changes to food waste management.

The findings will also be presented to Riverina and Murray Joint Organisation (RAMJO) to assist in a regional approach to food waste management.

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Appendices

1. Food Waste Survey

Food Waste Management in Local Government. Is it desirable? (And if so why?)

Thank you for your support of this important research study about managing food waste in the Narrandera Local Government Area. The research is aimed at understanding what factors influence your decisions and behaviours in relation to food waste and management at home. It will also investigate food waste reduction options you might prefer to support and participate in. The survey should take you approximately 10-15 minutes to complete. All data from the survey will be reported anonymously and no one will be identified, meaning that no single individual is named in any material arising from the survey. The information you are going to provide will also be confidentially and securely maintained. The result of the study will help inform Narrandera Shire Council in relation to improve current and future food waste management practices.

Introducing food organics and green waste to the current kerbside collection service. As part of my research, I am exploring options to incorporate food organic waste via a green waste bin and kitchen caddy waste bin. Food organics and some green waste go straight to landfill under the current system. If the system was changed to allow for the collection of your food waste and green organics, this would mean that house holders would need to separate food scraps from general waste and place it in a garden green organics bin.

Question 1. Would you support the introduction of a food and green waste collection service?

- Yes No

Question 2. How successfully do you think your household would be able to separate organic waste from general waste?

- Easy done
 Won't make any attempt
 Will probably make mistakes

Question 3. Would you be willing to pay more for food and organic green waste collection service?

- Yes No

Question 4. How many people live in your household?

Question 5. How do you currently dispose of food waste?

- Compost
- Animals, i.e. Chickens, pets
- General waste bin
- Other

Question 6. Of the food that is purchased in your household in a typical week or fortnight, what percentage do you think is consumed?

Question 7. If you would be willing to pay more for food waste and organic green waste collection, how much would you be willing to pay annually?

- \$0-\$10
- \$10-\$30
- \$30-\$50
- \$50-\$75
- \$75-\$100
- More than \$100

Question 8. What would encourage you to separate your food organics?

- System is easy to use
- Promotes environmental responsibility
- Everyone else does it
- Small financial discounts

Question 9. How often would you like a bin pickup for organic waste if this program was instigated?

- Weekly
- Fortnightly

Question 10. Do you live in:-

- Urban (village, town)

- Peri Urban (Gillenbah, outskirts of village/town)
- Rural (Farm, small acreage)

Question 11. Would you use a council supplied kitchen caddy for your food waste?

- Yes
- No

Question 12. Would you be willing to pay for compostable bags to fit in the kitchen caddy?

- Yes
- No

Question 13. Do you think collecting and composting food waste will benefit the environment?

- Yes
- No

Question 14. How concerned are you about the amount of food purchased but not consumed in your household?

- Not concerned
- Slightly concerned
- Moderately concerned
- Very concerned

Question 15. In your household, what is the most important reason to avoid wasting food? (Please pick up to three options by numbering boxes 1, 2, 3, with 1 = most important)

- Economic reason (personal saving)
- Environmental concerns (pollution prevention)
- Social reason (food shortage elsewhere)
- The desire to manage my home efficiently
- The desire to not feel guilty from wasting food
- Other (please specify)

Question 16. To what extent would you be interested to reduce food waste further?

- Not at all

- Very little
- Somewhat
- To a great extent
- Not applicable - do not waste any food

Question 17. Thinking about an average week, what percentage of your general waste bin is food waste?

- None
- Less than 10%
- About 10%
- About 20%
- About 30%
- About 40%
- More than 40%

Question 18. Thinking about an average week, what percentage of your general waste bin is garden waste?

- None
- Less than 10%
- About 10%
- About 20%
- About 30%
- About 40%
- More than 40%

Question 19. Which of the following do you think are the most important reasons to avoid food waste going to Council landfill? (Please pick up to three options by numbering boxes 1, 2, 3, with 1 = most important)

- Improve food availability
- Reduce organic contamination in the recycling bins

- Reduce harmful greenhouse gas emissions
- Extend the lifespan of the existing landfill
- Production of quality compost for home garden & public spaces
- Create local business opportunity for organic waste recyclers

Question 20. Suppose a policy is to be implemented to prohibit the disposal of food waste in your household's general waste bin and at the Council landfill. Which of the policy options below would you prefer be implemented to assist households in reducing their food waste? Please pick up to three preferences from the following list of policy options by numbering boxes 1, 2, 3, with 1 = most preferred.

