

Getting to Net Zero:

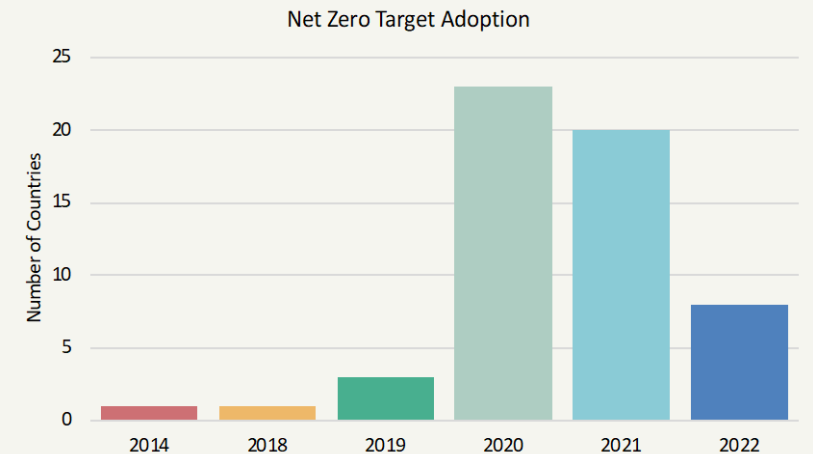
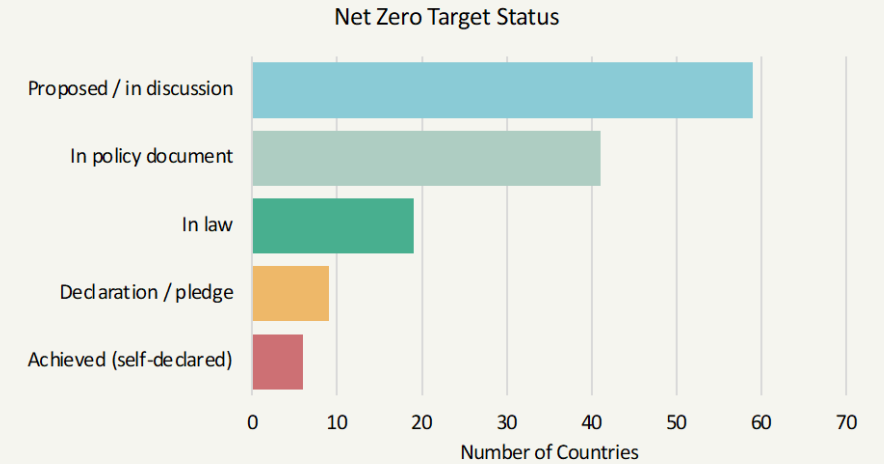
Knowledge and Perceptions in Singapore

NUS-IPUR, SUTD-LKYCIC and MSE-EBERU

May 2024

Motivation

- **Governments across the world have pledged to reach “Net Zero”**, providing a clear, timebound goal for efforts to limit carbon emissions and mitigate the risk of climate change.
- **In 2022, Singapore announced its goal to achieve Net Zero by 2050** and set out a Long-Term Emissions Development Strategy (LEDS) to chart the pathway to achieving this goal.
- For Singapore to achieve its target, we require effective international cooperation, as well as **ambitious and collective action by the whole of society**.



Data Source: Zerotracker.net (2023)

About this Report

This report presents results of a survey that sought to understand what Singaporeans think about the Net Zero target and the actions that could be taken to move towards the target.

Understanding the **public's knowledge and perceptions of Net Zero** allows decision-makers inside and outside Government to:

- **Identify** opportunities to accelerate progress towards Net Zero;
- **Address** misperceptions; and
- **Account** for the priorities, concerns and constraints of citizens.

Working with the public will make it easier to achieve the target **on time**, while minimising the need for regulatory interventions, and reducing the likelihood of disruptive and contested transitions. It can also open up the potential for **co-benefits to health, lifestyles and social cohesion**.

This study is a **collaboration between government and academia**. A team from NUS, SUTD and MSE worked closely together in 2023-2024 to design and execute the study, and to draw out its key messages.

Study Partners

IPUR

The Lloyds Register Foundation Institute for the Public Understanding of Risk at the National University of Singapore is a cross-disciplinary research institute focusing on risk perceptions and risk communication.



Lloyd's Register Foundation
Institute for the Public
Understanding of Risk

LKYCIC

The Lee Kuan Yew Centre for Innovative Cities seeks to stimulate thinking and research on the critical issues of cities and urbanisation, and explore the integrated use of technology, design and policy to provide urban solutions.



Lee Kuan Yew
Centre for
Innovative Cities

EBERU

MSE's Environmental Behavioural Sciences and Economics Research Unit uses behavioural sciences, environmental economics and data analytics to support the formulation of sustainability policies.



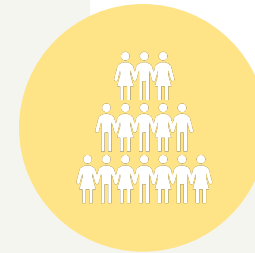
Ministry of Sustainability
and the Environment
— SINGAPORE —

Survey Scope

We asked **2,304 Singaporeans** about (i) their knowledge and perceptions of Net Zero; (ii) their current actions, future intentions, and policy support toward Net Zero; (iii) social and environmentally-related values; and (iv) information consumption.



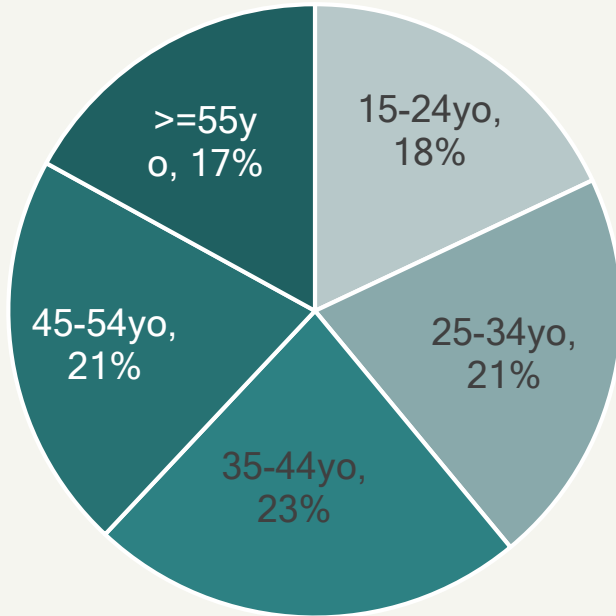
18% of respondents were aged 24 or under, and **38%** were over 45.
55% had at least a university degree;
77% of those surveyed belong to the Chinese race, while the remaining respondents were primarily of Malay and Indian descent.



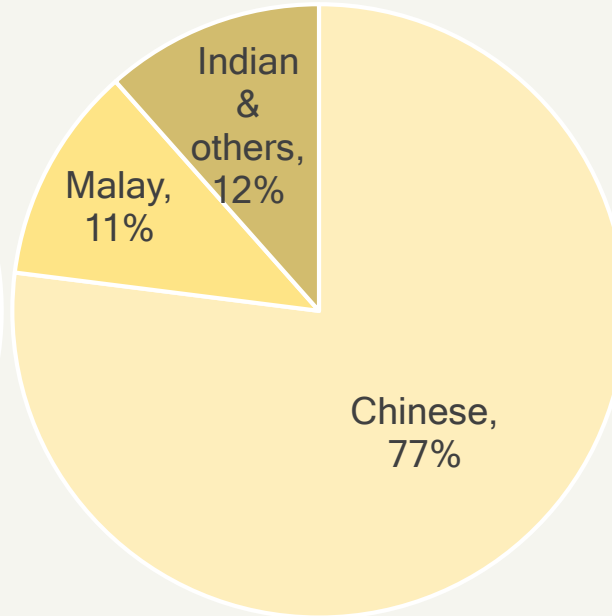
The study was conducted using an online survey in **2023**, with a sample that broadly included most segments of Singapore's general population. Sub-sample (264 respondents) also answered some questions in vernacular language to test if there was a difference in understanding.

Demographic Profile of Survey Respondents (Online Panel)

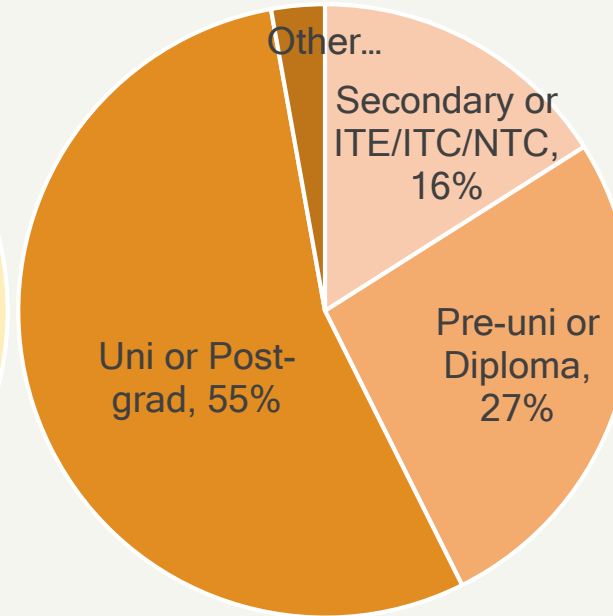
Age



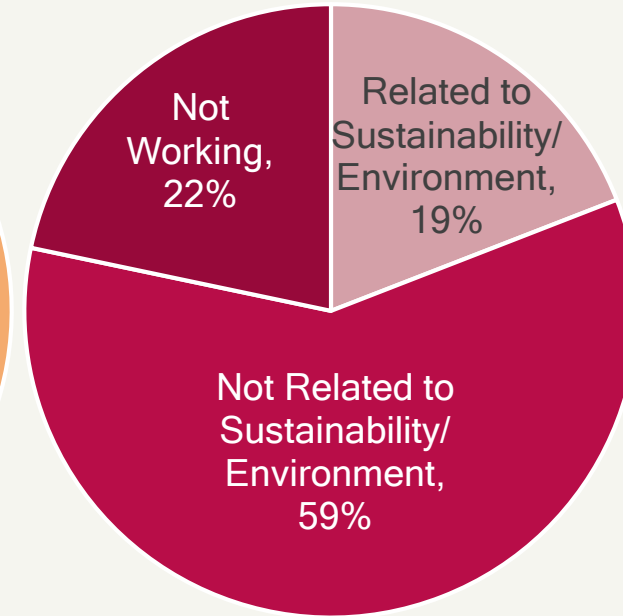
Race



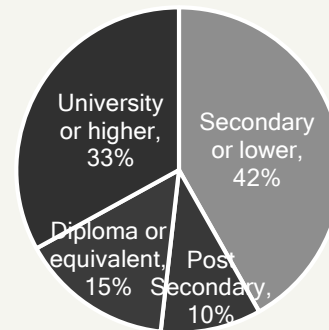
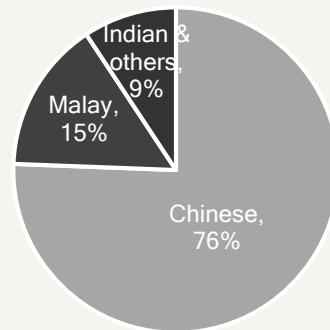
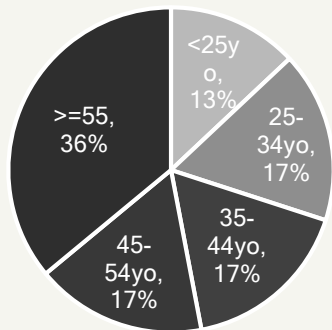
Education



Work



Population Proportions



All age and education groups were represented in the survey sample but respondents were on average **younger** and had a **higher level of educational attainment** than Singapore's population as a whole.

