Report No.363

epaResearch
Climate - Water - Sustainability
Identifying pressures • Informing policy • Developing solutions

No Home for Plastic

Authors: Abigail O'Callaghan-Platt and Mindy O'Brien

www.epa.ie

Rialtas na hÉireann
Government of Ireland

ENVIRONMENTAL PROTECTION AGENCY

The Environmental Protection Agency (EPA) is responsible for protecting and improving the environment as a valuable asset for the people of Ireland. We are committed to protecting people and the environment from the harmful effects of radiation and pollution.

The work of the EPA can be divided into three main areas:

Regulation: *We implement effective regulation and environmental compliance systems to deliver good environmental outcomes and target those who don't comply.*

Knowledge: *We provide high quality, targeted and timely environmental data, information and assessment to inform decision making at all levels.*

Advocacy: *We work with others to advocate for a clean, productive and well protected environment and for sustainable environmental behaviour.*

Our Responsibilities

Licensing

We regulate the following activities so that they do not endanger human health or harm the environment:

- waste facilities *(e.g. landfills, incinerators, waste transfer stations)*;
- large scale industrial activities (*e.g. pharmaceutical, cement manufacturing, power plants)*;
- intensive agriculture *(e.g. pigs, poultry)*;
- the contained use and controlled release of Genetically Modified Organisms *(GMOs)*;
- sources of ionising radiation *(e.g. x-ray and radiotherapy equipment, industrial sources)*;
- large petrol storage facilities;
- waste water discharges;
- dumping at sea activities.

National Environmental Enforcement

- Conducting an annual programme of audits and inspections of EPA licensed facilities.
- Overseeing local authorities' environmental protection responsibilities.
- Supervising the supply of drinking water by public water suppliers.
- Working with local authorities and other agencies to tackle environmental crime by co-ordinating a national enforcement network, targeting offenders and overseeing remediation.
- Enforcing Regulations such as Waste Electrical and Electronic Equipment (WEEE), Restriction of Hazardous Substances (RoHS) and substances that deplete the ozone layer.
- Prosecuting those who flout environmental law and damage the environment.

Water Management

- Monitoring and reporting on the quality of rivers, lakes, transitional and coastal waters of Ireland and groundwaters; measuring water levels and river flows.
- National coordination and oversight of the Water Framework Directive.
- Monitoring and reporting on Bathing Water Quality.

Monitoring, Analysing and Reporting on the Environment

- Monitoring air quality and implementing the EU Clean Air for Europe (CAFÉ) Directive.
- Independent reporting to inform decision making by national and local government *(e.g. periodic reporting on the State of Ireland's Environment and Indicator Reports)*.

Regulating Ireland's Greenhouse Gas Emissions

- Preparing Ireland's greenhouse gas inventories and projections.
- Implementing the Emissions Trading Directive, for over 100 of the largest producers of carbon dioxide in Ireland.

Environmental Research and Development

- Funding environmental research to identify pressures, inform policy and provide solutions in the areas of climate, water and sustainability.

Strategic Environmental Assessment

- Assessing the impact of proposed plans and programmes on the Irish environment *(e.g. major development plans)*.

Radiological Protection

- Monitoring radiation levels, assessing exposure of people in Ireland to ionising radiation.
- Assisting in developing national plans for emergencies arising from nuclear accidents.
- Monitoring developments abroad relating to nuclear installations and radiological safety.
- Providing, or overseeing the provision of, specialist radiation protection services.

Guidance, Accessible Information and Education

- Providing advice and guidance to industry and the public on environmental and radiological protection topics.
- Providing timely and easily accessible environmental information to encourage public participation in environmental decision-making *(e.g. My Local Environment, Radon Maps)*.
- Advising Government on matters relating to radiological safety and emergency response.
- Developing a National Hazardous Waste Management Plan to prevent and manage hazardous waste.

Awareness Raising and Behavioural Change

- Generating greater environmental awareness and influencing positive behavioural change by supporting businesses, communities and householders to become more resource efficient.
- Promoting radon testing in homes and workplaces and encouraging remediation where necessary.

Management and structure of the EPA

The EPA is managed by a full time Board, consisting of a Director General and five Directors. The work is carried out across five Offices:

- Office of Environmental Sustainability
- Office of Environmental Enforcement
- Office of Evidence and Assessment
- Office of Radiation Protection and Environmental Monitoring
- Office of Communications and Corporate Services

The EPA is assisted by an Advisory Committee of twelve members who meet regularly to discuss issues of concern and provide advice to the Board.

EPA RESEARCH PROGRAMME 2014–2020

No Home for Plastic

(2018-SE-DS-18)

EPA Research Report

Prepared for the Environmental Protection Agency

by

VOICE Ireland

Authors:

Abigail O'Callaghan-Platt and Mindy O'Brien

ENVIRONMENTAL PROTECTION AGENCY
An Ghníomhaireacht um Chaomhnú Comhshaoil
PO Box 3000, Johnstown Castle, Co. Wexford, Ireland

Telephone: +353 53 916 0600 Fax: +353 53 916 0699
Email: info@epa.ie Website: www.epa.ie

ACKNOWLEDGEMENTS

This report is published as part of the EPA Research Programme 2014–2020. The EPA Research Programme is a Government of Ireland initiative funded by the Department of the Environment, Climate and Communications. It is administered by the Environmental Protection Agency, which has the statutory function of co-ordinating and promoting environmental research.

The authors would like to acknowledge the members of the project steering committee, namely Dorothy Stewart (EPA), Jean Clarke (Department of the Environment, Climate and Communications), Jeanne Moore (National Economic and Social Council) and Celine Horner (EPA); and also Abigail Murphy (EPA) for her contribution and Oonagh Monahan (Research Project Manager on behalf of the EPA).

Cover image: Clonakilty Community College, a post-primary school in County Cork that took part in the No Home for Plastic school programme.

DISCLAIMER

This report is based on research carried out/data from April 2019 to December 2019. More recent data may have become available since the research was completed.

The EPA Research Programme addresses the need for research in Ireland to inform policymakers and other stakeholders on a range of questions in relation to environmental protection. These reports are intended as contributions to the necessary debate on the protection of the environment.

EPA RESEARCH PROGRAMME 2014–2020
Published by the Environmental Protection Agency, Ireland

ISBN: 978-1-84095-971-0 January 2021

Price: Free Online version

Project Partners

Abigail O'Callaghan-Platt
VOICE Ireland
Dublin
Ireland
Tel.: +353 1 642 5741
Email: abi@voiceireland.org

Mindy O'Brien
VOICE Ireland
Dublin
Ireland
Tel.: +353 1 642 5741
Email: mindy@voiceireland.org

Contents

List of Figures

List of Tables

List of Boxes

Executive Summary

The objective of the research was to develop a citizen science protocol for use in Ireland with the aim of raising awareness of levels of personal plastic use and achieving a reduction in plastic waste. Two forms of the protocol were developed: the household programme and the school programme. The citizen science protocol takes the form of a technology-mediated plastic waste auditing tool, whereby individuals and schools submit data on daily plastic use. The household programme was piloted with 39 households and the school programme was piloted with 15 schools (10 primary and five secondary), with both programmes succeeding in their objectives.

Participants in the household programme completed an audit of their plastic use both in and out of the home using a web link to the auditing tool on their mobile phones. This allowed them to walk around their homes noting disposable plastic use while engaging with the tool. The household programme succeeded in raising participants' awareness of their plastic use, with 62% of participants expressing surprise at the amount of plastic use, the audit revealed.

To move forward from awareness raising to behaviour change, each participant was sent a feedback report suggesting simple changes they could make to reduce their disposable plastic use. They could then opt to take on plastic reduction pledges, accessed through the online tool. The 16 participants who chose to engage further with the programme, set plastic reduction pledges and maintain contact with the project team succeeded in reducing their disposable plastic use. On completion of the programme, participants expressed intentions to continue making choices to reduce plastic use in the future, as they felt that these behaviours had become normalised within their lives.

Schools that piloted the education programme ran plastic reduction classes with pupils over a period of 4 weeks. Each class participated in a range of activities, such as "moving debates", supermarket visits, class and home plastic use audits, in-class discussions and small group research projects. Three versions of the programme were developed: one for lower primary school classes, one for upper primary school classes and one for post-primary schools. The school programme succeeded in raising pupils' awareness of the issues surrounding plastic use. All teachers reported an increase in pupils' awareness of plastic issues, with 58% of teachers reporting a large change in awareness levels. Fifty per cent of schools that submitted post-programme evaluation forms also opted to use the programme to assist them in developing a plastic reduction action plan. Feedback on the programme was positive, with teachers reporting that they enjoyed teaching the programme and would recommend the programme to other schools.

While the primary aim of the tool was to raise awareness of plastic use in the user, it also allowed us to gather data on household, on-the-go and classroom plastic use and to establish participants' views on plastic consumption and wider environmental issues. In this way, we gathered data from 39 adult householders, 100 post-primary school pupils and 318 primary school pupils. Participants were also asked about their perceived barriers to reducing plastic use, their level of concern over environmental issues, the environmental issues that they feel are most pressing, their feelings of empowerment to tackle environmental issues, and the pro-environmental actions they take currently.

