



THE UNIVERSITY
of ADELAIDE

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Sorting out sustainable food waste behaviour of households: A comprehensive survey of food waste disposal practices

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Household food waste issue

- **One-third of food produced** globally is either lost or wasted along the supply chain (FAO, 2011).
- Households are responsible for a **large proportion** of total food waste (FW), especially in developed countries (Parfitt et al., 2010).
 - in Australia, **32%** of food waste generated each year is from households, and **73% (or 1.8 million tons)** of this is sent to landfill (Van Biene et al., 2021).
 - adding environmental impacts through **increased greenhouse gas emissions** (FAO, 2014)

Objectives

- 1) To increase understanding of where households dispose of their FW.
- 2) To explore factors associated with 'sustainable' FW disposal behaviour (i.e. diverting household FW from landfill).

Contribution

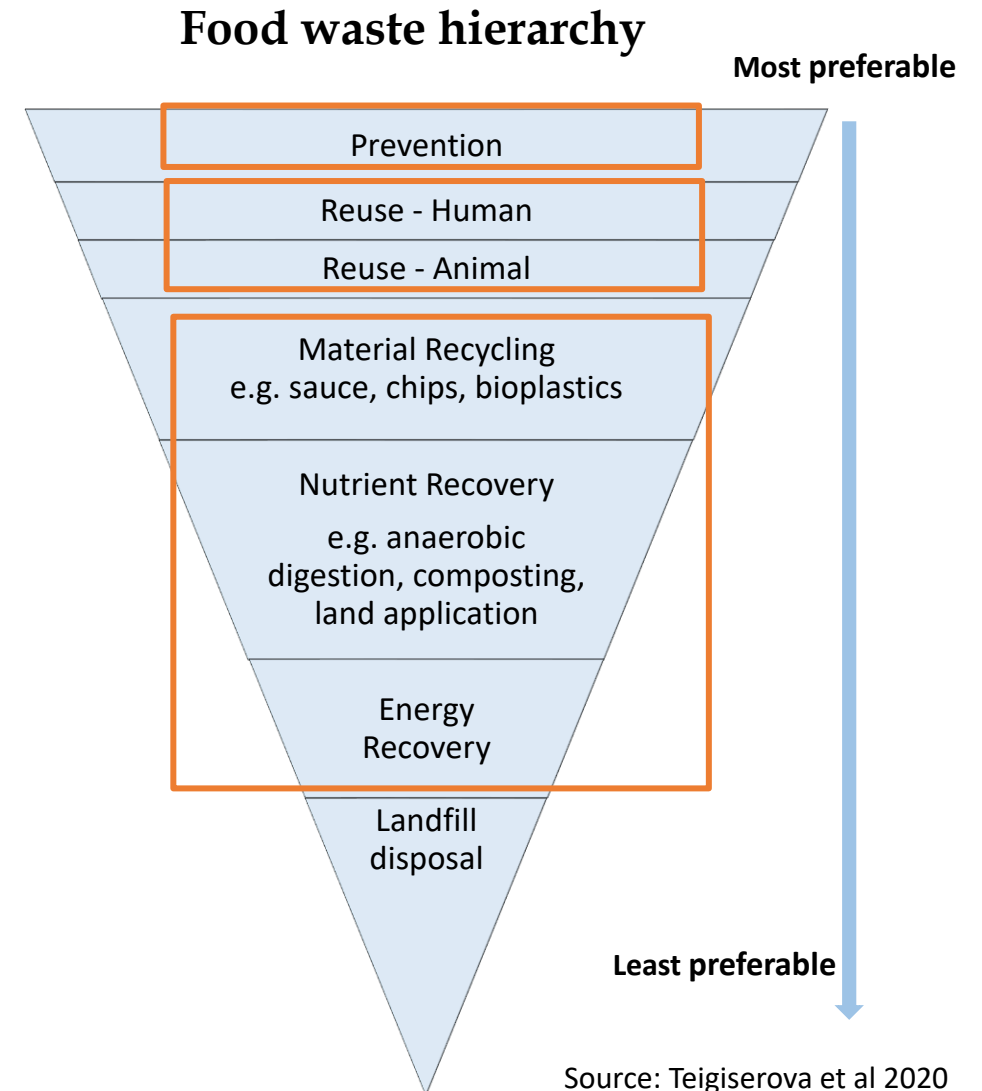
- 1) Incorporating **all possible** disposal destinations.
- 2) Exploring sustainable disposal behaviour in Adelaide, South Australia where all households have access to **at least one sustainable option** - organic kerbside collection.