Key Findings

- Respondents are familiar with and understand **the concept of Net Zero**. However, only about 15% are aware of the national target to achieve Net Zero by 2050.
- When provided with information about the Net Zero target, **65% of respondents supported the current target**, and a further 17% supported a more ambitious timeline to reach Net Zero.
- People are already taking actions which are aligned with Net Zero and intended to strengthen their efforts.
- Older respondents are on average more likely to perform low-cost and high-effort actions, while younger respondents are more open to lifestyle changes.
- Respondents express **strong support for Government actions** to achieve Net Zero.
- There is a **high level of trust in Government communications**.

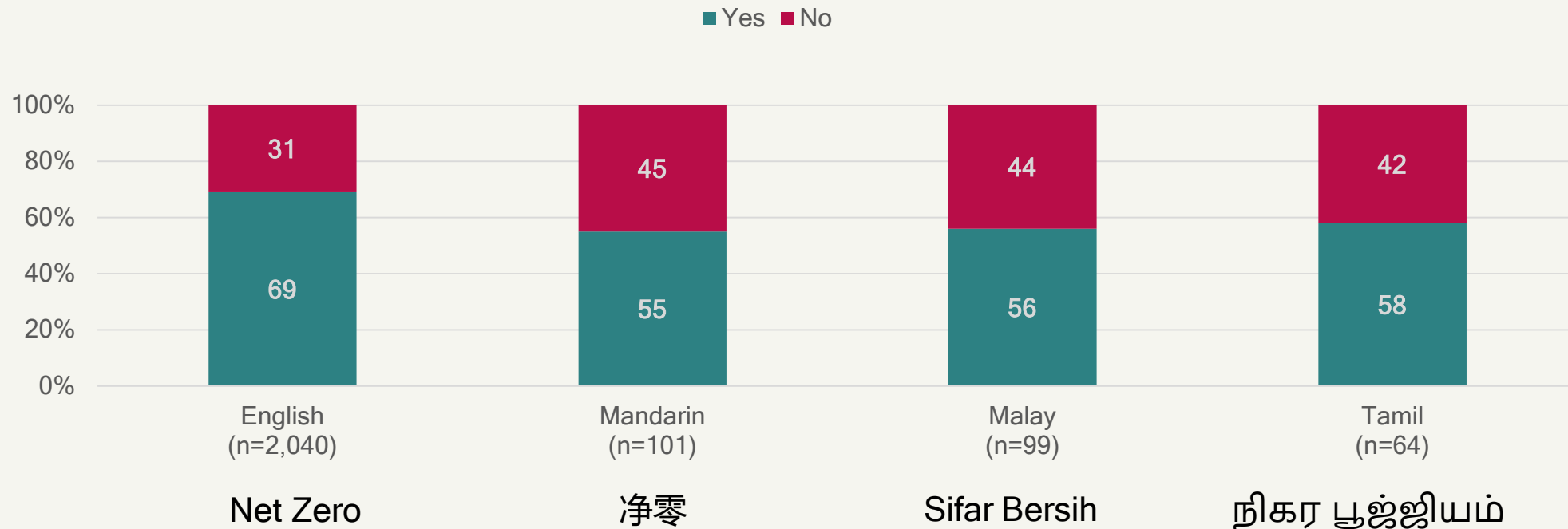
Insight 1

Respondents are familiar with the concept of Net Zero but less knowledgeable about the national policy target

Most respondents have heard about Net Zero as a concept

Around 70% of people have heard about Net Zero. Equivalent terms in vernacular languages were less familiar to people.

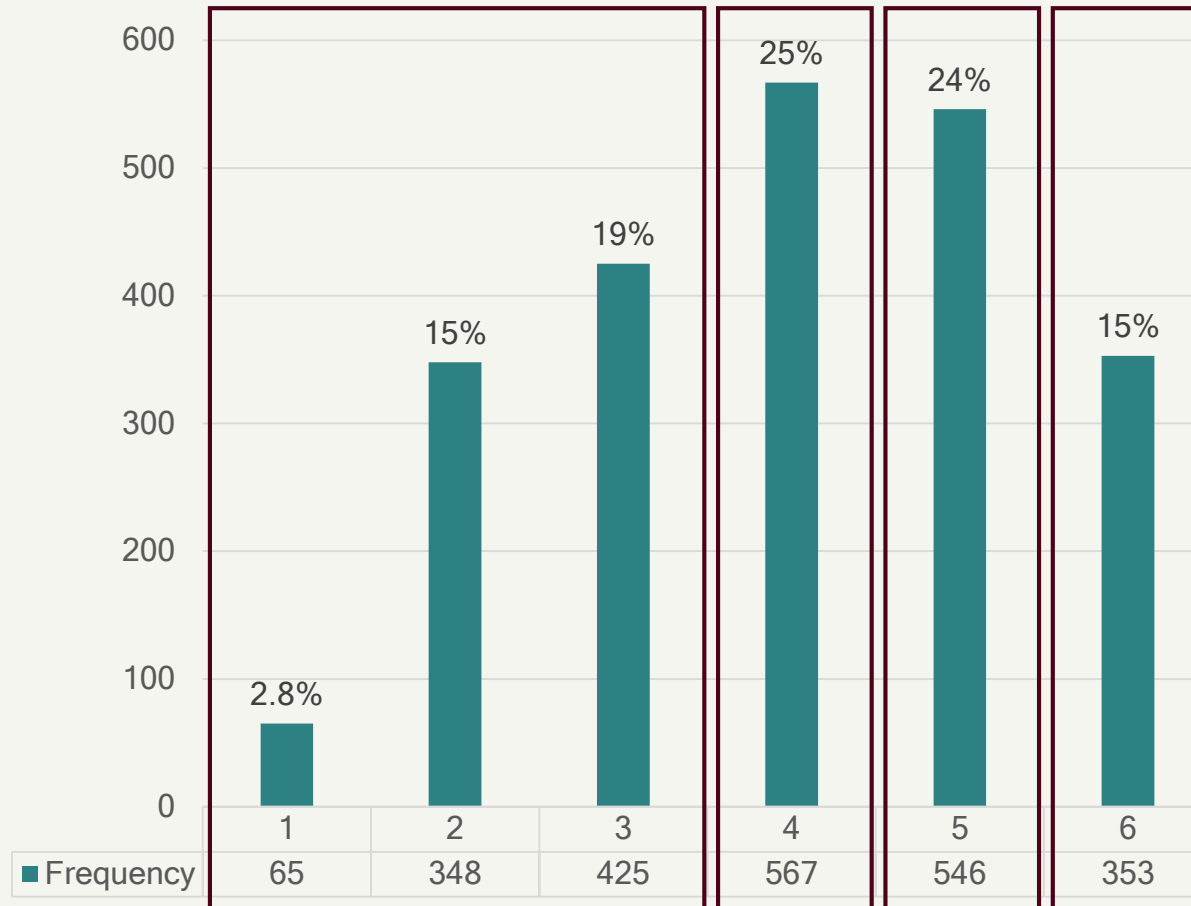
“Have you ever heard of the term ‘Net Zero’ in relation to climate policy?”



Knowledge about Net Zero as a policy target

- The survey also asked several questions about understanding of Net Zero. We rated respondents' "actual knowledge" based on a simple index of the following questions:
 - "Which of the following explains the term "Net Zero" in relation to climate policy?" [Multiple options with one correct answer.]
 - "Do you know if the Singapore government has set a national policy target to achieve Net Zero carbon emissions by a certain year?"
 - "Do you know by which year does Singapore aim to achieve this target?"
- We also asked respondents to rate their own level of understanding of Net Zero, their "self-reported knowledge," with this question:
 - "How would you rate your level of understanding of the term "Net Zero" in relation to climate policy?"
- Comparing the difference between actual and self-reported knowledge provides a gauge for future communications interventions.

Actual knowledge: 15% understood the Net Zero concept and were aware of Singapore's 2050 target.



Knowledge rating:

Poor

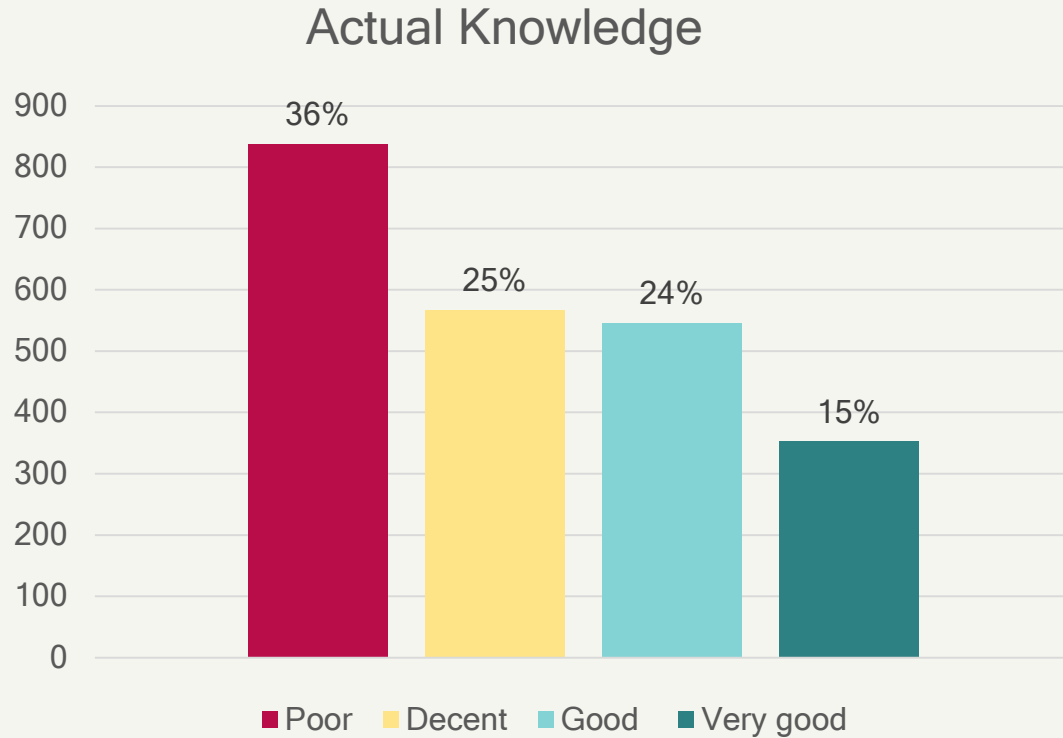
Decent

Good

Very Good

1	Don't know what Net Zero is and thought Singapore did not have a target
2	Don't know what Net Zero is and don't know if Singapore has a target
3	Don't know what Net Zero is but thinks Singapore has a target
4	Know what Net Zero is but don't know if Singapore has a target
5	Know what Net Zero is and know Singapore has a target but don't know when
6	Know what Net Zero is and know when is Singapore's target year

Self-Reported Knowledge: In general, most respondents over-estimated their knowledge of Net Zero.