A number of recommendations were developed based on the findings of the research. A key recommendation was to make plastic-free options easily available in major supermarkets and at affordable prices comparable to those of packaged goods. This is a crucial step in allowing people to make plastic-free choices. The Irish government should adopt policies to disincentivise the overuse of plastic packaging in supermarkets and other retail outlets by increasing extended producer responsibility fees for the amount of plastic packaging placed on the market, adopting new economic instruments and establishing mandatory reuse targets for packaging. Based on their success in raising awareness of plastic use, both the audit and the school programme should be made available going forward and their use promoted. Further research opportunities were also highlighted.

1 Introduction

1.1 The Issue of Plastic Overuse

Plastic has become a ubiquitous material globally, with plastic production growing rapidly since its first widespread use outside the military in the 1950s. In 1960, plastic constituted less than 1% of municipal solid waste; however, the increasing use of single-use plastics and the durable nature of plastic led to 6.3 billion tonnes of plastic waste being generated by 2015, of which 79% accumulates globally in landfills or the natural environment (Geyer *et al*., 2017). According to the European Commission's recently published Circular Economy Action Plan (EC, 2020) and its Strategy for Plastics in the Circular Economy (EC, 2018a), the consumption of plastics worldwide is expected to double in the next 20 years. Plastic waste has become a pressing concern and fears are mounting for the future, with research findings published in 2017 estimating that, by 2050, if current trends continue, there will be 12 billion tonnes of plastic waste in landfill or the natural environment (Geyer *et al*., 2017).

Recent research has sought to quantify the damage caused by plastic waste to the world's oceans, with horrifying results. A 2014 study estimated that there are 5.25 trillion pieces of plastic in the oceans, weighing 268,940 tonnes (Eriksen, 2014). In 2014, the United Nations Environment Programme (UNEP) conducted a natural capital valuation of the impact of plastic on the marine environment and found that plastic littering costs marine ecosystems US$13 billion per year (UNEP, 2014). "In the [European] Union, 80 to 85% of marine litter, measured as beach litter counts, is plastic, with single-use plastic items representing 50% and fishing-related items representing 27% of the total" (EU, 2019). A 2018 study conducted in Ireland found that 73% of deep-sea fish had ingested plastic (Wieczorek *et al*., 2018). A 2015 study reported that 90% of seabirds have plastic in their gut (Wilcox, 2015), and in June 2018 it was reported that plastic had overtaken natural materials as the major nest-building material in the gannet colony of Little Skellig, leading the island off the coast of County Kerry to look like a rubbish dump (Hilliard, 2018).

These revelations raised public awareness of and concern over plastic waste and prompted calls for action. In response to the growing concern, the latest European strategy for plastics, released in January 2018, stipulates that all plastic packaging shall be reusable or recyclable in a cost-effective manner by 2030 (EC, 2018b). In addition, the European Union (EU) adopted a very ambitious Directive, the Single-Use Plastics (SUP) Directive, in June 2019. (EU, 2019). Member States have until 3 July 2021 to transpose this Directive into national law.

In summary, the SUP Directive bans the following plastic items:

- cotton bud sticks;
- cutlery (forks, knives, spoons, chopsticks);
- plates;
- straws;
- beverage stirrers;
- sticks to be attached to and to support balloons, except balloons for industrial or other professional uses and applications that are not distributed to consumers, including the mechanisms of such sticks;
- food containers made of expanded polystyrene, i.e. receptacles such as boxes, with or without a cover, used to contain food that is intended for on-the-spot consumption or take away; typically consumed from the receptacle; or ready to be consumed without any further preparation, such as cooking, boiling or heating, including food containers used for fast food or other meals ready for immediate consumption, except beverage containers, plates, and packets and wrappers containing food;
- beverage containers made of expanded polystyrene, including their caps and lids;
- beverage cups made of expanded polystyrene, including their covers and lids.

The Directive also instructs Member States to set ambitious and sustained consumption reduction targets for single-use plastics; requires plastic caps and lids of drinks containers to be tethered; sets product marking requirements on how to dispose of

the plastic items and the negative impact of littering; expands extended producer responsibility for plastic products; requires separate collection of 90% of plastic drinks containers; and requires the funding of public awareness campaigns.

Across the EU, an average of 31 kg of plastic packaging waste is produced per person per year. In Ireland, we generate 60 kg of plastic waste per person per year (over 280,000 tonnes in 2017; EPA, 2019); however, this comparatively high figure may be the result of differing systems of measurement.

Thirty-one per cent of the plastic waste in Ireland was recycled in 2018, exceeding the current EU target of 22.5% (EPA, 2017). While Ireland's plastic recycling rate hovers around 31–36%, our plastic packaging tonnage is steadily increasing, leaving more and more plastic unrecycled. While we are exceeding the EU plastic recycling target, we are at the lower end of the EU-28 in terms of plastic recycling, just ahead of France, Finland, Estonia and Malta (Eurostat, 2019). Table 1.1 illustrates our plastic packaging recycling rates, using 2017 figures.

Key points:

- The amount of plastic packaging generated is closely tied to the level of economic activity. It fell during the recession and is now at an all-time high.
- The amount of plastic packaging we use has almost doubled in 5 years (75% rise).
- The percentage of plastic packaging we recycle is less than it was in 2009.
- The amount of plastic we recycle has increased by a third since 2011 (32% rise).
- But the amount of plastic we *do not recycle* has more than doubled since 2011.

We do not know why Ireland's use of plastic packaging is so high compared with our closest neighbour, the UK, which generates 33 kg of plastic packaging per person per year (Statista, 2020). It could be that Ireland's system of measuring the plastic packaging generated differs from other EU countries or that we are at the end of the commercial retail chain; the Environmental Protection Agency (EPA) is currently conducting a study to understand why Ireland is so out of sync with other EU countries in the generation of plastic packaging waste. Initial results indicate that three countries – Ireland, Estonia and Luxembourg – are all outliers in terms of plastic packaging generation and that this relates to the fact that these countries used a waste-based system to generate the statistics as opposed to figures for plastic placed on the market. The EU has recognised that Member States must increase the recycling rate for plastic packaging waste and, under the European Strategy for Plastics in a Circular Economy, the recycling target has been increased from 22.5% to 55% by 2030 (EC, 2018a).

In January 2019, the Irish government announced a decision on single-use plastics (Department of Communications, Climate Action and Environment, 2019). This stated that all government departments and public bodies, including state agencies and schools, will not purchase or supply, directly or indirectly, single-use plastic cups, single-use cutlery and single-use straws. In this way the government planned to take the lead in preventing the use of single-use plastics.

The damage caused to the environment by plastic is well documented and policies to address this are being put in place. It is clear that we need to reduce our plastic consumption and increase our plastic recycling rates as a matter of urgency.

Table 1.1. Environmental Protection Agency national waste reports (consolidated)

	Year										
Plastic packaging	**2017**	**2016**	**2015**	**2014**	**2013**	**2012**	**2011**	**2010**	**2009**	**2008**	**2007**
Waste generated (000 tonnes)	280.7	275.5	282.1	NA	NA	168.6	158.7	187.6	223.3	248.0	237.7
Recycling rate (%)	34	36	34	NA	NA	40	47.5	39.4	36.2	28.9	22.2
Waste recycled (000 tonnes)	94.9	99.2	95.9	NA	NA	67.4	75.4	73.9	81.2	71.7	52.8
Waste not recycled (000 tonnes)	185.8	176.3	186.2	NA	NA	101.1	83.3	113.7	143.1	176.4	184.9

NA, not available.

1.2 Research Aims and Objectives

The objective of the research was to develop a citizen science (CS) protocol for use in Ireland with the aim of raising awareness of levels of plastic use and leading to behavioural change in the form of plastic waste reduction. Two forms of the protocol were developed: the household programme and the school programme. The CS protocol takes the form of a technology-mediated plastic waste auditing tool, whereby individuals and schools submit data on daily plastic use. The household programme was piloted with 39 households, with further work on behaviour change taking place with 16 households, and the school programme was piloted with 15 schools (10 primary and five secondary). Data from the auditing tool and feedback from the pilot participants were used to gauge the effectiveness of the programmes in reaching their objectives.

While the primary aim of the tool was to raise awareness of plastic use in the user, it also allowed us to gather data on household, on-the-go and classroom plastic use, and to establish participants' views on plastic consumption and wider environmental issues. Participants were also asked about their perceived barriers to reducing plastic use, their level of concern over environmental issues, the environmental issues that they feel are most pressing, their feelings of empowerment to tackle environmental issues and the pro-environmental actions they take currently.

1.3 The Impacts of COVID-19 on Household Plastic Use

The research outlined in this report was conducted prior to the coronavirus disease 2019 (COVID-19) pandemic. The COVID-19 public health crisis has altered our use of plastic, and the findings from the plastic use audit, if repeated now, might look very different. While several sources of plastic waste will have reduced during the pandemic, such as disposable plastics associated with school and work lunches, many more will have increased, such as disinfectant wipes and plastic packaging, and new sources of plastic waste have been added.