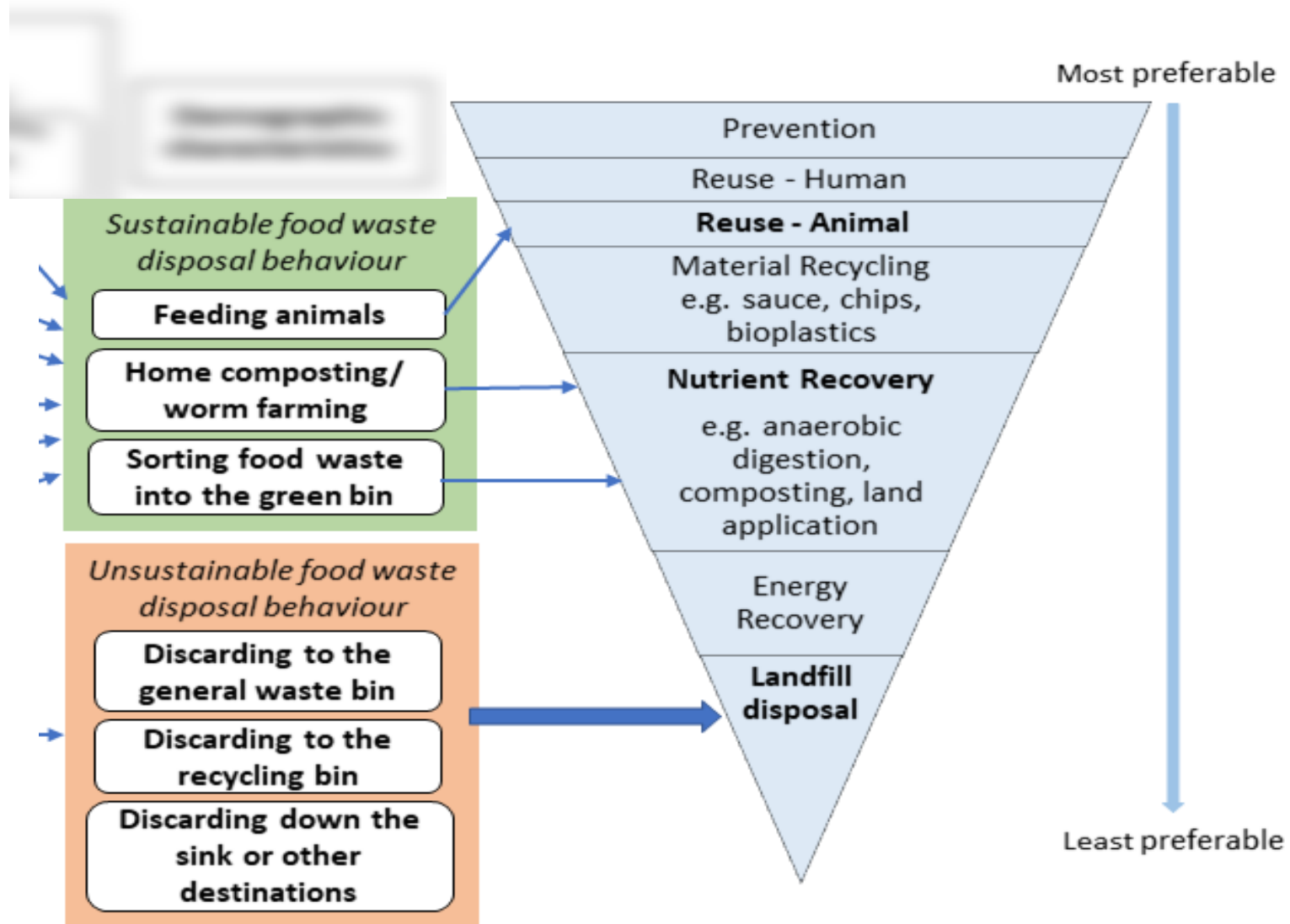
Kitchen caddy

Household food waste disposal

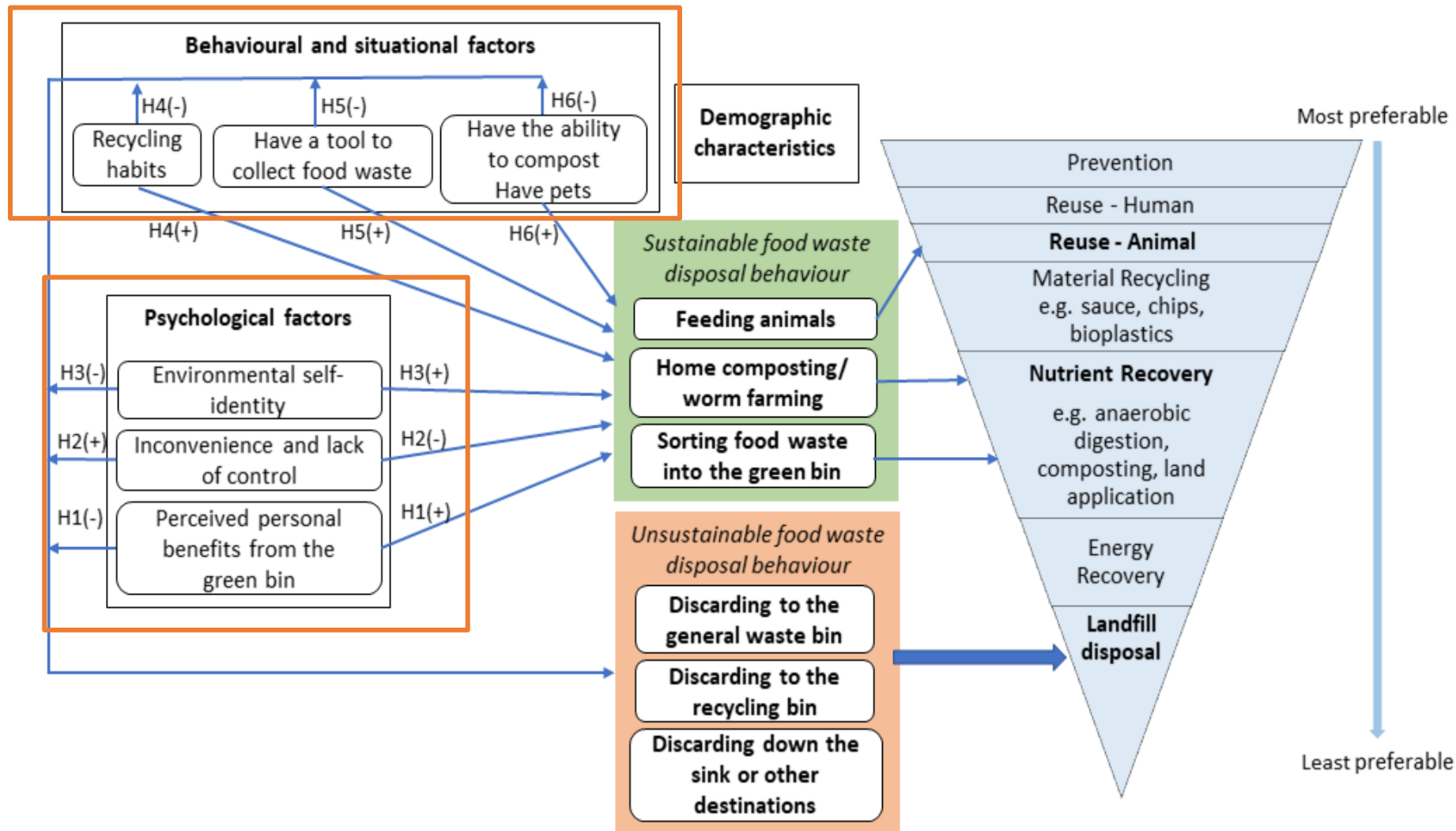
- Landfilling is the **least preferred** option (Papargyropoulou et al., 2014).
- Minimising household FW receives **considerable attention**.
- Even with minimisation strategies, some FW disposal **remains to be managed** (Ladele et al., 2021)
- Several FW disposal options are available to households.
 - No known previous research has examined behaviour with respect to the range of possible disposal options available to households.