1 = Poor	Don't know what Net Zero is
2 = Decent	Know what Net Zero is but don't know if Singapore has a target
3 = Good	Know what Net Zero is and know Singapore has a target but don't know when
4 = Very good	Know what Net Zero is and know when is Singapore's target year

Relative Effectiveness of Climate Actions

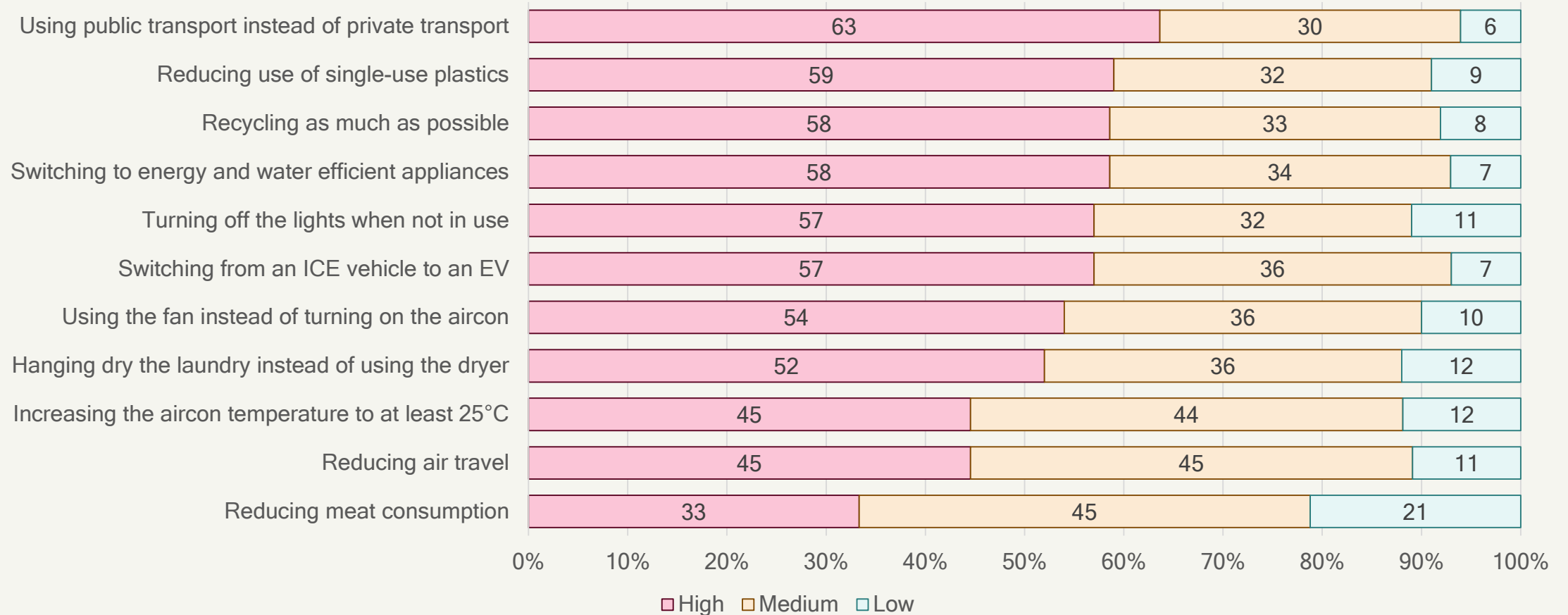
Almost every activity that people engage in during the course of their daily lives implies some level of carbon emissions. This gives numerous opportunity for individuals to reduce their carbon footprint through climate actions. Examples of such actions range from conserving energy and resources, to avoidance of waste through more careful consumption habits.

The study investigated which **actions people believe are most effective** in reducing emissions with a set of questions about specific actions:

- “For each of the following actions by individuals, what do you think is the level of impact in its contribution to achieving Net Zero?”
- The actions were chosen based on a review of international studies.

Perceived impact: Using public transport, reducing single-use plastics, recycling and home appliance choice were perceived to have the highest impact on carbon emissions

Perceived Impact



Effectiveness of Climate Actions

Global Evidence

International studies have found that some individual behaviours are more carbon-intensive and thus offer greater potential for emissions reductions through behavioural change. Examples of high-impact individual actions include switching to a plant-based diet (Wynes and Nicholas, 2017; Behavioural Insights, 2023; Project Drawdown 2024), living car-free (Wynes and Nicholas, 2017), reducing/ avoiding air travel (Wynes and Nicholas, 2017; Behavioural Insights, 2023), cutting food waste (Project Drawdown), buying green energy (Wynes and Nicholas, 2017) and investing in distributed solar PV (Project Drawdown).

Singapore Specificities

However, the distinctive characteristics of Singapore's environmental, social, economic and infrastructure context mean that the ranking of impactful actions may be different in Singapore. For example:

- The tropical climate means that households employ cooling methods but there is no requirement for general heating.
- As a small, resource-constrained country, Singapore imports almost all its energy needs, and has limited renewable energy options.
- Over 90% of Singapore's food is currently imported. Carbon emissions of food consumption depend on the method of production as well as the length and type of transportation.

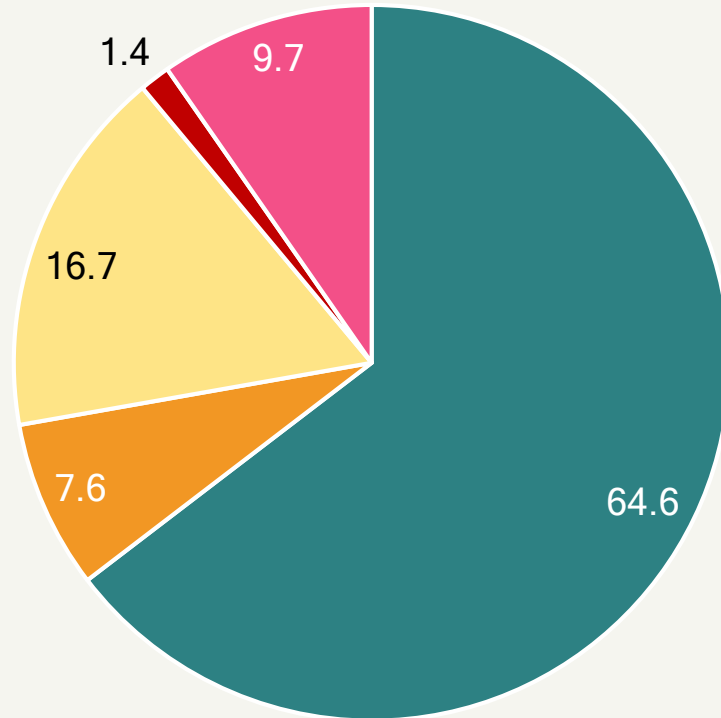
Some Singapore-specific carbon footprint tools have been developed (e.g., the SP Carbon Footprint Calculator). Nonetheless, to the best of our knowledge, **no Singapore-specific study has been conducted which provides estimations of the relative effectiveness of a comprehensive set of individual actions.**

Insight 2

Respondents are already taking climate actions and intend to do more but are concerned about shifting from current consumption patterns, and the cost, time and effort involved

Public support for Singapore's Net Zero target

“Singapore aims to achieve Net Zero carbon emissions by 2050. What do you think of this target?”



- I am supportive of this target
- I think this target is too soon
- I think this target is too late
- I do not support having a target at all
- I do not know what to think of the target

A large majority - almost two-thirds - of respondents support the 2050 Net Zero target, while a further 17% would like to see a more ambitious timeline for emissions reductions.

The public may be sceptical of the impact of individual action because they believe that other people are not likely to make the same amount of effort as they are. This phenomenon, of people under-estimating how concerned and committed others are, is known as 'pluralistic ignorance' and has been documented in several countries in relation to support for action to mitigate climate change. The knowledge that the vast majority of respondents are committed to the Net Zero goal may help to reinforce individuals' motivation to take climate action.

Drivers and barriers to action

Are there types of environmental action that people are more, or less, willing to take? We used the statistical technique of factor analysis to sort the long list of actions included in the survey into groups. We then investigated whether **socio-demographic characteristics** helped to explain actions and intentions.

- Older respondents were more likely to take low-cost and high-effort actions
- Younger male respondents were less likely to perform high effort actions
- Lower income and educational attainment was linked to lower willingness to perform high-cost actions
- Respondents without children were less likely to perform both high-effort and high-cost actions

A specific question in the survey asked those who were unwilling to take action what their reasons were for not taking the action. Barriers to action varied depending on the nature of the action. **For some actions which require a major shift in consumption patterns**, like cutting back on air travel and reducing meat consumption, **the main barrier was preference** - respondents said they “preferred the status quo.”

In line with intuition, **cost was an issue for actions which** people perceived to **involve direct expenditure** by the individual. Time and convenience were also frequently highlighted as barriers by respondents.

Categories of climate actions

Factor analysis¹ showed that climate actions could be broadly categorised into three groups: “High Effort”, “High Cost” and “Low Cost.”