Many people believe that plastic is a sanitary and sterile material, despite evidence that COVID-19 remains on plastic for 3 days, compared with 1 day on cardboard (Van Doremalen *et al*., 2020). Fear around contagion has prompted increased use of plastic-packaged items, such as plastic-wrapped food, based on this belief in the protectiveness of plastic.

Areas in which progress had been made in the uptake of reusables have seen a move back towards the use of disposables. For example, many cafes are now refusing to accept reusable coffee cups, with customers required to use single-use disposable cups. In addition, new sources of single-use plastic have become commonplace. Single-use disposable plastic masks and gloves are now used by many people on daily trips out of the house, for activities such as food shopping. Researchers in Italy estimate that Italy alone will need 1 billion masks and 0.5 billion gloves per month as it leaves lockdown (Montalto Monella, 2020), and there are already reports of disposable masks washing up on beaches worldwide and of disinfectant wipes washing up on Irish beaches (Irish Times, 2020).

When the pandemic is over it may take some time before people resume their more sustainable habits and, unfortunately, many may not. The long-term impacts of the pandemic on behaviour surrounding disposable plastic have yet to be seen; however, greater caution around health, combined with the mistaken belief in plastic's cleanliness, may hinder the environmental movement for some time. We need strong government intervention to establish guidelines for the safe use of reusable items to reassure the public that reuse is safe.

2 Methodology

2.1 The Technology-mediated Citizen Science Tool

2.1.1 Why use citizen science?

Citizen science is the involvement of the public in scientific research. It has been used in a wide variety of environmental research contexts to allow data to be gathered on a large scale and to raise awareness of environmental issues among the public. Bird counts by members of the public beginning in 1900 are acknowledged as the first use of a CS methodology. Since then, CS has been used in a wide variety of environmental projects. In 2015, Theobald *et al.* identified 388 citizen science-based biodiversity projects, with up to 2 million participants. By engaging the public, CS has a particularly useful role in research with environmental or public policy implications (Dickenson *et al*., 2012). Turrini *et al.* (2018) state that CS fosters environmental goals in three ways (Figure 2.1):

1. generating new environmental knowledge;
2. enhancing awareness levels of participants;
3. enabling civic participation.

The project used CS with the aim of gathering evidence on plastic use in Irish homes (generating new environmental knowledge) and raising awareness of the environmental impacts of plastic use by households and school pupils (enhancing awareness levels of participants). The aim of awareness raising is ultimately to prompt participants to reduce their plastic use.

While changes in awareness levels have been reported in CS participants (Evans *et al*., 2005; Jordan *et al*., 2011; Krasny and Bonney, 2005; Trumbull *et al*., 2000), changes in attitudes and behaviour as a result of CS participation are more difficult to demonstrate. One reason proposed for this is that participation in CS programmes is self-selecting, and those selecting to take part in environmental projects already have a pro-environmental attitude (Forrester *et al*., 2017). However, the main issue in measuring behaviour change is that it is a complex construct involving many factors (Bonney *et al*., 2016; Turrini *et al*., 2018).

Research into environmental school programmes, including those with CS as a central element, has established that the simple linear rational model of awareness–attitude–behaviour change, as originally developed in the 1970s, is not accurate. There is

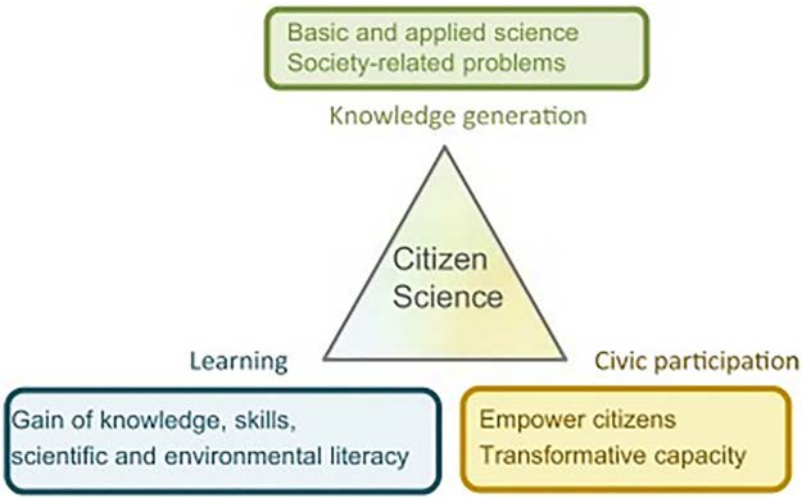

Figure 2.1. Turrini's threefold potential of citizen science. Source: Turrini *et al.* (2018). Reproduced under the terms and conditions of the Creative Commons attribution licence CC BY 4.0 (https://creativecommons.org/licenses/by/4.0/).

a well-established gap between pro-environmental attitudes and pro-environmental behaviour (Kollmuss and Agyeman, 2002). Although this gap has been widely studied, and a number of models developed (Ajzen and Fishbein, 1980; Blake, 1999; Hines *et al*., 1987; Kollmuss and Agyeman, 2002), there has been no definitive explanation. A variety of external and internal factors have been identified that exert influence, however (Kollmuss and Agyeman, 2002). The external factors are institutional, economic, social and cultural; the internal factors are motivation, environmental knowledge, awareness, values, attitudes, self-efficacy, locus of control, responsibilities and priorities.

There is some evidence in the literature of participation in environmental CS programmes resulting in pro-environmental behaviour change. Participants in the Neighborhood Nestwatch Program reported changing their behaviour following the CS programme to accommodate bird life in their gardens and began to value gardens as a wildlife habitat (Evans *et al*., 2005). Following participation in a CS butterfly monitoring project, volunteers reported taking an active role in conservation and habitat improvement (Oberhauser and Prysby, 2008). Participation in an invasive plant-monitoring CS programme increased the percentage of volunteers considering the environmental impact of plant purchases, with more people considering whether plants were native or not (Jordan *et al*., 2011).

One category of CS is curriculum-based CS projects (Bonney *et al.,* 2016). These projects involve young people gathering and submitting data, often under the supervision of teachers. Bonney (2016) reports that several curriculum-based CS projects have increased young participants' levels of understanding of the environmental issue on post-programme evaluation. Chawla and Cushing (2007) found that school pupils with greater environmental knowledge reported higher levels of environmental behaviour and that active environmental education leads to the greatest gains in reported environmental behaviour in young people. Turrini *et al.* (2018) state that curriculum-based CS projects differ from traditional environmental education projects only in that they provide new scientific knowledge. However, Chawla and Cushing (2007) report that engaging schoolchildren in active environmental behaviours in place of more traditional, passive environmental education encourages children to grow into environmentally active adults.

2.1.2 Selecting the platform for the citizen science tool

A platform was needed to host the CS auditing tool for participants in both the household and the school programme. The following list of criteria for the platform was developed:

- easy to access;
- free;
- reputable;
- mobile compatible;
- easy to use – from both a project team and participant perspective;
- features a form builder, with a number of different question types available for the audit, and skip logic;
- data can be submitted to a central server and are immediately available after collection;
- data can be exported to SPSS, a statistical software package.

There are a large number of different providers of mobile and web applications for data collection; however, options were limited by the requirement for the tool to be free to use. Once the fee-paying applications were eliminated, a shortlist of open-source data collection tools remained. Through reading reviews of different systems, the list was narrowed down to two options: Epicollect5 and KoBoToolbox. In both options, data can be collected using multiple devices and all data can be viewed on a central server. Epicollect5 is a mobile and web data collection application developed by Imperial College London, with funding provided by the Wellcome Trust. KoBoToolbox is described as a suite of tools for field data collection for use in challenging environments. It was developed by researchers in Cambridge, Massachusetts, and its users are said to be mostly people working in humanitarian crises and aid professionals and researchers working in developing countries.

The audit was first developed using both options, Epicollect5 and KoBoToolbox, and the household plastic use audit questions. A project account was set up on each application and a test household audit form was created. Once the form was deployed, test audits were undertaken. Ways to access the audit were examined from the household perspective. Both applications gave options of access via a mobile

phone app or browser. The apps are available for Android devices via Google Play. The project team downloaded the two apps to test them for possible use.

The test found that use of the apps was cumbersome. First, the user needed sufficient storage space on their phone to download the app; although the apps take up very little space (e.g. KoBoCollect uses 9.8 MB and Epicollect5 uses 30 MB), this may still cause problems for some. The apps also required a level of comfort with technology that should not be a requirement for participants.

Once the apps were downloaded, the draft audit was completed using each of them. Using the KoBoCollect app for a CS project is not ideal; it was developed for use by researchers rather than members of the public. However, Epicollect5 is frequently used in CS projects.

Ultimately, it was felt that both apps required too many steps from the participant. This meant that there would be too many points at which an error could be made or a person could lose patience and interest in participating. It was therefore decided that the use of an app for delivery of the CS project was not viable. CS data collection requires that members of the public can use the auditing tool easily and without any assistance.

Another option for data submission via KoBoToolbox was Enketo web forms. These forms can be filled out on a computer, tablet or mobile phone. The web form URL can simply be emailed or texted to participants. The participant clicks on the URL to open the form, at which point they can input the audit data and then select “submit”.