Conceptual framework and hypotheses



Conceptual framework and hypotheses



- Factors were considered include psychological factors, behavioural and situational are motivated by a comprehensive review of relevant literature.
- Demographic characteristics were controlled for.

Online survey

- **Data Collection:** cross-sectional survey collected from 15 April - 21 May 2021 by PureProfile
- Developed after focus groups discussions
- **Participants:** 18+ Adelaide residents, metropolitan suburbs
- **Sample size:** 1030 respondents
- **Quotas:** nationally representative by gender and age, good range of income brackets
- **Survey topics:**
 - 1) Demographic characteristics
 - 2) Food-related behaviours
 - 3) Food waste disposing behaviour
 - 4) Attitudes/concerns/beliefs

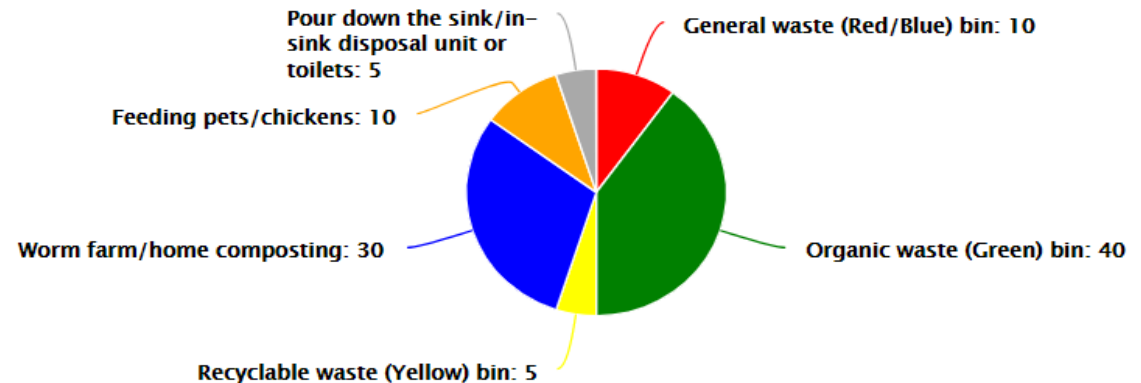
Dependent variable

- Respondents were asked to report **where they disposed of FW** into different destinations (see photo)
- These **proportions summed to 100%** which is the total FW amount that households reported producing during a typical week

Please estimate the percentage of your household **total solid FOOD WASTE** (e.g. potato peels, chicken bones, bread) that goes to each of the following **destinations** in **a typical week**.

Please only consider the food and NOT the packaging.