Category 1 “High Effort”
(i.e., actions that require high effort of lifestyle change)

Reducing air travel

Reducing meat consumption

Category 2 “High Cost”
(i.e., actions that impose significant additional cost)

Paying more to offset emissions (e.g. in electricity plans)

Investing in sustainable financial products (e.g. green bonds)

Switching from a petrol/diesel vehicle to an electric vehicle

Category 3 “Low Cost”
(i.e., actions with low additional cost or effort)

Using public transport instead of private transport

Using the fan instead of turning on the aircon

Increasing the aircon temperature to at least 25°C

Hanging dry the laundry instead of using the dryer

Switching to energy and water efficient appliances

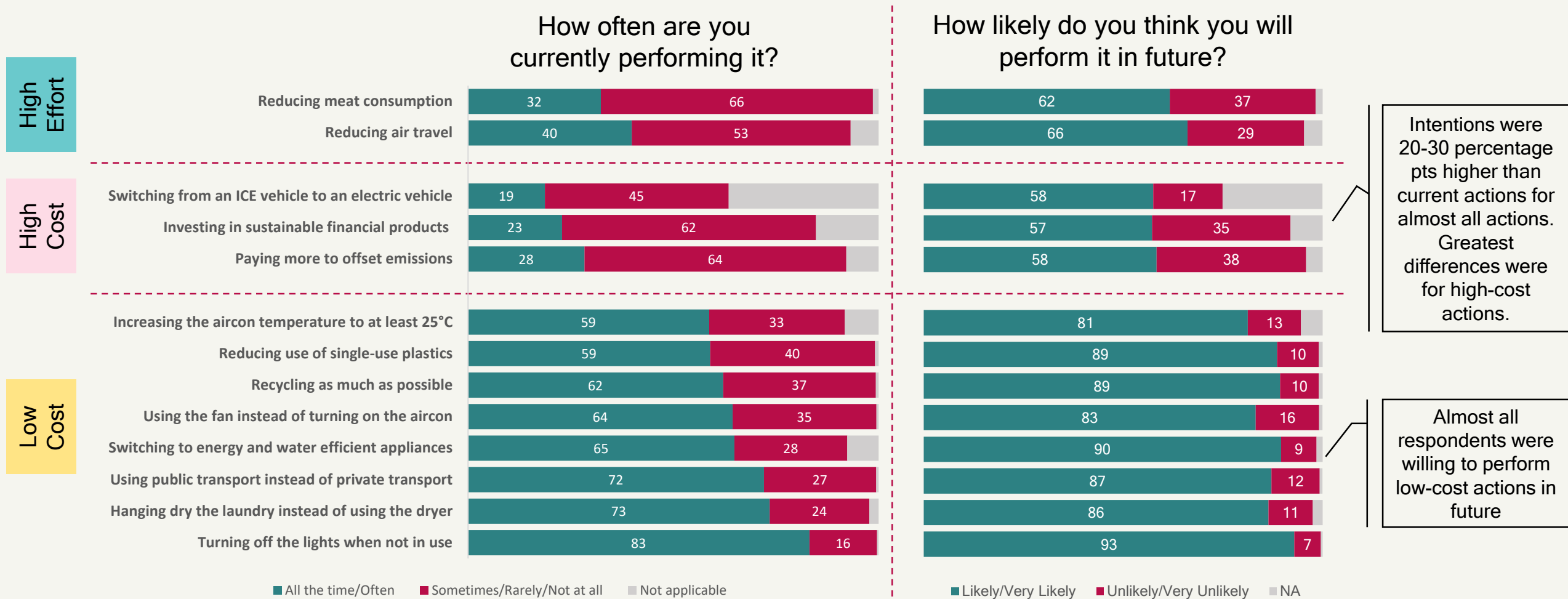
Turning off the lights when not in use

Recycling as much as possible

Reducing use of single-use plastics

Note: ¹ Factor analysis is a statistical method to find similarities in preferences between the different types of actions. IPUR found that there were three main categories and upon review of the actions in each category classified them as ‘High Effort’, ‘High Cost’ and ‘Low Cost’. More details of the methodology is presented in the appendix.

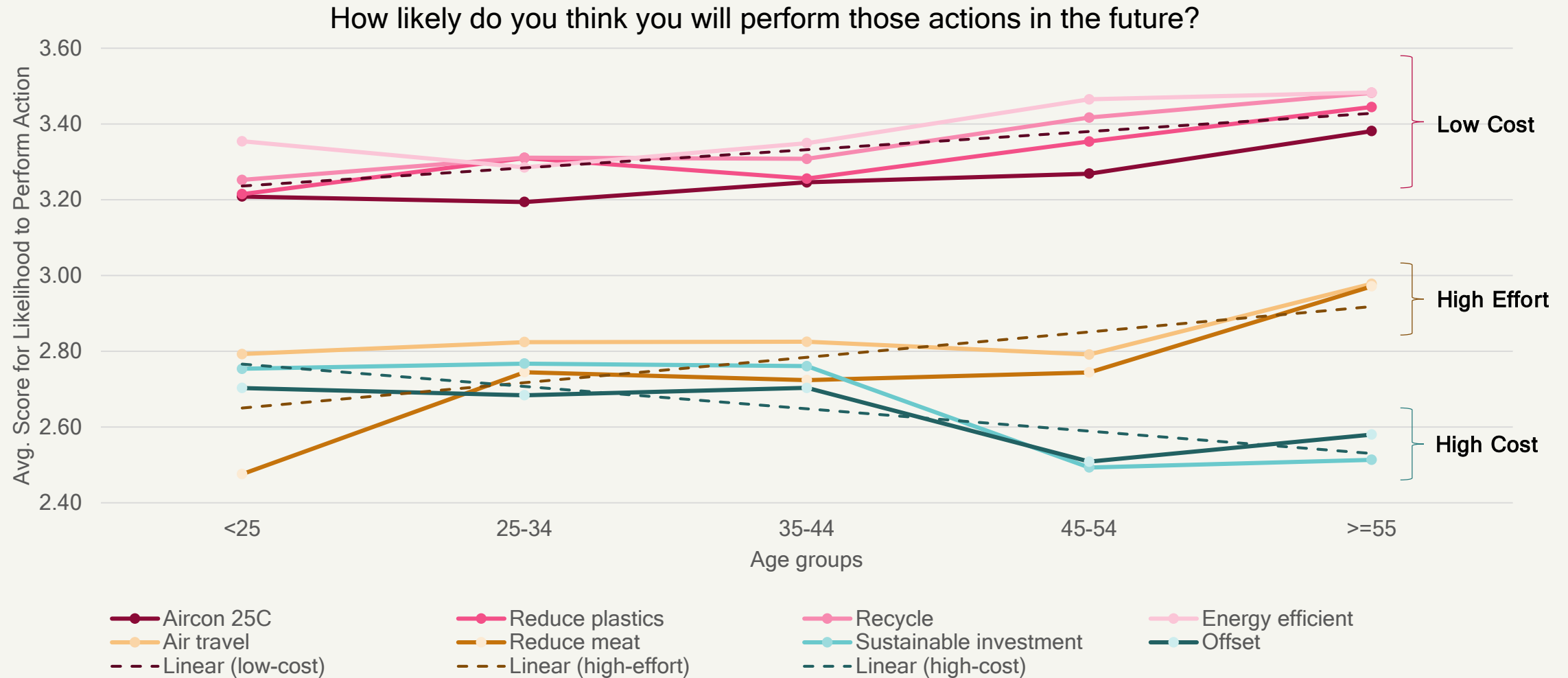
Most respondents perform low-cost actions and a majority intend to perform most of the listed actions in the future.



Intentions were 20-30 percentage pts higher than current actions for almost all actions. Greatest differences were for high-cost actions.

Almost all respondents were willing to perform low-cost actions in future

Older respondents were more willing to perform low-cost and high-effort actions, but less willing to engage in high-cost actions.



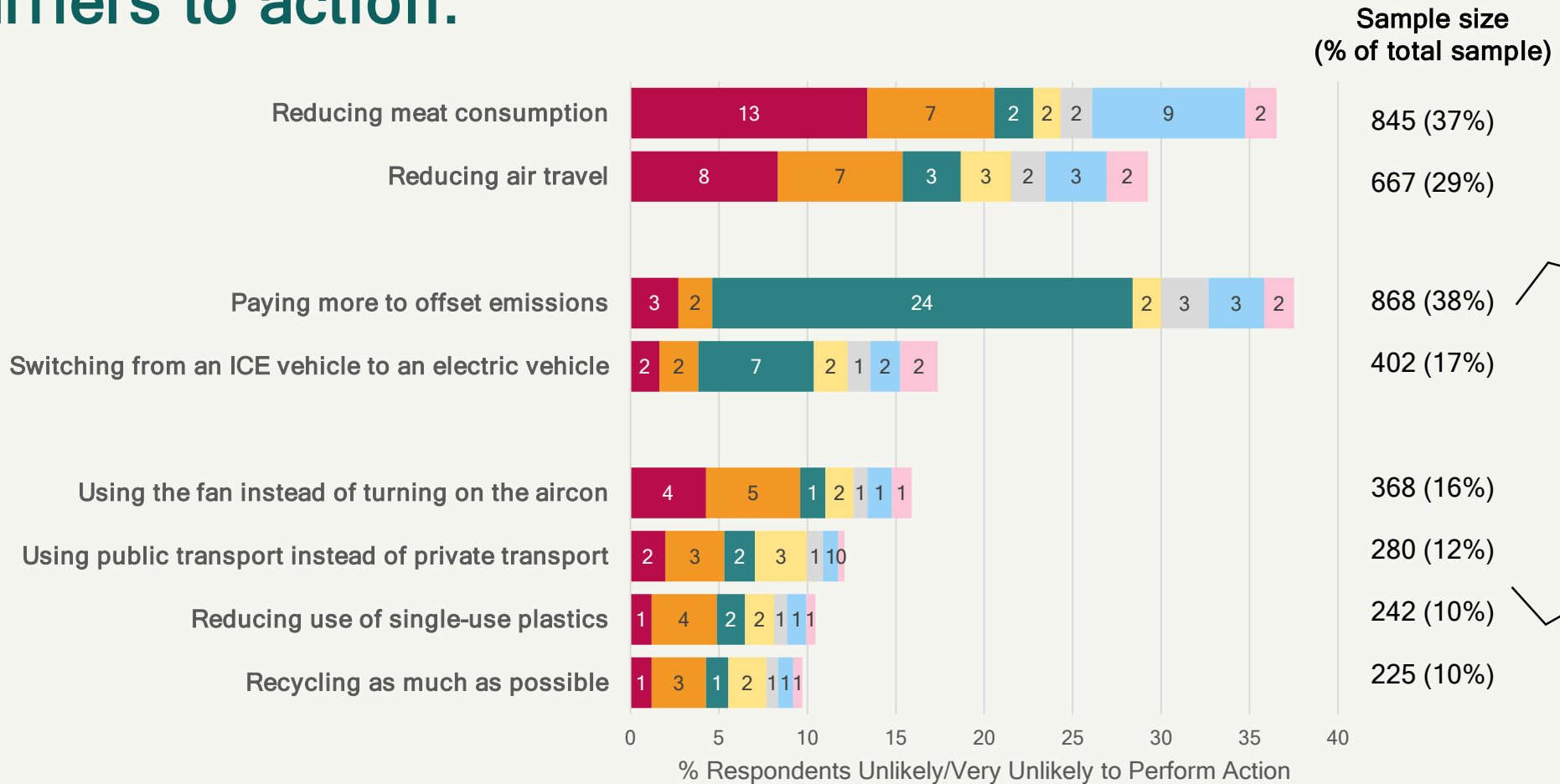
Note: Actions with insignificant differences in likelihood to perform the action across the age groups were dropped. Respondents were asked about how likely they will perform each action. 'Very Unlikely' was assigned a score of 1 and 'Very Likely' was assigned a score of 4.