Epicollect5 also allows users to submit data via the web. But, Epicollect5 at five.epicollect.net currently requires public users to have a Google account. The project team felt that this put an unnecessary restriction on who could participate in the programme.

At this point, the project team selected Enketo web forms for KoBoToolbox as the CS platform for data collection. In addition, KoBoToolbox allows users to export data directly to the Statistical Package for the Social Sciences (SPSS); data gathered is accessible only by the organisation running the project; it accepts 10,000 submissions per month with 5 GB of data storage per month and unlimited projects; and it allows users to build complex forms with skip logic, validation and more than 20 different question types.

The tool was incorporated into both the household and school programmes. It constituted the basis of the household programme, while for schools it was part of a larger educational programme. By the end of the project there had been 224 interactions with the tool.

2.2 The Household Programme

2.2.1 Developing the household programme

The core aim of the household programme was to raise awareness of personal disposable plastic use, as awareness is the first step towards behaviour change. To do this, an audit was developed to examine plastic use in the home and on the go. Through the audit, data were collected on plastic use in Ireland. The audit also sought to gather data on perceived barriers to plastic reduction, levels of environmental concern, types of environmental actions participants were currently engaged in and levels of stated self-efficacy.

The content of the plastic use audit was developed through a household walk-through to establish commonly used disposable plastics found in each room. A household with a high level of plastic consumption was selected for the walk-through to ensure that all sources of household plastic were included. This was followed by visiting a supermarket and noting down the full range of disposable plastic household items on sale.

Following the development of the audit’s content, four households undertook test audits using the web forms on their phones to establish ease of use from the participant’s perspective. Their feedback on using the tool and on the content of the audit itself was used to make the required changes. The test audits also allowed the team to establish the average time taken to complete the audit and to view the results from the four households, enabling us to identify any gaps in the audit data and make changes to the questions accordingly.

2.2.2 Running the household programme

The original plan for the household programme was to work with 50 households. Under this plan, each

household would sign up to the programme and, following sign-up, be given a link to the CS tool and a username. They would then use the tool to undertake an audit of the plastic present in their lives. The aim of this was to raise participants' awareness of their plastic use.

On reflection, the project team decided to work with fewer households and on a deeper level. The deeper level involved a follow-up to the audit. Each participating household was sent an individual feedback report on its plastic use with a list of suggested changes it could make based on its audit data. Participating households could then select to use the online CS tool to sign up to specific plastic reduction pledges. The project team supported the households that selected to sign up to pledges by maintaining contact with them, checking on their progress and providing any additional information they asked for.

A variety of methods was used to promote the programme and encourage households to sign up:

- Articles were placed in three newspapers: the *West Cork People*, the *Limerick Leader* and the *Dublin People Northside East*.
- A member of the project team was interviewed on Near FM radio station.
- A page was set up on the VOICE website, with sign-up details for interested households.
- A dedicated Twitter account was set up and the project was promoted on VOICE social media channels.
- Information and sign-up details were provided in the VOICE ezines.
- Email notification of the project was sent to the VOICE mailing list (over 2000 people).
- Information and a sign-up sheet were available at the VOICE stall at the Environ conference in April 2019 and the Flavours of Fingal event from 29 to 30 June 2019.
- A member of the project team gave a presentation at a recycling event in Westport in April 2019.

In total, 78 people contacted the project team via email expressing an interest in participating in the programme. Each person was sent an email in response. The email outlined the details of participating in the project and provided each person with a username and a link to the online CS tool.

Of these 78 people, 39 submitted the audit. A feedback report was written and emailed to the participants. The feedback reports provided to each household programme participant were individually tailored to address their use of avoidable disposable plastic as reported in the audit. Each feedback report provided a list of recommended plastic pledges for the household. The plastic pledge list was developed through visits to supermarkets to establish what plastic-free options are readily available to Irish shoppers, reading zero waste blogs to establish actions that households can take to reduce their plastic use, and visits to refill shops and health food shops to see what alternatives are available.

Using the plastic pledge list, a template report was developed and the report was then tailored to each household to take into account its circumstances and stage on the journey to reducing plastic in the members' lives. The template feedback report can be found in Appendix 1. The report lists a number of possible changes the participant could make to reduce plastic use. For example, the report might suggest that a household switch from surface cleaning wipes to reusable cloths, take reusable containers when shopping at deli or meat counters, or move from liquid shampoo to shampoo bars. Details of nearby refill shops or farmers' markets local to them were provided where possible. The report is divided into two sections:

- **First steps:** these are the changes that can be made with the least effort and that will make an immediate difference to plastic use.
- **Further steps:** these changes may be more challenging at first and some require a little advance preparation, but, over time, these changes become habit and easy to maintain.

After receiving the report, several participants selected to use the CS tool to sign up to plastic pledges. Household programme participants who selected to sign up to pledges were offered information relevant to their locality. This involved identification of farmers' markets, health food shops, refill shops/stalls and vegetable box deliveries across the country. An email was sent to the remaining participants asking if they had found the feedback report useful, if they would like to sign up to pledges, and how we could support them in their efforts to reduce plastic. Several people went on to sign up to pledges, while others replied to the email saying they had found the report useful, and

any questions they had at this stage were answered. In total, 16 participants completed the online pledge sign-up form.

After 1 month, the households that signed up to plastic reduction pledges were contacted via email with questions on how they were progressing. The participants were asked:

- Have you experienced any difficulties in keeping to any of your plastic pledges? If so, which pledges did you experience difficulties with?
- Please tell us about the difficulties you experienced or issues you faced. Can you think of any ways to get around these issues?

Following this initial check-in, these households were contacted monthly to establish whether or not the process was effective in creating lasting change and to answer any questions they might have.

There was a high level of drop-off from one stage to the next. The initial interest level was high, with 78 people contacting the project team with expressions of interest. This dropped to 39 people taking the audit, then to 16 people signing up to pledges. However, drop-off in CS programmes is not uncommon (Frensley *et al*., 2017). Another recruitment concern was that the participating households were self-selecting and were therefore potentially an environmentally conscious subset of households.

2.3 The School Programme

2.3.1 Developing the school programme

The development of an educational programme on plastic reduction incorporating CS was one of the central objectives of the research. The use of a school-based environmental education programme allowed the messages on plastic overuse to be communicated to a wider audience. It was anticipated that the participants in the household programme, as self-selected, would be environmentally aware individuals, and the ability to reach a wider, less aware, audience was the key motivator for the use of school programmes in this research.

The core aims of the school programme were to:

- provide information on plastic use to increase knowledge;
- increase scientific literacy;
- increase awareness of the role we all play in plastic consumption;
- provide a framework for plastic reduction in schools.

The content of the programmes was drawn from a number of different sources. These included waste-focused school programmes, existing plastic infographics and plastic school programmes and wider, classroom-based environmental school programmes. A table of content sources can be found in Appendix 2.

Three versions of the programme were developed: one for lower primary school classes, one for upper primary school classes and one for post-primary schools. Developing three versions of the programme ensured that the content provided was age appropriate for each group.

A time frame of 4 weeks was recommended, with one class per week to complete the core programme, and a list of optional add-on activities provided for those wishing to engage with the topic further.

In acknowledgement of research findings showing that active environmental education is more effective than passive environmental education (Chawla and Cushing, 2007), active components were incorporated into the programme where possible. For example, the post-primary-level programme incorporated a “moving debate”, class development of action plans, supermarket visits and letter writing, small group research projects and individual audits of personal plastic use. Optional add-on activities suggested included creative art-based responses to the material and beach cleans.

Programme components selected to achieve the school programme’s aims:

1. *Provide information on plastic use to increase knowledge.* In week 1, a PowerPoint lesson on plastic use and several short videos were used to increase knowledge and pupils’ awareness.
2. *Increase scientific literacy.* In week 2, primary school pupils gathered and analysed classroom plastic data and recorded the findings in science notebooks, and post-primary school pupils undertook small group research projects.

3. *Increase awareness of the role we all play in plastic consumption.* In weeks 3 and 4, pupils undertook an audit of disposable plastic use in their homes.
4. *Provide a framework for plastic reduction in schools.* In weeks 3 and 4, schools developed a plastic reduction action plan with pupils' input.

The home plastic use audit was designed to increase households' awareness of their own disposable plastic use. In the primary school programme the audit was in paper form. Each child took the paper audit home with them to complete while walking around their home. Pupils in the lower classes were provided with a shorter, simplified audit. Younger pupils would require an adult to read the questions; however, this is ideal to raise awareness of plastic use among adults in the family. Pupils in the upper primary school classes would be capable of completing the audit themselves; however, they were encouraged to ask a family member to complete the audit with them for the same reason. Post-primary school pupils were provided with a web link to the online auditing tool for use on their phones. They completed the same audit as participants in the household audit. The audit looks at household plastic use, plastic use out of the home and attitudes towards plastic use and wider environmental issues.

The order of the individual components of the programme differed between the primary and post-primary school programmes. Outlines of both programmes are below.

Brief outline of the primary school programme:

- Week 1: Learning about plastic – PowerPoint lesson and videos. Follow-up questions for older classes.
- Week 2: How much plastic is in our school? Audit of plastic in pupils' lunches and the class bin. Follow-up analysis for older classes. Creative activity on plastic for younger classes.
- Week 3: How can we tackle plastic in the school? Class discussion to develop a plastic reduction action plan for the school.
- Week 4: Plastic in the home – class discussion on ways to reduce plastic use in the home following the home audit homework.