- Home/backyard composting
- Community composting
- Green bin residential food waste collection program
- Education to avoid over purchasing and over consumption
- I would not support any option
- I would like to suggest other option(s) (please specify

Thank you for your participation, please return the completed survey and the signed consent form in the stamped, addressed envelope provided no later than Monday 18th August 2019

2. Ethics Application

IPPG and CLG Ethics Self-Assessment Tool

Project PIMMS Number: [Click or tap here to enter text.](#)

Project title: Food Waste Management in Local Government. Is it desirable? (And if so why?)

Project Manager: David Fahey

Date Checklist completed: 14/01/2019

	Yes	No
1. Is the project classified as research or evaluation for reporting purposes? ¹ (If no, final assessment: 'Human ethics approval not required')	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2. Does the research or evaluation involve humans or their data? (If no, final assessment: 'Human ethics approval not required')	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3. Does the research relate to policy advisory, social research and evaluation, stakeholder engagement, leadership and local government? (If no, submit your application through: 'Research Master')	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4. Does the project use a method that is <i>not</i> listed below? <ul style="list-style-type: none"> • Interviews • Questionnaires/ surveys • Telephone survey • Focus groups • Workshops • Deliberative panel • Action research • Photography • Audio/video recording • Online research • Archival research • Life story or oral history • Site visit/ observation. (If yes, submit your application through 'Research Master')	<input type="checkbox"/>	<input checked="" type="checkbox"/>

¹ The Australian Research Council defines research as “the creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies, inventions and understandings”, and evaluation as “the systematic acquisition and assessment of information to ascertain the value and merit of a subject (e.g. a program, policy, technology, person, need, activity etc.).” The IPPG/CLG Director has ultimate decision-making authority as to the classification of projects. All project managers must consult with the IPPG/CLG Director and obtain written confirmation if a project is considered research or evaluation for reporting purposes. The email must be saved in the ethic folder.

		Yes	No
5. Does your research involve any of the following? Y/N			
Establishment of a register or databank of identifiable data for possible use in future research projects	Reference National Statement Chapter 3.2 , page 27	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
Collection, transfer and/or banking of human biospecimens	E.g. tissue, blood, urine, sputum etc.	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
Any significant alteration to routine care or health service provided to participants	E.g. deviation from standard care or usual practice	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
Interventions and therapies, including clinical and non-clinical trials, and innovations	Reference National Statement Chapter 3.3 , page 30 and the WHO definition of a Clinical Trial	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
Targeted recruitment or analysis of data from any of the vulnerable groups listed in Chapter 4 of the National Statement (or where any of these vulnerable groups are likely to be	Women who are pregnant and the human fetus (Chapter 4.1 , page 46)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
	Children and young people (under 18 years) (Chapter 4.2 , page 50)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	
	People in dependent or unequal relationships (e.g. lecturer/student [except T&L], doctor/patient,	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N	

significantly over-represented in the group being studied)	employer/employee) (Chapter 4.3 , page 53)	
	People highly dependent on medical care who may be unable to give consent (Chapter 4.4 , page 55)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	People with a cognitive impairment, an intellectual disability, or a mental illness (may include the disadvantaged/homeless) (Chapter 4.5 , page 58)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	People who may be involved in illegal activities (including those affected e.g. victims of domestic violence) (Chapter 4.6 , page 60)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	Aboriginal and Torres Strait Islander Peoples not acting in their professional capacity (Chapter 4.7 , page 62)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Collection, use or disclosure of personal information without consent of the participant	Name, address and other details about the participant (e.g. date of birth, financial information etc.)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	Photographs, images, video or audio footage	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	Fingerprints	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Collection, use or disclosure of health information	Personal information (as defined above) collected to provide, or in providing, a health service (e.g. admission to hospital, GP visit, pathology, pharmacy etc.)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	Information or an opinion about: (i) the health or a disability (at any time) of an	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N