General waste (Red/Blue) bin	<input type="text" value="10"/>	%
Organic waste (Green) bin	<input type="text" value="40"/>	%
Recyclable waste (Yellow) bin	<input type="text" value="5"/>	%
Worm farm/home composting	<input type="text" value="30"/>	%
Feeding pets/chickens	<input type="text" value="10"/>	%
Pour down the sink/in-sink disposal unit or toilets	<input type="text" value="5"/>	%
Other, please specify <input type="text"/>	<input type="text" value="0"/>	%
		Total: 100



Fractional multinomial logit model (fmlogit)

- Generalization of the **fractional logit model** following Papke and Wooldridge (1996).
- The model is estimated by maximising the log likelihood function of a regular multinomial logit using **the proportions as dependent variables** and using **robust standard errors**, which can measure shares of outcomes or multiple proportions (Mullahy, 2015).
- It models a set of dependent variables that each **must range between 0 and 1** and must always **add up to 1 for each observation** (Buis, 2008).
- Model is estimated using the Stata fmlogit package developed by Buis (2008).

Dependent variables, proportions of total household FW discarded in different destinations (n=1027)

Dependent variables	Mean	St. Dev.	Min	Max
Rubbish bin	0.363	0.339	0	1
Green organics bin	0.323	0.361	0	1
Recycling bin	0.115	0.169	0	1
Home composting	0.101	0.238	0	1
Animal feed	0.059	0.144	0	1
Sink and other	0.039	0.082	0	0.7

20%

- **20%** of FW through informal routes including home composting, feeding to pets and sewer disposal (Reynolds et al., 2014)
- This also highlights the substantial FW amount that **cannot be captured through auditing a formal waste management system** (i.e. kerbside waste collection) (Reynolds et al., 2014)

Summary statistics of socio-demographic and household characteristics (n=1030)

Variable	Definition	Mean (std. dev.)	Min	Max
Women	1=Women; 0=Otherwise	0.50 (0.50)	0	1
Age	Years old	46.45 (16.95)	18	92
University educated	1=University education; 0=Otherwise	0.36 (0.48)	0	1
Household income^a	Thousands of AUD per year	85.23 (52.53)	12.25	222.30
Share of life in Australia	Number of years living in Australia over age (years)	0.52 (0.32)	0.03	1
Live in a unit	1=Yes; 0 =No	0.13 (0.34)	0	1
Household residents	Number of residents living in the household	2.79 (1.31)	1	10
Have children younger than five years old	1=Yes; 0 =No	0.13 (0.33)	0	1
Have a kitchen caddy	1=Yes; 0 =No	0.56 (0.50)	0	1
Ability to compost	1=Yes; 0=No	0.57 (0.49)	0	1
Have pets	1=Yes; 0 =No	0.65 (0.48)	0	1

Note: ^a Household income is a semi-continuous variable

Summary statistics of key independent variables (n=1030)

Items per index variables	Mean	Min	Max
Perceived personal benefits of sorting FW to the green bin (Cronbach's $\alpha = 0.68$)	5.36	1	7
Putting FW into the green bin is the right thing to do			
I feel good when I sort and dispose of FW correctly into the green bin			
By using the green bin for FW, my rubbish bin stays cleaner and does not need to be taken out as frequently			
Inconvenience and lack of control in using the green bin (Cronbach's $\alpha = 0.82$)	3.40	1	7
I do not have sufficient information regarding FW going into the green bin			
It is expensive to buy supplies (e.g. compostable bags, kitchen caddy, etc.) to sort into the green bin			
I do not want to deal with the smell and the mess of food when sorting FW			
It takes too much time and effort to sort FW into the green bin			
I have no control over FW as other people in the house are the ones disposing FW			
Environmental self-identity (Cronbach's $\alpha = 0.93$)	5.25	1	7
Acting environmentally friendly is an important part of who I am			
I am the type of person who acts in an environmentally friendly way			
I see myself as an environmentally friendly person			
Recycling habit (Cronbach's $\alpha = 0.81$)	6.20	1	7
Sort and recycle glass bottles			
Sort and recycle paper/cardboard			
Sort and recycle rigid plastic packaging (e.g. milk bottles)			

Note: All items were assessed on 7-point Likert scales; higher values correspond to stronger agreement with the statement or higher frequency of recycling habit. FW=Food waste.