Brief outline of post-primary school programme:

- Week 1: In class – plastics lesson with PowerPoint and videos provided:
  - homework – supermarket visit and letter writing.
- Week 2: In class – moving debate with topics of discussion provided:
  - homework – individual or small group research project with topics provided.
- Week 3: In class – project presentations:
  - homework – plastic use audit and reflection on personal plastic use.
- Week 4: In class – class discussion to develop school plastic reduction action plan.

The programmes developed were reviewed by a primary school teacher and an environmental educator, and recommended changes were made prior to running the pilot programme.

2.3.2 Running the educational programme

A variety of methods were used to promote the programme and encourage schools to sign up.

- Articles were placed in three newspapers: the *West Cork People*, the *Limerick Leader* and the *Dublin People Northside East*.
- A member of the project team was interviewed on Near FM radio station.
- A page was set up on the VOICE website, with sign-up details for interested households.
- A dedicated Twitter account was set up and the project was promoted on VOICE social media channels.
- Information and sign-up details were provided in the VOICE ezines.
- Schools were contacted directly.

In total, 15 schools participated in the school programme, while pupils from an additional four post-primary schools took part in the home audit. Fourteen primary schools got in contact and asked to participate in the programme, with 10 following through and completing it. Fifteen secondary schools asked to participate and five followed through and completed it. Schools from Carlow, Clare, Cork, Dublin, Galway, Kerry, Longford, Louth, Tipperary, Wexford and Wicklow completed the programme, with approximately 500 pupils taking part.

In terms of recruiting schools to participate, there was an issue with the timing of the project and the secondary school year. It was initially planned that schools would trial the programme prior to the school summer break. However, secondary schools were unable to run the programme at this time owing to the time pressure students and teachers are under from exams and exam preparation. For this reason, secondary schools that signed up to the programme opted to run it after the summer break, in the autumn term.

The majority of the primary schools that participated in the programme took part in May. However, several got in contact after that point and asked to run the programme in the autumn term. This gave us an opportunity to adapt the initial programme based on primary school teachers' feedback and provide the schools running the programme in the autumn with an improved version.

2.4 Analysis

The data gathered from the household and educational programmes were exported from KoBoToolbox to SPSS for analysis. SPSS is a widely used statistical software package and was used in this case for the quantitative analysis of plastic use.

Qualitative data were gathered alongside quantitative data. Content analysis using grounded theory, which is an inductive approach, was used to allow themes to emerge from the data. Data were gathered on qualitative issues via both the audit responses and the text of emails received from the participants.

In total, there were 187 submissions in KoBoToolbox for analysis.

3 Plastic Use

Participants in both the household programme and the school programme were asked to fill out an audit of their plastic use. Audit data from 139 participants (39 household participants and 100 secondary school pupils) were analysed by the team; the results are reported in sections 3.1 and 3.2. In addition, participating primary schools were asked to audit the disposable lunchtime plastic in their classrooms over a period of 1 week. The results of the classroom audits representing the plastic use of 318 primary school pupils are reported in section 3.3. Finally, section 3.4 presents the perceived barriers to reducing plastic use, as communicated by participants in the household programme.

3.1 Plastic Use in the Home

3.1.1 Kitchen plastic use

A series of questions were asked about kitchen plastic use.

Ninety-one per cent of participants reported that their fruit and vegetables came packaged in plastic, with only 9% able to buy all of their fruit and vegetables without plastic. This is unsurprising and illustrates how problematic it is for people to source affordable plastic-free fruit and vegetables.

Seventy-three per cent of participants said they bought prepackaged bread such as sliced pan, which is commonly packaged in soft plastic. Sixty per cent use dishwasher tablets wrapped in plastic. However, most major supermarkets stock only plastic-wrapped dishwasher tablets, with loose powder less readily available and plastic-free tablets available only in health food shops.

The study found that people are commonly choosing to use plastic-based products when plastic-free alternatives are readily available: 51% of participants used Ziploc-style bags in the kitchen, 35% used coffee capsules and 37% used surface cleaning wipes.

The disposable kitchen plastics that were least used were clingfilm, bottled water and washing machine capsules. Clingfilm was used by 23%, with 77% using a reusable storage container for leftovers instead. Nineteen per cent said they drank bottled water, while 14% used plastic clothes washing capsules, with the remainder choosing plastic-free loose powder or liquid.

3.1.2 Bathroom plastic use

The analysis of disposable plastic items found in participants' bathrooms reveals that, while plastic-free alternatives are available, the majority chose to use plastic-based items, with 85% using plastic toothbrushes,[1] 60% using cotton buds with a plastic stem, and 50% using facial cleansing wipes. Only 12% used a bar of soap instead of shower gel and 19% used a bar of soap instead of liquid hand soap.

When broken down by group, the audit revealed that the self-selecting, environmentally conscious households participating in the programme used plastic-based products in the bathroom. Eighty per cent of household participants reported using plastic toothbrushes, 49% used cotton buds with a plastic stem and 21% used facial wipes. However, soap use was higher among the self-selecting group, with 26% using a bar of soap in place of shower gel and 36% using a bar of soap instead of liquid hand soap.

There are clear, easy switches that can be made to reduce plastic use in the bathroom. However, the majority of people are not currently choosing to adopt them.

3.2 Plastic Use Out of the Home

Household programme participants and secondary school pupils were asked about their use of single-use plastic while out of the house in the previous week. The question "Which of the following items did you use this week?" was followed by a tick-box list of single-use plastics commonly used outside the home, such as disposable drinks cups and bottles, sandwich

1 However, it should be noted that no toothbrushes are 100% plastic free, even those marketed as plastic free.

packaging, etc. Figures for each group are presented separately based on the different lifestyles of adults and teenagers.

3.2.1 Householder responses

Despite the households participating in the programme being a self-selected group of environmentally conscious people, only 10% stated that they had used none of the listed take-away plastics in the previous week.

Crisp and biscuit packets were the most common source of single-use plastic used out and about by household participants, with 49% stating that they had eaten packets of crisps and the same percentage stating that they had eaten packets of biscuits out of the home in the past week. Single-use plastic drink bottles were also popular, with 31% having used one in the past week. Plastic straws and plastic cutlery were the items least used by households, with only 5% and 8% using them, respectively.

3.2.2 Teenager responses

Crisp packets, sandwich or roll wrapping, biscuit packets and disposable drinks bottles were the most common single-use plastics used out of the home by the 100 secondary school pupils who submitted audits. Fifty-five per cent had eaten crisps, 52% had eaten sandwiches or rolls wrapped in plastic, 46% had eaten packets of biscuits and 42% had drunk from disposable plastic bottles in the week of the audit (Figure 3.1). Thirty-five per cent also recorded buying take-away food that came in a plastic disposable container or wrapper.

Less commonly used were plastic cutlery (22%), straws (20%), juice boxes with straws (19%), disposable coffee cups (16%) and single-serve sachets of ketchup, etc. (10%).

Twelve per cent of teenagers reported using no disposable plastic out of the home in the past week.

3.2.3 Packed lunches

Households were also asked the question “If you prepare a packed lunch for either yourself at work or your children for school do you regularly include any of the following plastic items?”, followed by a tick-box list of common lunch box items that include plastic. Thirty-nine per cent of the respondents said that they did not prepare a packed lunch regularly. Of the 61% that regularly made a packed lunch, 50% packed a snack wrapped in plastic such as a cereal bar or a small pack of crackers, etc., 46% packed a pot of yogurt, 29% packed food wrapped in clingfilm or a sandwich bag, and 21% included a packet of crisps (Figure 3.2).

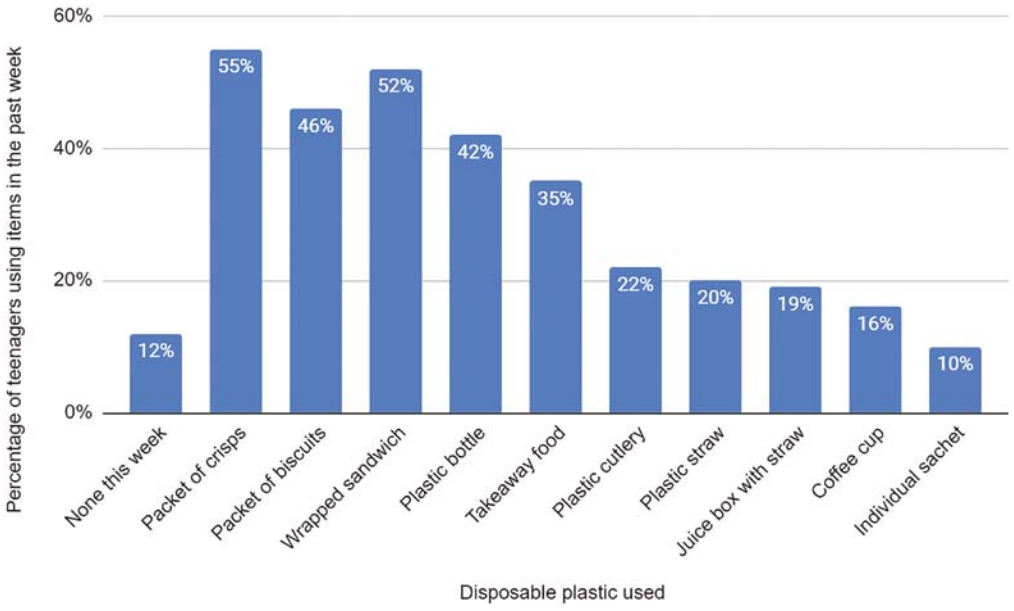

Figure 3.1. Percentage of teenagers answering yes to the question “Have you used any of the following disposable plastic items out of the house this week?”.