Preference, cost, convenience and time were identified as top barriers to action.

High Effort

High Cost

Low Cost



Cost was an overriding concern in relation to offsetting emissions.

Convenience and time were concerns for low-cost actions

- Prefer status quo
- Too costly
- Don't know how to perform action
- Too inconvenient
- Too time-consuming
- Don't think action would make any impact
- Not my decision

The role of values in motivating action

The role of values in motivating environmental action is significant and multifaceted. Values act as **intrinsic motivators** that influence individuals' attitudes, beliefs, and behaviours relating to the environment (Harring & Jagers 2013).








Studies have shown that individuals' environmental values, such as **biospheric values** (concern for nature and biodiversity) and **altruistic values** (concern for others and future generations), shape environmental behaviours and support for environmental policies (Schultz et al., 2005; Stern et al. 1999).

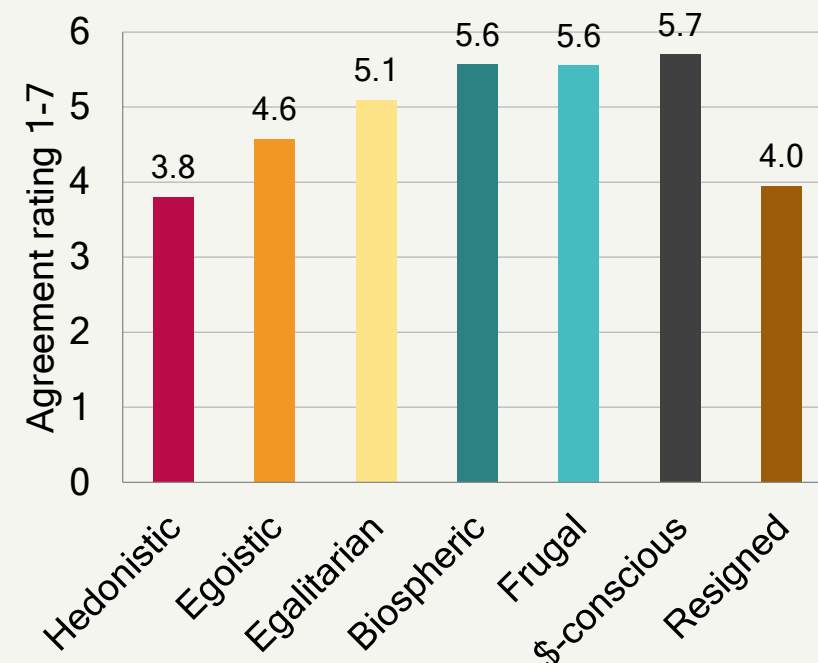
Individuals who prioritise environmental values are more likely to take actions like recycling and energy conservation.

The relationship between values and environmental action is complex, not least because **individuals may hold conflicting values and priorities**, but understanding the prevalence of different values among the public and their link to behaviours can be relevant to designing effective information and communications efforts about “Getting to Net Zero.”

Value adherence

Respondents were more likely to feel that biospheric, frugal and dollar-conscious value statements matched their views well, compared to statements expressing hedonistic and resigned views on the use of resources.

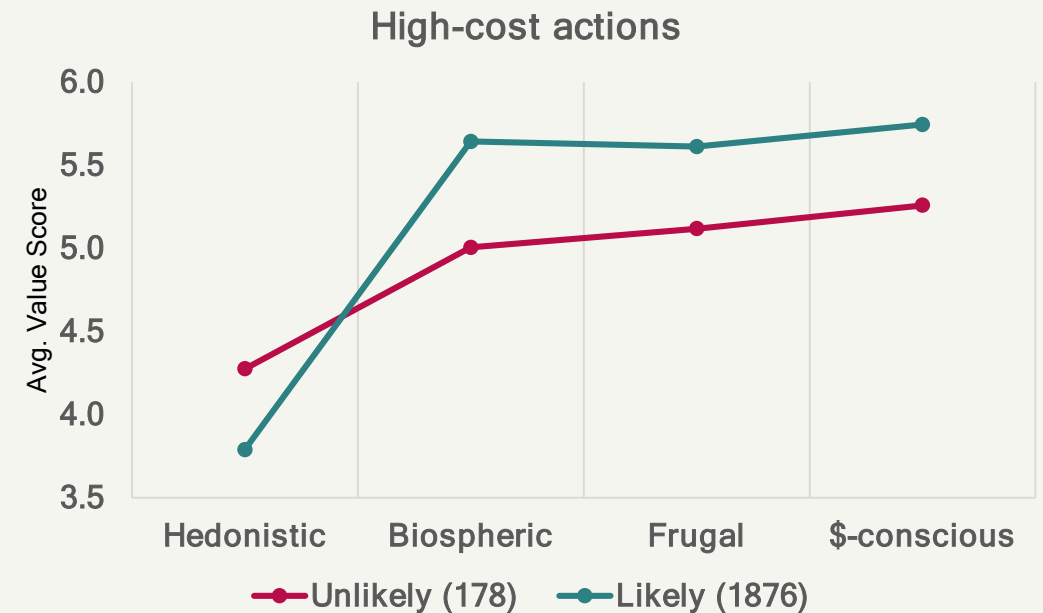
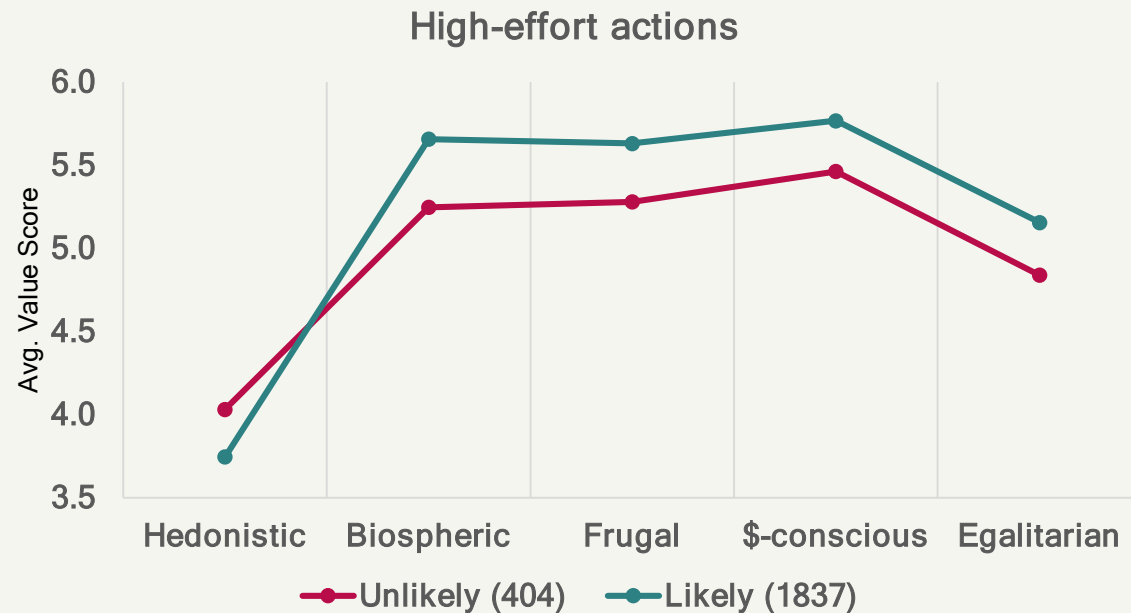
Hedonistic		People should enjoy life to the fullest without worrying about whether resources are being wasted.
Egoistic		Accumulating wealth and material possessions is a huge motivation for me in life.
Egalitarian		Resources should be distributed more equally with everyone in our society.
Biospheric		We should not be wasting resources because it is damaging to our planet.
Frugal		I always try my best to use only whatever I need, and I avoid wasting resources unnecessarily.
\$-conscious		I don't like to waste resources because it feels like wasting money to me.
Resigned		Material goods are going to be produced anyway, whether they eventually go to waste.



“For each statement, indicate how well the statement matches your own views on a scale of 1 to 7, where 1 = “Does not match my own view at all” and 7 = “Matches my own view very well.”

Values were linked to intentions for high-effort and high-cost actions

Respondents who said they were 'unlikely' to take actions had lower biospheric, frugal, and dollar-conscious values, and higher hedonistic values than those intending to take these actions.



Note: The 'Unlikely' group was defined by those who are unlikely to perform ALL actions in the specified group. Only values with statistically significant and considerable absolute differences are presented.

Insight 3

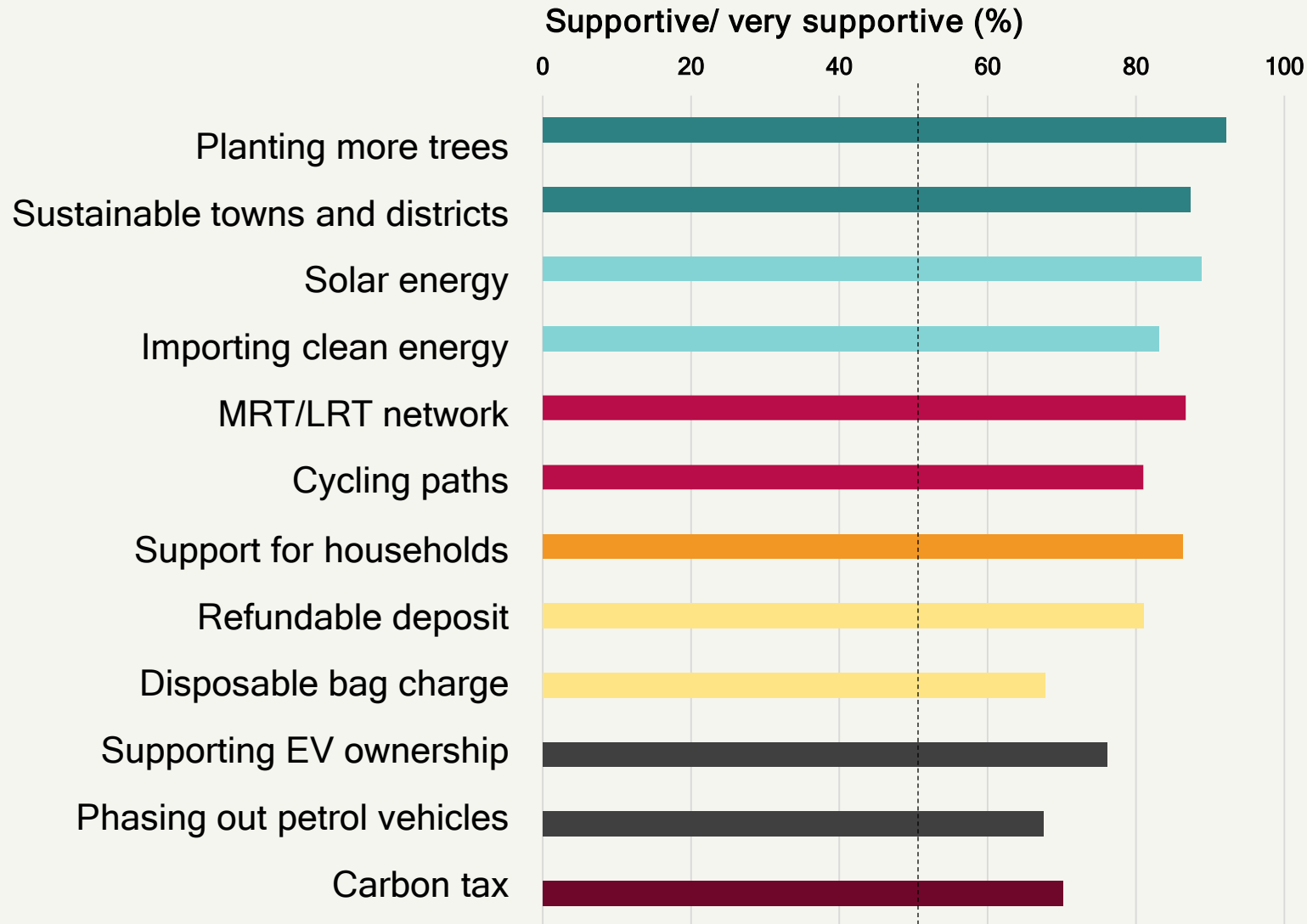
There is strong support in Singapore for policies to achieve Net Zero