	individual; or (ii) an individual's expressed wishes about the future provision of health services to him or her; or (iii) a health service provided, or to be provided, to an individual	
	Personal information about organ donation	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
	Genetic information about an individual or the individual's relatives	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Collection, use or disclosure of sensitive information	Racial, ethnic information, political, religious and philosophical beliefs, sexual activity or identity, and trade union membership	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Projects involving covert observation, active concealment, or planned deception of participants	E.g. covert observation of the hand-washing behaviour of hospital employees, undisclosed role-playing by a researcher, etc. Does NOT include observation in a public place WITHOUT the use of photographs, images, video or audio footage (Chapter 2.3 , page 19)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Activity that potentially infringes the privacy or professional reputation of participants, providers or organisations	E.g. observation in the workplace, collection of commercially confidential information, etc. Commercially confidential information - Any information which is not in the public domain or publicly available, and where disclosure may undermine the economic interest or competitive position of the owner of the information (TGA adopted definition from European Medicines Agency (EMA))	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N

People not acting in their professional capacity that are in / from countries that are	Politically unstable; where human rights are restricted; and/or where the research involves economically disadvantaged, exploited or marginalised participants from such countries	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N
Potential for participants to experience harm	E.g. physical, psychological, social, economic and/or legal (Chapter 2.1 , page 13)	<input type="checkbox"/> Y <input checked="" type="checkbox"/> N

(If yes to any of the questions in section 5 above, submit your application through Research Master’, otherwise submit your application through the ‘IPPG and CLG Internal Ethics program’)

Final assessment

- Human ethics approval not required IPPG and CLG Internal Ethics program
- Research Master

Ethics documentary requirements

IPPG and CLG Internal Ethics program:

- Approved IPPG and CLG program

form

Human ethics approval not required:

- N/A

Research Master:

- Completed Research Master application
- HREC approval

Outline of supporting documentary requirements

Method	Project information sheet	Consent (pick either)		Data collection tool ²	Evidence of permission to use entity/location for research purposes
		Written consent form	Evidence of verbal consent ³		
Interviews					
Questionnaires/surveys	X	X		X	
Telephone survey					
Focus groups					
Workshops					
Deliberative panel					
Action research					
Site visit/observation					X
Photography ⁴					
Audio/video recording					
Online research ⁵	X				X
Archival research	X				
Life story or oral history				X	

*** Key email correspondence with Ethics Manager, Ethics Director, RIO and/or HREC and documents relating to amendments should also be recorded.**

² For example, survey instruments, interview questions, focus group running sheet.

³ Written consent is preferred. Verbal consent can only be used where it is not culturally appropriate to obtain written consent, e.g. when engaging people with low literacy (please detail such considerations in the initial ethics application if you intend to use verbal consent). Evidence of verbal consent might include audio recordings, research notes indicating that verbal consent was obtained, or a script reflecting the verbal consent acquisition process.

⁴ Consent only required when photographing individuals or small groups.

⁵ Permission from a representative of online entity only necessary where permission for the online research method is not already granted through the entity's terms of service, including its privacy policy. If permission is granted through the terms of service, include evidence of this in the project folder.

IPPG and CLG Internal Ethics Form

Project summary

Project PIMMS Number	
Project Title	Food Waste Management in Local Government. Is it desirable? (And if so why?)
Project Director	Bligh Grant (Student Supervisor)
Project Manager	David Fahey (Student)
Project Team	N/A
Project start date	8th April 2019
Project completion date (expected)	30 th November 2019
Other institutions involved	N/A
Ethics approval required partner organisations (if applicable)	N/A
Source and amount of funding	N/A

Ethics requirements

Please respond to **all** questions.

Methodology (maximum of 200 words per response)

<p>Summary of the research proposal's aims or hypothesis</p>	<p>There is a role for local government in Australia to encourage their citizens to change the norm from a throwaway society to utilising resources to the maximum. This includes promoting a circular economy (WRAP, 2019) and in particular in the chosen research the maximisation of food waste recovery into a product that has added value as a commodity and to add public value for citizens.</p>
<p>Summary of proposed research procedures (methodology & research design)</p>	<p>A comparative analysis/mixed methods approach will be taken to define and compare programs that already exist or have had trials. This would include looking at intergovernmental relationships, local governments role in waste management, similarities/differences between local government areas, cost benefit analysis, public goods and public value, evaluation of programs tested and/or up and running and the sociology of waste management.</p>
<p>Significance of the research</p>	<p>I have been approached by many citizens of Narrandera Shire Council (NSC) local government area (LGA) and asked why the NSC does not have an organic waste collection service and in particular a food waste collection. Climate change and the reduction of greenhouse gas emissions are of concern to the citizenry of my LGA. This has prompted me to undertake this research proposal.</p>
<p>Research Participants</p>	

Please indicate if either of the following population groups is targeted in the design of your research?