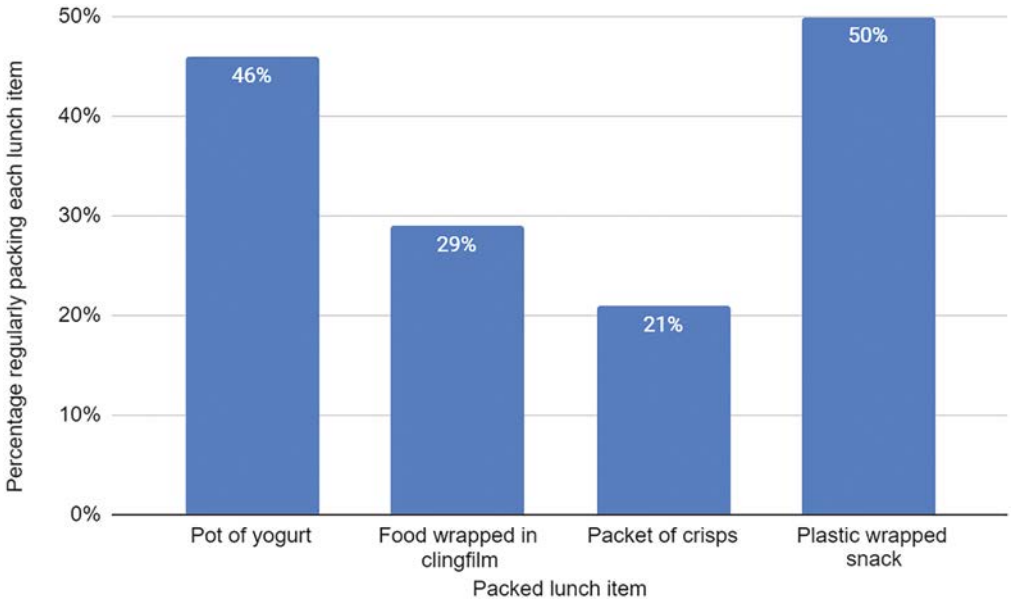

Figure 3.2. Percentage of household respondents answering yes to the question "If you prepare a packed lunch for either yourself at work or your children for school do you regularly include any of the following plastic items?".

3.3 Plastic Use in the Classroom

Classroom plastic use audits representing 318 pupils were submitted from primary schools participating in the pilot school programme. Each class recorded the plastic present in their lunch boxes over the period of 1 week. Following this, they entered the data into the CS online tool and submitted them to the project team for analysis.

Clingfilm wrapping was the number one source of disposable plastic in 50% of the classrooms that submitted an audit. In total, 376 clingfilm-wrapped lunch items were recorded across the classrooms that submitted data (Figure 3.3).

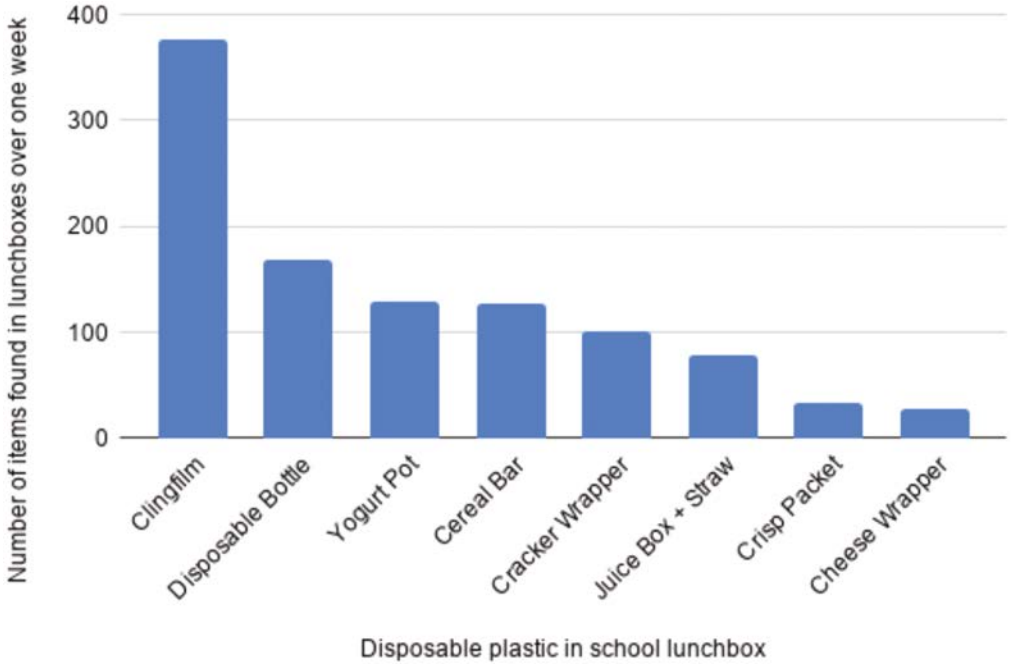

Figure 3.3. Number of items found in lunch boxes of 315 primary school pupils over the period of 1 week.

The remaining 50% of classrooms recorded plastic water bottles or individual portions of plastic-wrapped crackers as their number one source of single-use lunchtime plastic. In total, 169 disposable plastic bottles and 101 packets of crackers were recorded for the week. All classrooms audited reported the presence of disposable plastic water bottles in their class during the week of the audit, with 21% listing it as their most common source of plastic waste. Although only 57% of classes recorded the presence of cracker wrappings, in these classrooms it was a major source of disposable plastic, with 21% listing it as their most common source of plastic waste.

Yogurt cartons and cereal bar wrappers were found in 79% of classrooms and were recorded 129 and 128 times, respectively. Yogurt cartons were the number one source of lunchtime plastic at one school.

Juice boxes with straws were found in 57% of classrooms and 78 were recorded in total. Forty-three per cent of classrooms recorded use of individual plastic-wrapped portions of cheese, with 28 portions used. Only 29% of classrooms recorded crisp packets during the week of the audit, with 34 packets eaten. This can be explained by the strict lunch box policy in place with regard to healthy eating in many schools.

None of the schools taking part in the programme participated in the school milk scheme and so did not have individually sized disposable plastic milk bottles as a plastic waste item.

Data on the most common sources of school lunch plastic waste allow us to focus the information we provide to families on plastic-free switches that can be made. These data were used to develop a list of ideas that schools could choose to include in new lunch box policies as part of a plastic reduction action plan.

3.4 Barriers to Plastic Reduction

One particular area of interest in the study was to identify participants' perceptions of the barriers to reducing household plastic use. Participants in the household programme were asked "What do you feel are barriers to reducing the plastic in your life?". Households that went on to set pledges were also asked to outline any barriers they had experienced in maintaining their plastic reduction pledges as part of their regular progress check-ins.

3.4.1 Lack of plastic-free options

The main barrier perceived by participants was a lack of readily available plastic-free options. Responses focused mainly on the amount of food packaging present within the major supermarkets, while other participants spoke of the lack of access to shops supplying plastic-free options. This lack of plastic-free options was mentioned by 32 of the 39 household participants (Figure 3.4).

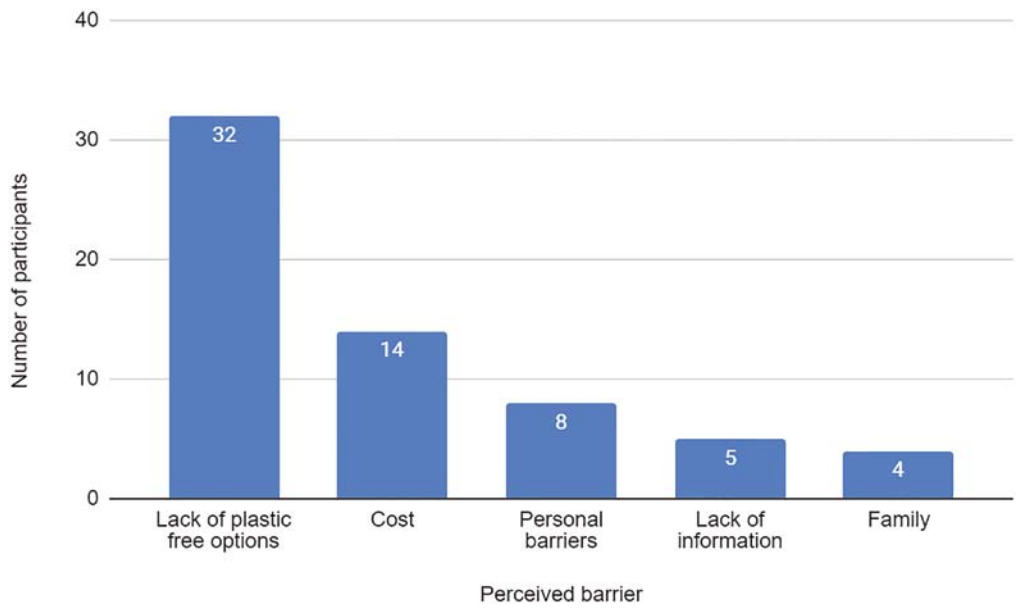

Figure 3.4. Perceived barriers to reducing single-use plastic.