Net Zero policies

Respondents were asked about whether they supported a range of policies covering different sectors, with four options from **very supportive** to **not supportive at all**. Policies were selected which are either already being implemented or are under consideration by the Singapore Government. They include policies which primarily involve **direct government investment**, like building more sustainable towns and cycle paths, those that involve **regulatory interventions**, like phasing out petrol vehicles, and economic incentives, including support for electric vehicle ownership and increasing the carbon tax for businesses.

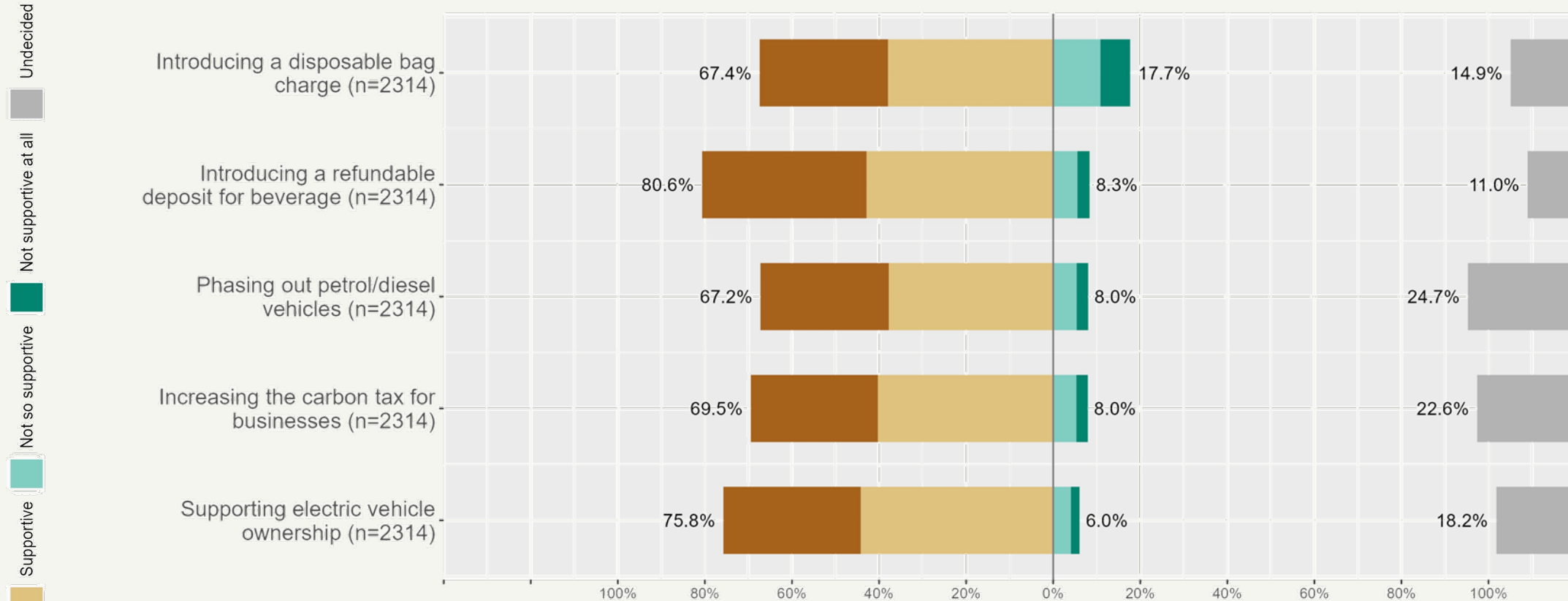
Urban	Planting more trees and building more parks
	Building more sustainable towns and districts
Energy	Increasing solar energy deployment
	Importing clean energy from the region
Transport	Expanding the MRT/LRT network
	Increasing the length of cycling paths
House	Developing programmes to support climate friendly households
Waste	Refundable deposit for beverage containers
	Disposable bag charge
Cars	Supporting electric vehicle ownership
	Phasing out petrol/diesel vehicles
Tax	Increasing the carbon tax for businesses

Support was high across all policies



All policies were supported by a large majority of respondents (more than 60%). The most highly supported policies were **planting more trees** and building more parks; developing **solar energy**, expanding the **MRT/ LRT network** and providing **support for climate-friendly households**. Three of those highly supported policies offer considerable additional benefits or 'co-benefits' beyond their contribution to the Net Zero goal. The most supported policies involve government expenditure and no direct additional costs for households, in line with intuition.

Some respondents were undecided about some policies



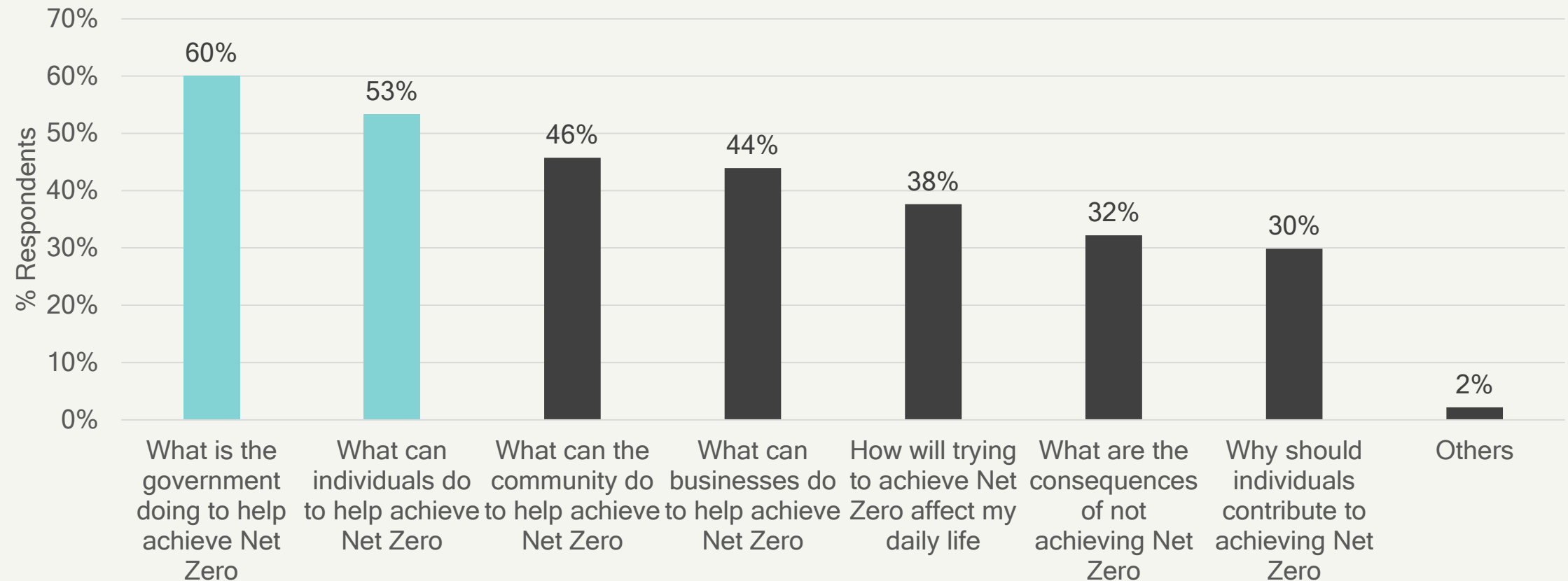
More than a fifth of respondents were undecided about their support for phasing out petrol/diesel vehicles and increasing the carbon tax for businesses. The disposable bag charge received about 67% support, and about 18% were not supportive while 15% were undecided about it.

Insight 4

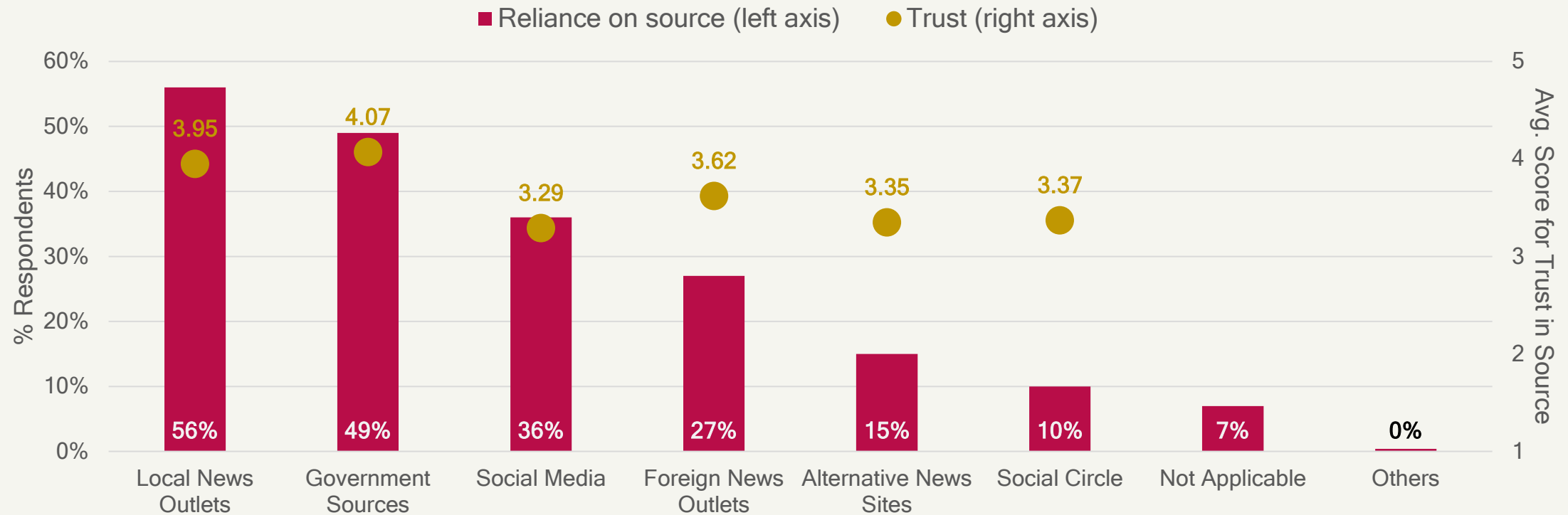
High levels of trust in Government communications could provide an opportunity to promote climate actions

Respondents were keen to learn more about the Government's efforts to achieve Net Zero and how individuals can help.