- Aboriginal and Torres Strait Islander Peoples** acting in their professional capacity (e.g. in government, non-governmental organisation or private sector)
- People in other countries** acting in their professional capacity (e.g. in government, non-governmental organisation or private sector).

If you have indicated either of the above groups are involved please ensure you complete Attachment 1 (Vulnerable populations) of this application form.

Methods: For each method (e.g. interviews, survey, focus groups, workshops) indicate the following. Please copy additional rows if required.

Method 1

How many participants will be recruited? Please provide a justification of the number. What selection/exclusion criteria will be used?

Paper questionnaire available to all residents in Narrandera township and surrounds that are over 18 years of age. An editorial about the research proposal will be published in the local Narrandera Argus newspaper, followed by questionnaires placed at the local library, council chambers and by request. It is hoped that at least 200 participants can be recruited to answer the survey. The population of Narrandera shire that is over 18 is currently about 4300, The sample size of 200 would give a confidence interval of 6.77.

How will you recruit participants? How will you contact them?	I intend to utilise the Narrandera Shire Council website, the local Narrandera Argus to do an editorial on the research and the Narrandera Shire Council Facebook page and the Narrandera community newsletter
Does the researcher have a pre-existing relationship to research participants (e.g. family, colleagues, students).	Yes, I am the Deputy Mayor of Narrandera Shire Council and have lived and worked in the area for the past 28 years
What will this study involve for participants? How might they be inconvenienced? Please note what time commitment is required and where the research will take place.	The survey should take no longer than 10-15 minutes to complete
Describe any risk or harm (see IPPG Code of Ethical Research Conduct) that may be associated with the research for subjects/participants and how these will be minimised	None
How will informed consent be obtained from participants (attach any forms to be used). Give details of methods to be used if subjects include people who are unable to consent for themselves.	At the top of the consent form
Describe any benefit, payment or compensation participants will receive.	None

Documentary requirements

Please complete and attach the relevant documentation.

Method	Project information sheet	Consent (pick either)		Data collection tool ⁶	Evidence of permission to use entity/location for research purposes
		Written consent form	Evidence of verbal consent ⁷		
Interviews	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Questionnaires/surveys	X	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Telephone survey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Focus groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Workshops	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Deliberative panel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Action research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Site visit/observation ⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Photography ⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Audio/video recording	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Online research ¹⁰	<input type="checkbox"/>			<input type="checkbox"/>	<input type="checkbox"/>
Archival research	<input type="checkbox"/>				
Life story or oral history	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

*** Key email correspondence with Ethics Manager, Ethics Director, RIO and/or HREC and documents relating to amendments should also be recorded.**

Comments	fathimathnasranaseer@gmail.com davefahey11@msn.com
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⁶ For example, survey instruments, interview questions, focus group running sheet.

⁷ Written consent is preferred. Verbal consent can only be used where it is not culturally appropriate to obtain written consent, e.g. when engaging people with low literacy (please detail such considerations in the initial ethics application if you intend to use verbal consent). Evidence of verbal consent might include audio recordings, research notes indicating that verbal consent was obtained, or a script reflecting the verbal consent acquisition process.

⁸ Permission from a representative of a physical location is only necessary when that location is private property.

⁹ Consent only required when photographing individuals or small groups.

¹⁰ Permission from a representative of online entity only necessary where permission for the online research method is not already granted through the entity's terms of service, including its privacy policy. If permission is granted through the terms of service, include evidence of this in the project folder.