Results of the fmlogit model

Table 1. Average marginal effects for fmlogit modeling of household FW disposal (n=1027)

Variable	Sustainable FW behaviours			Unsustainable FW behaviours		
	Green bin	Compost	Animal feed	General waste bin	Recycling bin	Sink and other
Have a kitchen caddy	0.164***	0.032**	0.016	-0.200***	-0.007	-0.005
Recycling habit	0.027***	0.000	-0.002	-0.005	-0.015**	-0.006***

Having a tool to collect FW

- The presence of this tool is associated with
 - **16.4%** ↑ FW into **green bin**
 - **3.2%** ↑ FW into **home compost**
 - **20%** ↓ FW disposed of **rubbish bin**.
- Literature shows this outcome could be an effect of
 - improved convenience
 - creation/enforcing of a social norm

Recycling habit

- Each one-point increase is associated with:
 - **2.7%** ↑ FW into **green bin**
 - Less FW discarded to wrong bin
- Sorting FW is not as habitual as sorting recyclables (Slide 13).
- Sorting recyclables and sorting FW can be related, insight of engaging residents in non-organic recycling could potentially be applied to organic recycling.

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	Green bin	Compost	Animal feed	General waste bin	Recycling bin	Sink and other
Dependent variables						
Perceive benefits from sorting FW	0.072***	-0.020***	-0.003	-0.055***	0.003	0.003
Perceive sorting FW as inconvenient and out of personal control	-0.068***	-0.015***	0.004	0.063***	0.008*	0.009***

Perceive benefit from sorting FW

- Each one-point increase is associated with:
 - 7.2% ↑ into **green bin**
 - 5.5% ↓ disposed of **rubbish bin**
 - 2.0% ↓ into home **compost**
- Suggest that the green bin may be the option requiring **less effort** to do “the right thing”

Perceive inconvenience from sorting FW

- Each one-point increase is associated with:
 - 6.8% ↓ into **green bin**
 - 1.5% ↓ into home **compost**
 - **More** FW disposed of **unsustainably**

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	Green bin	Compost	Animal feed	General waste bin	Recycling bin	Sink and other
Environmental self-identity	-0.042***	0.031***	0.005	0.002	0.003	0.002
Have the ability to compost	-0.136***	0.146***	0.029***	-0.034**	-0.013	0.009

Each one-point increase is associated with:

- **More** FW sorted in **home compost**
- **Less** FW sorted in the **green bin**
- Home composting is preferred over the green bin when environmental self-identity is considered.
- Only ~10% of FW is sorted in home compost.

Key messages

- Understanding range of households' FW disposal behaviours critical to promoting sustainable practices
- Most FW is discarded into the **general waste bin**.
- Factors most associated with sustainable sorting behaviours;
 - **tool to collect FW,**
 - **recycling habits**
 - **ability to make and use compost**
- Factors most associated with sorting into the green bin
 - **perceiving personal benefits**
 - **perceiving costs of inconvenience**
- Findings can help to **inform strategies for promoting sustainable FW disposal practices to divert FW from landfill**

Thank You!