Many participants expressed frustration at the amount of food packaging in the major supermarkets in Ireland. Participants felt that they were unable to choose to reduce their plastic use while using supermarkets to buy food.

> Shops force packaging on customers.
>
> Too much stuff in supermarkets wrapped in plastic that doesn't need to be.
>
> Supermarkets!!
>
> Shops don't facilitate plastic-free shopping, we are forced to buy an enormous amount of packaging we don't want or need.
>
> The biggest obstacle to reducing plastic is supermarkets. Virtually all fruit and veg in [two named supermarkets] is in plastic plus tray. All meat is packaged.
>
> We have started to try and reduce our plastic use for a while now, but it is proving much more difficult than we imagined. The food industry and shops make it almost impossible to avoid plastic and the same applies to all other types of shopping and even life in general. I have written to companies and tried to effect some change but it's so vast a problem it's difficult not to feel very frustrated.
>
> My main frustration is the sheer inevitability. I have stopped buying fruit that is packed in plastic containers, but for a lot of fruit that means we simply don't eat it any more, as it seems impossible to buy plastic free. Same for milk bottles. We drink a lot of milk. I have recently tried to buy ketchup in a glass bottle – just the standard Heinz, that I'm sure you could always get in glass bottles. After four shops I gave up and bought a plastic bottle. It shouldn't be so hard!
>
> Supermarkets, so much is offered in plastic.
>
> Things coming wrapped from supermarket.
>
> Shops mostly don't give us a choice. Choice would be most important.
>
> Lack of choice.
>
> I feel powerless, especially shopping in [name of supermarket].

> Trying to not buy things in plastic, but where from?
>
> While plastic-free shops are in operation in many parts of the country, these are not an option for many people. For most there is simply no plastic-free shop in their area.
>
> If there were more bulk stores locally rather than a 2-hour drive away, we would make great use of it.
>
> If I have to drive 10 miles to get my shopping from a package-free store it doesn't really make sense.
>
> For me, convenience and the supermarkets are the biggest issue. It is hard not to buy plastic. The supermarkets need to reduce offering everything in plastic and offer refill options. Currently living in Tipperary, there is nowhere to get refills.
>
> More refill and bulk-buy options in mainstream retailers (and not just in the major urban areas) would be wonderful.
>
> [There is] a lack of refillable stores in Meath/ Westmeath.
>
> Not much choice for zero waste shopping in a small town.

For others, visiting numerous shops to buy food rather than buying everything in one shop is not possible.

> Needing to shop in the main outlets where it's impossible to avoid all plastic.
>
> Having small children and busy – can be difficult to get around to smaller local shops for shopping.
>
> We try and shop at farmers' market but not always possible.

The issues of time and convenience were raised by several participants. Some of these responses may be viewed as a subcategory of 'lack of plastic-free options', as the lack of readily available options means that making plastic-free choices, where available, is both time-consuming and inconvenient.

> Time [and cost] – at the moment I visit several different shops a week just to reduce plastic on fruit and veg. I also would like to reduce on hummus and bread but making these at home is very time consuming.
>
> A lot of food is prepacked in plastic, it is very convenient.
>
> Food on the go.
>
> Personally, it's convenience, but I can definitely reduce.
>
> Alternatives and convenience.
>
> Convenience.
>
> I get frustrated about the lack of options to make good choices and that are convenient.
>
> The energy required for zero waste is really big. I wish we did not use it at all, I know there are more changes I could make, but I suppose we are stuck on the convenience of crackers from a shop vs making them ourselves.

Convenience is a complicated concept, as it is linked to time issues, readily available options and personal preferences. For example, in the case of a participant who cited convenience as the reason for using disposable nappies and baby wipes, this is not a lack of convenient and easy access to reusable nappies (although this may also be the case), but instead a lack of convenience in the actual daily use of the reusable option.

3.4.2 Cost of plastic-free shopping

Surprisingly, only 14 (36%) of the 39 household participants listed cost as a barrier to reducing plastic use. Several felt that plastic-free options, when available, were unaffordable, making reduced plastic shopping unrealistic for their household.

> Cannot realistically afford to shop all the time in any of the refill shops. Biggest problems experienced are lack of alternatives at reasonable costs.
>
> I do find cost a problem.
>
> The barriers relate mainly to the cost of changing grocery shopping habits.
>
> We can't afford many non-plastic options like buying from the market/refill shop, etc. for the bulk of our shop.
>
> I know that the food we buy is mostly sold in plastic, but at present I feel our budget is too low.

Others stated that plastic-free options when available were a difficult choice to make given that plastic packaged items were cheaper.

> Cheaper to buy everything in plastic!
>
> Supermarkets doing better offers on plastic-wrapped fruit and veg.
>
> Cost is not really an issue – I am happy to pay more but it is frustrating to pay more for one item of loose fruit when three packed items of the same fruit in the same shop cost less.
>
> The "Loose for Less" campaign is essential here. The local organic shop is great but crazy expensive: €4.50 for four chicory.

One participant felt that the combination of lack of readily available plastic-free items and the higher cost of these items made reduced plastic shopping unrealistic.

> My first thought is that cost AND convenience are huge barriers, but probably more so cost. I think people would sacrifice a small bit of convenience if it was less expensive to do so, but the double whammy of extra cost combined with less convenience when trying to be a more environmentally conscious consumer makes it feel like an unrealistic sacrifice to a lot of people. Organic produce is more expensive than non and is often wrapped in plastic anyway; plastic-wrapped bundles of fruit and veg are nearly always less expensive than loose fruit and veg (leading to plastic AND food waste), and the initial cost of more durable, non-plastic items such as water bottles, lunch boxes, travel mugs, etc. is off-putting to a lot of people.

3.4.3 Personal responsibility

Eight participants listed their own selves as a barrier to reducing plastic, citing personal laziness, lack of

organisation and thoughtlessness as barriers they experience.

> I need to be more organised when shopping and have my own food containers.
>
> Not having suitable containers for storing leftovers in the fridge.
>
> Not thinking/planning ahead enough.
>
> Partly laziness.
>
> Laziness.
>
> Rushing.
>
> Thoughtlessness on my part and not thinking while I am shopping about the amount of plastic there is covering items.

However, comments about laziness preventing plastic reduction illustrate how plastic-free shopping is currently a difficult, high-energy activity.

3.4.4 Lack of information

Five participants felt that they lacked information on ways to reduce their plastic use, and that this was a barrier to making changes.

> I would like to go to a store that offers refills but I'm not sure if there is one near me.
>
> Unsure of where to go for alternatives.
>
> I do not know how to get yogurts or cleaning agents in a more eco-friendly format.
>
> How to purchase shower gels shampoo, etc., without plastic containers?
>
> I really believe the awareness and education of the impact of plastic and educating people on practical alternatives really needs to increase. It needs to be communicated through to the key buyers in each household, which is often predominantly women, and the education to the 30–50 age group really needs to increase. This could to be done through businesses and community groups. At the moment it seems to be schools – which really needs to happen, but we need to educate the older generation, who are the ones currently doing the shopping. I'm trying to educate myself but it's not so easy to get information or to know which packaging has the least impact. I think a succinct presentation that anyone could log on and get would be really helpful. Including why it needs to be done, and suggestions if you have to buy single-use which is the best option to choose, e.g. clear plastic over black plastic. Or tin foil over plastic, etc. I know VOICE is doing this at the moment but it needs to be done more widespread – you need more funding to do more of it.

3.4.5 Family

Four of the household participants felt that, while they were environmentally conscious and tried to make shopping choices that reflected this, their families were less than supportive.

> I need to send this to my two teenagers so they can also do the audit – I'm trying to make good choices but sometimes they are scuppered by my teenagers!
>
> Lots of products still in plastic that I need to buy again, causes friction in the house if not available.
>
> My kids – I need to get them more involved in the campaign.
>
> I think my main barrier is my kids, who insist on eating stuff from non-recyclable packaging and using products which come in plastic – I am desperately trying to cut down on my consumerism while they are intent on ramping up theirs.

Provision of affordable plastic packaging-free items in major supermarkets is required to overcome the barriers experienced in reducing disposable plastic use. The combination of a lack of readily available plastic-free items in major supermarkets, where most people shop, and the higher price charged for unpackaged goods makes plastic-free shopping an inconvenient and expensive option. With these barriers, only the most environmentally committed people with the income to do so will make plastic-free choices. In order to significantly reduce plastic use in Ireland, these two major barriers have to be removed.