Data and Other Considerations

How and where will you store the data, including computer files, audio tapes, video tapes, handwritten notes, completed survey forms etc. to protect confidentiality of participants?	The hard drive of the Researcher's computer and physical forms locked in a separate drawer for research items.
To what extent will you be able to identify the subjects from the published or unpublished data?	Research subjects will not be identifiable on the basis of their responses. 1. The surveys are anonymous 2. No person will be identified in the final report
Will the data be published such as to identify participants?	No
Give details of any ethical issues as outlined in the IPPG Code of Ethical Research Conduct arising from the research and the methodological response to these, e.g. conflicts of interest, bias, deception.	None

Declaration

I declare that:

- All information in this application and supporting documentation is correct and as complete as possible
- This research will be undertaken in compliance with the UTS Research Ethics and Integrity Policy or any replacement or amendment thereof
- This research will be undertaken in compliance with the Australian Code for the Responsible Conduct of Research and National Statement on Ethical Conduct in Human Research
- I will also ensure that others working on the project understand the IPPG Code of Ethics and follow the IPPG's ethics Standard Operating Procedures, including data storage and privacy considerations.

	Name/Signature	Date
Project Manager	David Fahey	8 th April 2019
Ethics Manager/Director	Bligh Grant	14 th May 2019

Once approved, Save the form (and supporting documentation) in the appropriate Ethics folder for the project.

ATTACHMENT 1: RESEARCH INVOLVING VULNERABLE POPULATIONS

The IPPG ethics program approval covers:

- people in other countries, and
- Aboriginal & Torres Strait Islander Peoples,

if they are acting in their professional capacity (e.g. in government, non-governmental organisation or private sector).

If your research directly targets either of these groups, or if either of these groups are likely to be overrepresented in your research, you must complete this section of the application.

If your research involves people in other countries and/or Aboriginal & Torres Strait Islander Peoples **who are not** acting their professional capacity your will require HREC ethics approval.

Please note that research involving people from identifiable language and cultural groups, including your own, may require special sensitivity. If the research is being carried out in another country, you must comply with UTS as well as local standards, laws and guidelines.

	Question	Response
1	<p>Does your research involve Aboriginal and Torres Strait Islander people acting in their professional capacity (e.g. in government, non-governmental organisation or private sector)?</p> <p>If yes, refer to the relevant policies and guidelines¹¹ and consult with the Jumbunna Indigenous House of Learning, the University's Indigenous Unit (02 9514 1902), or an independent IRAP member as to any potential for harm faced by these research targets or the wider Aboriginal and Torres Strait Islander community in which they may be based.¹² Please give details about how you intend to minimise any potential harm of the research on these individuals. (Where possible, a representative of a local Aboriginal organisation may be on a project steering committee, or reference group, or may be consulted as one of many different stakeholders in a particular project.)</p> <p>If the IRAP member or Jumbunna have advised this research project carries any potential for harm on an Aboriginal and Torres Strait Islander community then the ethics application must be submitted to HREC.</p>	No
2	<p>Is the research being conducted in English? If yes, please proceed to Question 10 below.</p>	Yes

¹¹ [Values and Ethics: Guidelines for Ethical Conduct in Aboriginal and Torres Strait Islander Health Research](#); [Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities: Guidelines for researchers and stakeholders](#); [Keeping Research on Track II: a guide for Aboriginal and Torres Strait Islander peoples about health research ethics](#); [AIATSIS - Guidelines for Ethical Research in Australian Indigenous Studies](#).

¹² The SOP contains an email template for contacting an IRAP member or Jumbunna. Save a copy of any correspondence with this group and include it in your application.

	Question	Response
3	What language is the research being conducted in?	
4	Are you or members of the research team fluent in this language? Please list names.	
5	Will you be using an interpreter?	
6	What prior relationship, if any, does the interpreter have to the participant(s)?	
7	How have you ensured the confidentiality of the interpreter?	<input type="checkbox"/> Confidentiality agreement <input type="checkbox"/> Clear briefing of translator <input type="checkbox"/> Clear explanation on consent form of role of translator <input type="checkbox"/> Other (explain below)
8	Who will be translating the participant information from English into the relevant languages? Please attach copies of all material, clearly labelled, in English and other relevant languages	

	Question	Response
9	If you are using a translator/interpreter, describe who you will be using, their qualifications and experience, relationship to the group, and how you will ensure confidentiality. You may like to consider the use of back-translations of any written information for participants.	
10	Is the research taking place in another country? If so, you must arrange for a local independent contact to make it easier for your participants should they wish to confirm your identity or express any concerns. Please give details and note that the contact person's details should also be included in any written material for participants.	No