Which aspects of Net Zero would you like to find out more about?



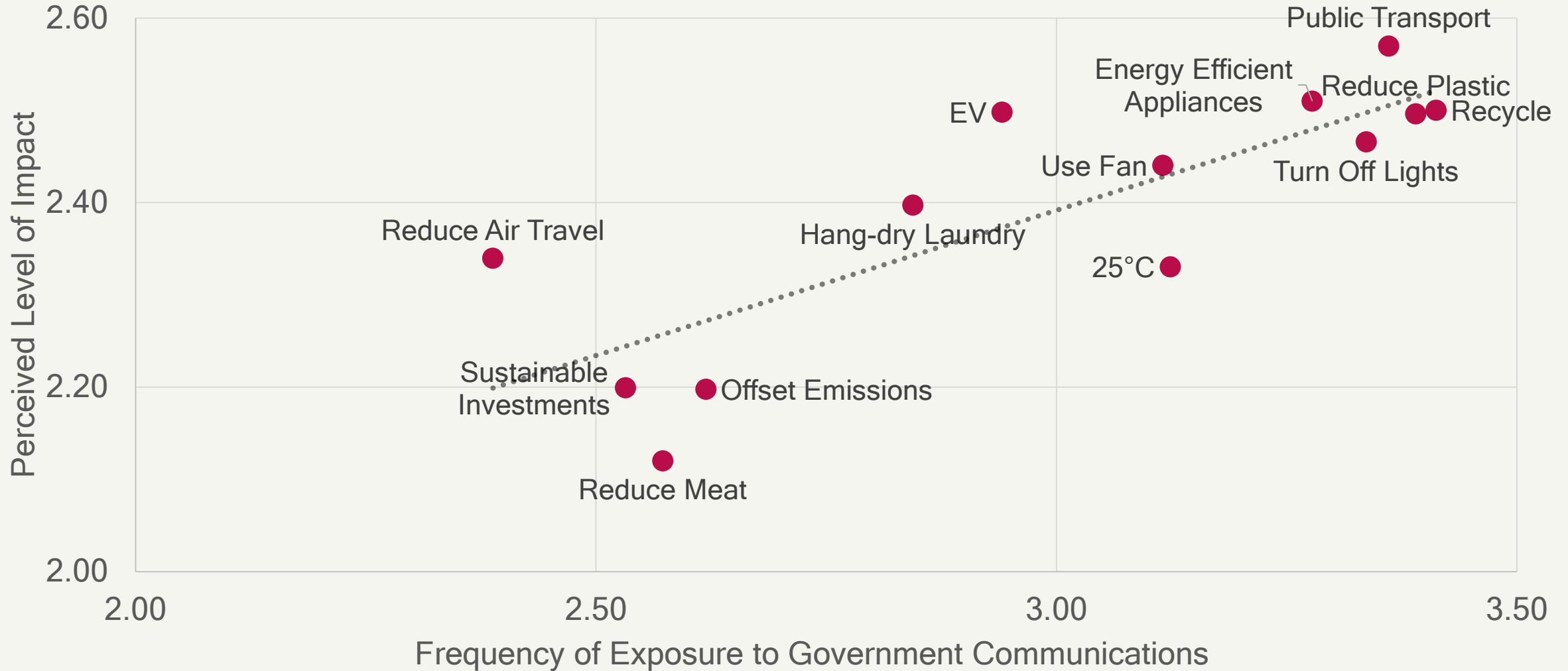
Respondents relied on and were more trusting of local news outlets and official Govt sources for environmental sustainability information.



The two most commonly-used sources of information on environmental sustainability issues were: local news outlets and Government websites or channels.

Trust in Government sources of information was the highest for all sources with a mean score of 4.07 on a 1-5 scale, compared to 3.29 for social media.

Actions promoted by the Government have higher perceived levels of impact, possibly due to higher levels of trust in Govt Communications



Note: Perceived level of impact is based on a 3-point Likert scale where 2 and 3 correspond to 'Medium' and 'High' levels of impact respectively. Frequency of exposure to Government communications is based on a 4-point Likert scale where 2 and 3 correspond to 'Rarely' and 'Sometimes' respectively.

Effective communication about climate risks and actions

Research and practice over the last four decades in the fields of social psychology and decision-making have yielded insight into what makes risk communication effective.

Risk information should be **clear, accurate, and timely** in order for people to be able to use it to take informed decisions (Covello, 2003).

To reach a wide audience, **risk information needs to be accessible and understandable** (Morgan et. al., 2001). It is often preferable to **combine text and visuals** in order to convey information that is compelling but also sufficiently detailed.

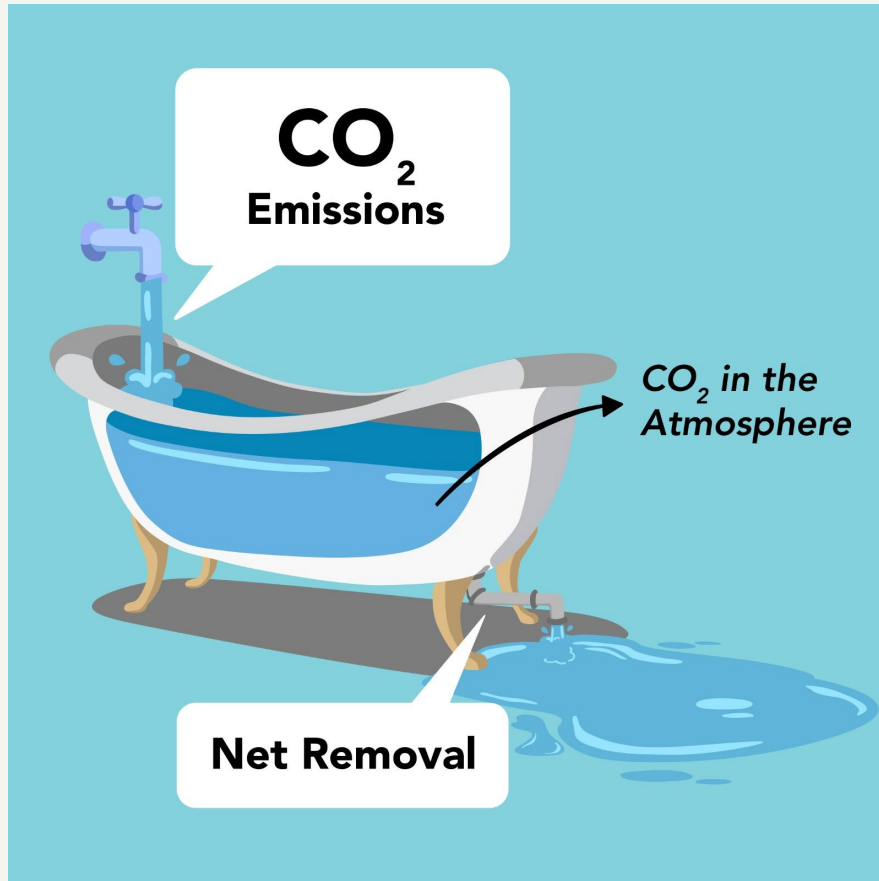
Communications should not assume knowledge of specialist terms or acronyms, or specific statistical or scientific concepts. Infographics accompanied by easily understood text can be an effective way to convey more complex and unfamiliar concepts.

Risk communication is a **two-way process**. **Communicators need to understand the concerns, emotions, and values of the audience**. When developing taking decisions about Net Zero, individuals have to make trade-offs between different risks, weigh up risks and benefits and grapple with resource constraints. **Empathetic communication** which takes individuals' perceptions into account **leads to greater receptivity to information and supports greater engagement** (Reynolds & Seeger, 2005).

Continued **dialogue, collaboration and active participation** between decision-makers and the public promotes **ownership and sustainability of outcomes** (Renn & Levine, 1991), and will be valuable as Singapore sets its pathway to Net Zero.

Does an infographic help to improve understanding?

We tested to see whether respondents found an infographic helpful to understand Net Zero.



“Trying to get up to speed on Net Zero, and what it means? Think of a bathtub being filled with water, slowly being drained at the same time. If the bathtub is filled faster than it can drain, it will overflow! It’s the same with our atmosphere - if it fills up with carbon dioxide (CO₂) emissions, this will cause global temperatures to rise, negatively impacting all life on Earth.

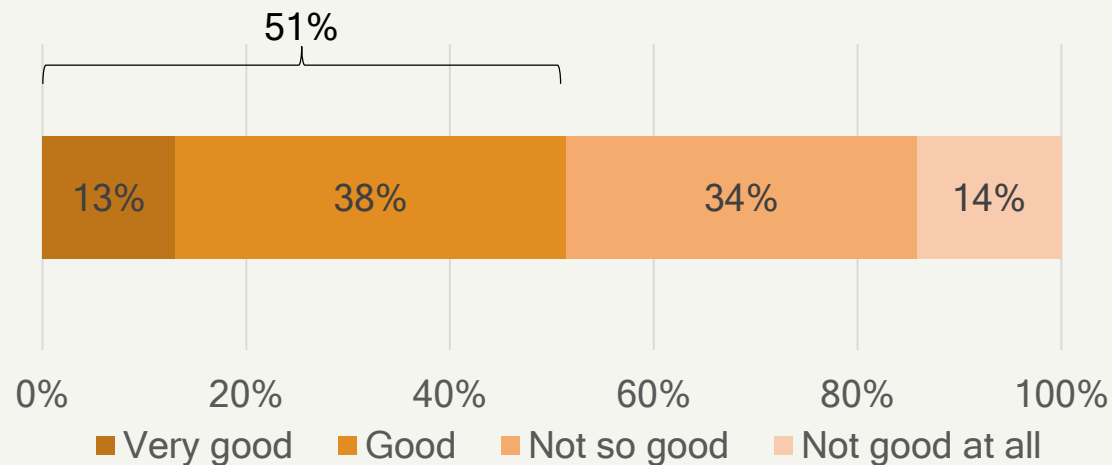
This is why we’re fighting hard to achieve our net zero goals. Find out how you can do your part at <https://www.greenplan.gov.sg>.”