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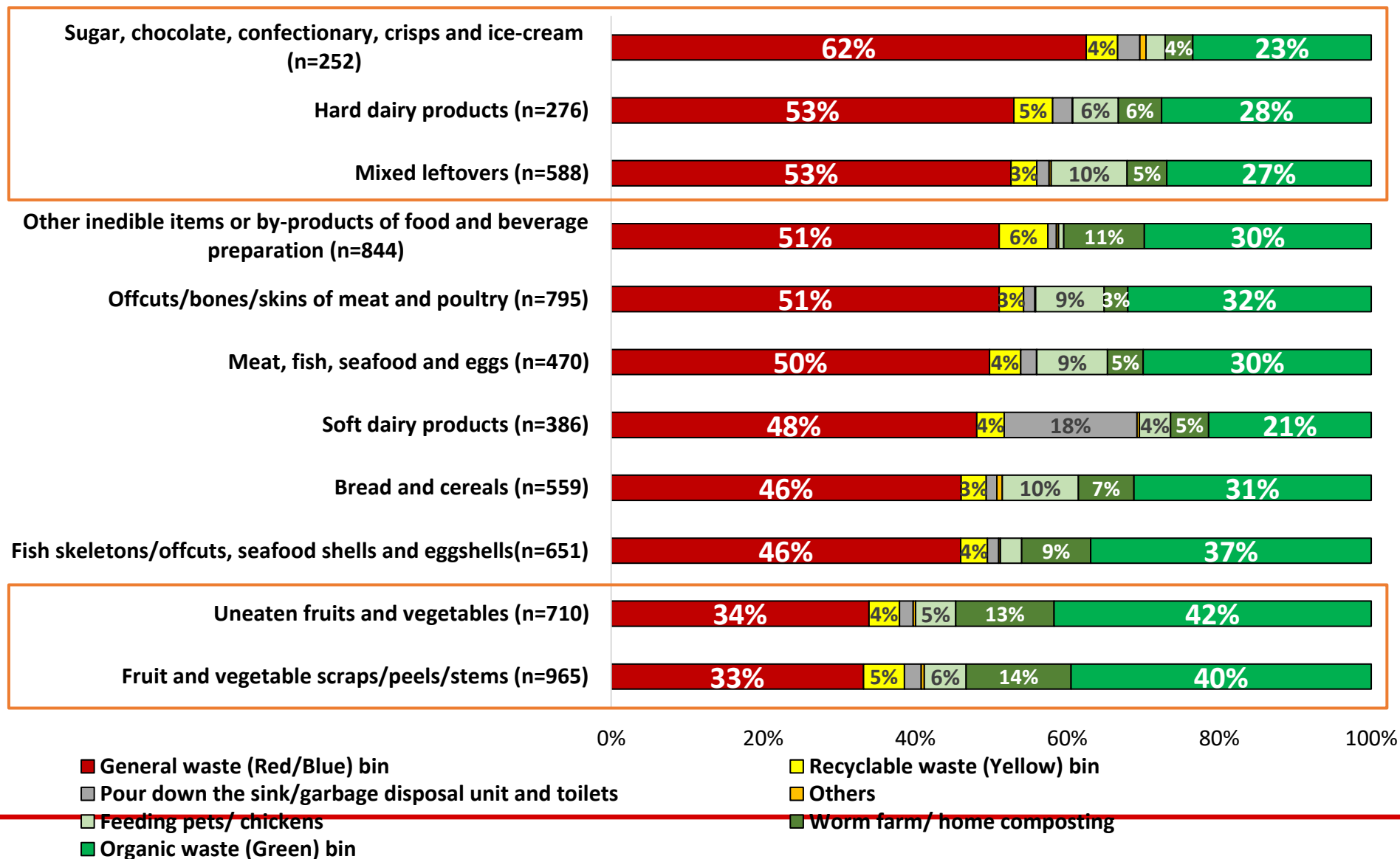
EastWaste

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Have the ability to compost	-0.136***	0.146***	0.029***	-0.034**	-0.013	0.009
Have pets	-0.011	0.001	0.068***	-0.054***	-0.007	0.002
Female	-0.016	-0.012	0.014	0.016	-0.006	0.003
Age	0.000	0.002***	0.001**	-0.002***	0.000	-0.001***
University educated	0.043**	0.007	0.001	-0.022	-0.021*	-0.008
Share life in Australia	0.038	0.068**	0.045**	-0.074**	-0.063***	-0.014
Household size	-0.010	0.013**	0.003	-0.009	0.002	0.000
Live in a unit	-0.083***	0.010	-0.001	0.054**	0.004	0.016*
Have a child younger than five years old	0.019	-0.037**	0.021	-0.005	-0.001	0.003
Household income	3.7E-08	-2.3E-07	-5.9E-08	4.4E-07***	-1.7E-07	-1.7E-08

Q - In **a typical week**, how do you **discard each FOOD WASTE category** in your house? Please estimate the percentage of **each food waste category** going to each of the following **destinations**.



Food waste volume by type (n=1025)