	Question	Response
12	<p>Does your research involve people overseas acting in their professional capacity (e.g. in government, non-governmental organisation or private sector)? If yes, will the research require approval from a local Institutional Review Board or HREC? If so, please indicate (a) whether such processes are mandatory or voluntary; (b) how such processes function and the values and principles on which they rely; and (c) whether these processes require reporting of the Australian review body's approval. If such overseas ethics approvals are sought, please attach evidence of approval.</p>	No

	Question	Response
11	<p>For research involving people overseas acting in their professional capacity (e.g. in government, non-governmental organisation or private sector), please consult with the locally based overseas contact as to any potential for harm faced by these research targets or the wider overseas community in which they may be based. Please give details about how you intend to minimise any potential harm of the research on these individuals. If the overseas contact has advised that this research project carries any potential for harm on an overseas community then the ethics application must be submitted to HREC.</p>	

PARTICIPANT INFORMATION SHEET

Towards a model of responsible and responsive local governance in Maldives: An exploratory study

(IPPG ETHICS REFERENCE NUMBER)

WHO IS DOING THE RESEARCH?

My name is David Fahey and I am a student at UTS. My supervisor is Bligh Grant Ron Woods.

WHAT IS THIS RESEARCH ABOUT?

It is a comparative study on food waste in South Australia and NSW with a view to research if the residents of Narrandera Shire would find recycling food waste desirable and if they would be willing to pay for a food waste management program.

FUNDING

Not applicable.

WHY HAVE I BEEN ASKED?

You are a resident of the Narrandera Shire Council Local Government Area

IF I SAY YES, WHAT WILL IT INVOLVE?

If you decide to participate, you will be asked to complete a paper survey. There are 20 questions in the survey regarding your current practices and attitudes to food waste.

ARE THERE ANY RISKS/INCONVENIENCE?

There will not be any risks/inconvenience or any kind of questions which would be sensitive or lead you to be embarrassed. There are no risks associated with this research, your anonymity is guaranteed. your comments will never be publically attributed to you, and all reporting of the data will be de-identified.

DO I HAVE TO SAY YES?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

WHAT WILL HAPPEN IF I SAY NO?

If you decide not to participate, it will not affect your relationship with the researchers or the University of Technology Sydney. If you wish to withdraw from the study once it has started, you can do so at any time without having to give a reason, by contacting David Fahey at 12965176@student.uts.edu.au or by contacting through phone number +9609997828. 0427262270

CONFIDENTIALITY

By signing the consent form, you consent to the research team collecting and using personal information about you for the research project. All this information will be treated confidentially. Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

The information will not be stored for future use in research projects that are an extension of this research project. In all instances your information will be treated confidentially.

I plan to submit the research project which includes your data to the University of Technology Sydney as part of the research project of the researcher's master program. Only the information related to the questions asked and a generic position title will be used.

WHAT IF I HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I, David Fahey or my supervisor Bligh Grant can help you with, please feel free to contact me at 12965176@student.uts.edu.au Bligh Grant at Bligh.Grant@uts.edu.au

If you need to confirm the identity of the researchers or would prefer to discuss a complaint or reservation with an independent local contact their details are listed below. The local contact person will pass your comments on to the UTS contacts listed above.

You will be given a copy of this form to keep.

NOTE:

If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au, and quote the [UTS HREC reference number/IPPG ethics reference number]. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

Written consent form template

*Towards a model of responsible and responsive local governance in Maldives: An exploratory study (IPPG
ETHICS REFERENCE NUMBER)*

I, (participant name), agree to participate in the research project Food Waste Management in Local Government, is it desirable and if so why?: A comparative study (approval reference number) being conducted by [David Fahey, Student number: 12965176, University of Technology Sydney).

I have read the Participant Information Sheet or someone has read it to me in a language that I understand.

I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet.

I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers or the University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep.

I agree that the research data gathered from this project may be published in a form that:

does not identify me

I am aware that I can contact David Fahey if I have any concerns about the research.

_____ / ___ / ____

Name and Signature [participant]

Date

David Fahey _____ / ___ / ____

Name and Signature [researcher]

Date

If you have any concerns or complaints about any aspect of the conduct of this research, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au, and quote the [UTS HREC reference number/IPPG ethics reference number]. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.