90% of respondents reported having a better understanding of Net Zero after viewing the infographic

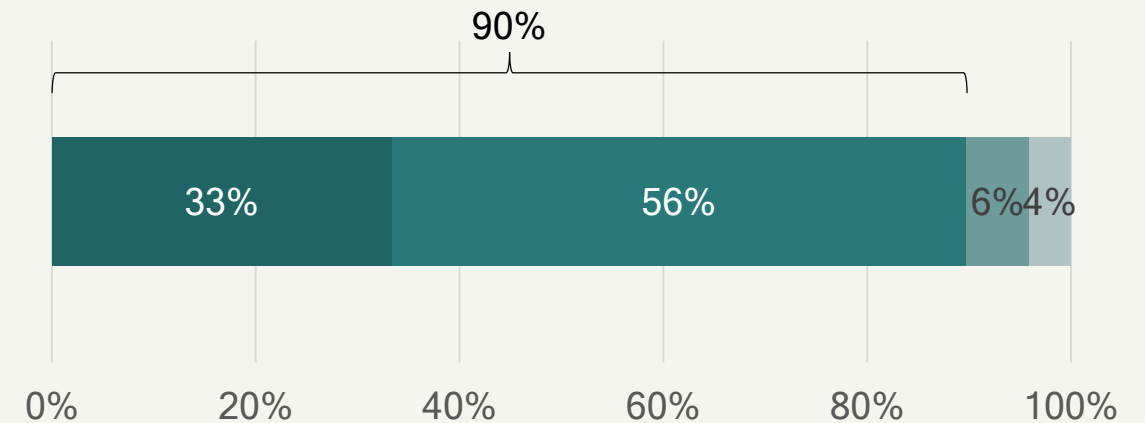
Before viewing the infographic, only half of the respondents self-reported a good understanding of Net Zero...

...after seeing the infographic, 90% reported having a better understanding, with 33% saying they “understand a lot more now”

How would you rate your level of understanding of the term “Net Zero” in relation to climate policy?



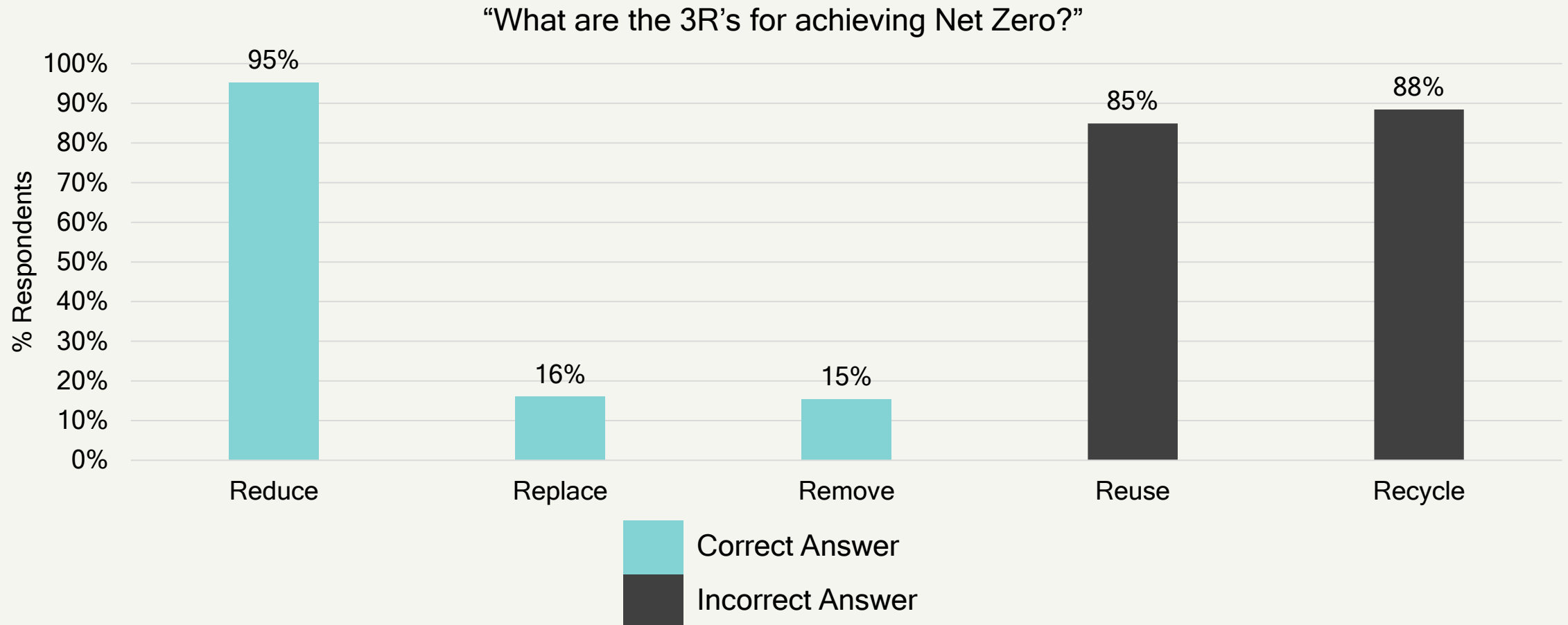
Has the information helped you to understand more about Net Zero?



- Yes, I understand a lot more now
- Yes, I understand a little more now
- No, I still don't understand what's Net Zero
- No, I have always known what Net Zero is about

More communication of the 3Rs to achieve Net Zero could increase respondents' familiarity with the terms

Net Zero actions could be summarised with “3R’s” - reduce, replace and remove. However, most respondents associated the 3R’s with waste minimisation (reduce, reuse and recycle) instead.



Findings and Recommendations for Net Zero Policy and Communications

Findings (1)

- 1** When presented with information about current policy, **respondents supported the national target to reach Net Zero by 2050**, while a sizable minority favours an even more ambitious timeframe. This provides a strong basis for involving the public in shaping the national pathway to Net Zero. However, some respondents did not have full knowledge about the target prior to the survey. This presents an opportunity for communications efforts to raise awareness about the target.
- 2** Households are **already taking actions which are consistent with reducing their carbon footprint**, and intend to do more in future. However, there is room for people to engage more in **specific actions which have high impact on reducing carbon emissions**.

It is difficult for people to find reliable and accurate information about the relative impact of different actions, specific to the Singapore context. There is a pressing need to develop a strong evidence base on household level emissions in Singapore to ground future information and communication interventions.

Findings (2)

- 3 People face barriers to taking more climate action. They may be reluctant to make major changes to their lifestyles or have time and money constraints. A majority of respondents identify with biospheric, frugal and financially conscious values, all of which are consistent with climate action. **Communications interventions should reflect these value priorities** and show how people can strengthen the links between their values and their actions.
- 4 Individuals want more information about what Government is doing to meet the Net Zero goal and how individuals can contribute. **Government agencies and local mainstream media are in a strong position to take the lead on communicating about Net Zero as they are among the most highly trusted** sources of information in the eyes of the public. The Government is already actively engaging with Singaporeans on sustainability. Future communications can focus on highlighting which actions have high impact on carbon emissions, and be specific about how individuals can maximise the impact of their efforts.

Recommendations to close the knowledge gap to strengthen public support for Net Zero

A. Build the evidence base on impactful action in the Singapore context

- Singapore's energy, transport, food and housing sectors have specific characteristics which affect the relative carbon emissions impact of individual actions.
 - Consequently, some recommendations from international studies are clearly irrelevant to Singapore, (e.g., those relating to home heating).
 - Others are relevant to Singapore but cannot reasonably be implemented by the majority of individual households (e.g., solar panels on roofs).
- As a result, transposing the findings of international studies directly to the Singapore context may lead to missed opportunities or mis-directed efforts on the part of households.
- More research is needed to estimate accurately the carbon footprint of individuals' climate action in Singapore.
- IHLs, working with Government and the private sector, can play a leading role here, developing policy-relevant knowledge while contributing to global scholarship on methods for integrated carbon footprint estimation at the scale of the individual in a high-density city with a tropical climate.

Recommendations to close the knowledge gap to strengthen public support for Net Zero

B. Communicate climate actions which connect with individuals' values

- The survey suggests that respondents place value on environment and planetary health (“biospheric” values).
 - They are motivated to learn more about what individuals can do to contribute to reaching Net Zero.
 - This presents an opportunity for communications interventions to focus on individual climate actions.
- Leveraging the strong trust in Government communications, future information and communication efforts could seek to broaden the range of actions that individuals can take to reduce their carbon footprint. These actions could be informed by potential future research to estimate the actual impact of individuals' climate actions
- The effectiveness of Government messaging around a broad set of green initiatives may also be amplified by recognising and connecting to the biospheric values held by the public.

Methodological Annex

Methodology to categorise climate actions

Respondents' intention to take climate actions was assessed using factor analysis. **Factor analysis** is a data reduction technique which extracts maximum common variance from all variables and puts them into a smaller set of factors.

Factor analysis yielded **three** factors based on the following criteria:

- (i) *Suitability criterion*: A Kaiser-Meyer-Olkin measure of sampling adequacy value of 0.879, confirming the data is suited for this type of analysis;
- (ii) *Extracting factor criterion*: Three factor loadings with eigenvalues greater than 1, determining three factors to retain;
- (iii) *Interpretability criterion*: Climate actions loaded into three factors were reasonably characterised into three groups: “High effort”, “High cost”, and “Low cost”;
- (iv) *Reliability criterion*: Alpha scores ranged from 0.52 to 0.84, indicating acceptable level of reliability.

Results of factor analysis of climate actions

Factor loadings (Promax rotation) of all climate actions show how strong each action is related to each other. We used a cut-off value of 0.3 to decide which actions to include or exclude from each factor.

Climate actions	Low cost	High effort	High cost
Reducing air travel		0.3635	
Reducing meat consumption		0.5881	
Paying more to offset emissions (e.g. in electricity plans)			0.5626
Investing in sustainable financial products (e.g. green bonds)			0.6571
Switching from a petrol/diesel vehicle to an electric vehicle			0.6374
Using public transport instead of private transport	0.5415		
Using the fan instead of turning on the aircon	0.5308		
Increasing the aircon temperature to at least 25°C	0.4045		
Hanging dry the laundry instead of using the dryer	0.6915		
Switching to energy and water efficient appliances	0.7061		
Turning off the lights when not in use	0.825		
Recycling as much as possible	0.6125		
Reducing use of single-use plastics	0.5599		

Note: Factor loadings smaller than 0.3 were omitted.