3.5 Key Findings on Plastic Use

- Plastic use in the kitchen is difficult to avoid. While plastic can be reduced in several cases (such as surface wipes), the main sources are unavoidable food packaging.
- Alternatives to plastic and plastic-packaged bathroom products are available to households; however, many people currently choose to use plastic-based bathroom products such as facial wipes and plastic toothbrushes. Sanitary protection is a large source of avoidable plastic waste.
- Approximately half of the 136 people reporting on their plastic use out of the home used crisp and biscuit packets, disposable drinks bottles and clingfilm-wrapped sandwiches in the week of the audit.
- The largest source of single-use plastic in the classroom is clingfilm wrapping. The majority of lunch box plastic waste generated currently is easily avoidable.
- The main barrier to reducing plastic use as perceived by households is the lack of readily available plastic-free shopping options. To reduce plastic use in Ireland, affordable plastic-free options are required in major supermarkets.

4 The Household Programme

The overall objective of the research was to develop a CS protocol for use in Ireland with the aim of raising awareness of levels of plastic use and leading to plastic waste reduction. To raise awareness of their current plastic use, participants accessed the CS audit on their phones and walked around their homes, noting their use of plastic.

4.1 Success of the Household Programme: Awareness Raising

The majority (62%) of the household programme participants were surprised by the amount of plastic the audit revealed. When asked "Was the amount of plastic present in your life different than you had thought before you did the audit? Were you surprised by the amount of plastic?", household participants said:

> Yes. There is too much plastic in my life!
>
> Yes, I know I used a lot, but walking around the house and actually counting it really shocked me.
>
> There was far more than I thought ... plastic is everywhere and it seems almost impossible to avoid, even with the best will in the world.
>
> Yes, some items you don't even realise are plastic. Yes, very surprised – I am horrified at the amount.
>
> Yes, way too much.
>
> Yes, you don't realise plastic is everywhere. A lot of items in shops come with a lot of unnecessary plastic.
>
> More than expected. Too much plastic.

The aim of awareness raising is to ultimately prompt behaviour change. Several participants expressed surprise at the amount of plastic the audit revealed and indicated a desire to reduce their plastic use following the results of the audit:

> Yes, more than I'd thought. Want to make an effort to cut back. Using what we have.
>
> Yes, I need to cut down.
>
> Yes, I'm shocked at how much plastic we use. We will make some changes, especially easy ones like use soap instead.
>
> It is a reality when you count the plastic items. I was surprised and know all of us need to cut out the use of plastic.

Others stated that they were surprised by the amount of plastic the audit revealed, as they already made an effort to reduce their plastic use:

> Yes. Even more than I realised. No, I feel we're swimming in plastic but find it hard to cut out all but the easiest of options.
>
> Yes, much more than I thought! Very surprised. I thought I was ok!
>
> Yes. Far more than I thought – thought we'd cut down.
>
> Yes, a bit more, even though I am working on it.
>
> Yes, use too much but trying to reduce.
>
> It is huge, so big it's daunting to try to reduce. Yes, as I do try to reduce. Need to be much more organised.

These responses highlight the difficulty people face in trying to reduce their plastic use.

While 62% of the household programme participants felt the plastic use audit raised their awareness of their plastic use, 33% said it did not (Figure 4.1). These were environmentally conscious households that were already very aware of their plastic use as they are actively trying to reduce it, as the following statements show:

> No, I was very aware of the amount of plastic we have and am trying to actively reduce it. It is too much.

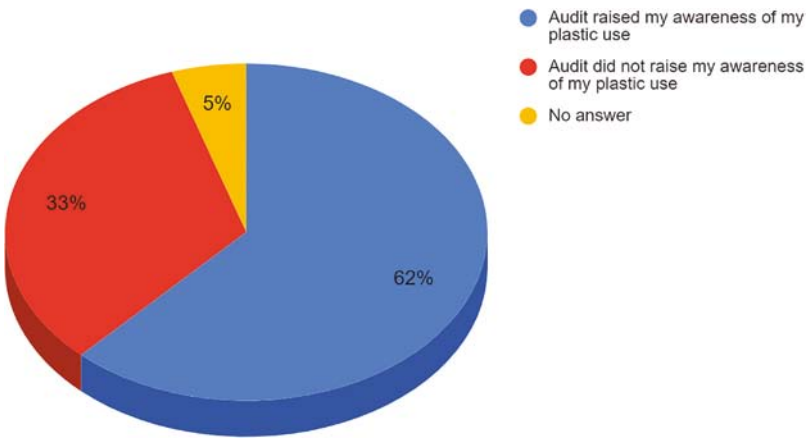

Figure 4.1. Awareness raising through use of the plastic use auditing tool by household programme participants.

> I know even with consciously trying to reduce my plastic it is still in my house. My husband and children are always buying more plastic and it causes friction. No, I am very aware.
>
> No, I am very aware of every bit of plastic that comes into my house. I find it quite stressful!! If I was living on my own, I think I would be nearly plastic free aside from major appliances. I find it harder to avoid with a husband and children who are supportive until they are threatened with losing something they enjoy on a daily basis.
>
> No, I'm well aware of the plastic in my household. Not surprised. Trying to cut it all out one step at a time!
>
> No, have started serious reduction last year.
>
> No. I knew there would be a huge presence of plastic. I am at present attempting to reduce my plastic footprint.

The final 5% did not answer the question on whether or not they were surprised by the amount of plastic in their lives. However, they did provide their thoughts on their plastic use; these are presented in Section 3.4 on barriers to reducing plastic.

With 62% reporting that engaging with the CS protocol raised their awareness of their plastic use, this suggests that the protocol developed as part of the research is a valuable tool.

4.2 Success of the Household Programme: Behaviour Change

Following on from the audit, each household was sent a report (see Appendix 1) outlining changes they could make to their current plastic use. These were broken down by ease of implementation, with suggested changes such as moving away from coffee capsules or multi-surface cleaning wipes in the "simple to implement" category and changes such as shopping in refill shops or moving to reusable sanitary products in the "more challenging to implement" category. Each household was encouraged to look through the report, think about what changes were realistic in their life at that point, and then sign up to specific plastic reduction pledges. Setting plastic pledges helps households to pin down the specific actions they would like to take to make changes towards reduced plastic consumption. Focusing on specific and achievable goals can help people move from environmental aspirations to making them a reality. The aim of pledge setting was to move participants from having had their awareness of their plastic use raised onto the next step – behaviour change.

4.2.1 Selecting plastic pledges

Of the 39 households that completed the audit, 16 chose to go on and set pledges. The list of pledge ideas that households could select from is presented in Box 4.1, along with the number of households that signed up to each pledge.

The pledge most commonly selected by participants was "Use loose washing powder and dishwasher

Box 4.1. Plastic pledges and the number of households that selected them

- Use a reusable mug instead of take-away cups – 9
- Use a refillable water bottle instead of buying water – 10
- Buy loose fruit and veg and place it directly in the basket – 7
- Shop in supermarkets that offer paper bags for fruit and veg – 4
- Take a reusable container to the deli and meat counter when I go shopping – 6
- Bring my own reusable shopping bags – 10
- Choose canned soft drinks instead of plastic bottles of soft drinks – 6
- Ask for drinks to be served without straws – 8
- Sign up to a veg box scheme – 3
- Shop in a farmers' market to avail of loose fruit and veg – 4
- Store leftovers in Tupperware or other reusable containers instead of wrapping them in single-use clingfilm – 10
- Use hot water and vinegar or cleaning sprays instead of surface wipes – 9
- Use loose washing powder and dishwasher powder or liquid instead of plastic-wrapped tablets and capsules – 11
- Use a cafetière or stove pot to make coffee instead of machines that require plastic pods – 7
- Use a bar of soap instead of liquid soap in a plastic single-use dispenser – 8
- Use soap and water or a liquid cleanser instead of facial wipes – 8
- Use a bamboo toothbrush instead of a plastic one – 6
- Use a menstrual cup instead of tampons – 2
- Use a reusable sanitary towel instead of disposable towels – 1
- Make nude lunch boxes for the children, without single-use plastic – 4
- Pack a nude lunch box for work or take a reusable container along when buying lunch at a deli counter – 4
- Switch to reusable nappies – 1
- Buy dried goods in larger quantities – 4
- Use cotton reusable bags and glass jars to buy grains, legumes, herbs and spices, dried fruit, nuts and olive oils from health food shops that offer refills – 4
- Use refill shops when available to refill your existing containers with new household cleaning products, shampoo, conditioner and shower gel – 7
- Use reusable razors instead of single-use razors – 5
- Use matches instead of disposable lighters – 7
- Stop using disposable cutlery, coffee stirrers, plates, etc., when out and about or hosting events – 7
- Use shampoo bars instead of bottled shampoo – 6
- Other plastic pledge (please provide details)

powder or liquid instead of plastic wrapped tablets and capsules" (Figure 4.2). The pledge selected the least often was "Switch to reusable nappies". This pledge is not only one of the more challenging options, it is also not one that applies to all participants, with only 10 participating households stating that someone in their household uses nappies. Other pledges that had a low uptake included changing to reusable sanitary protection, using refill options for dried foods, purchasing fruit and vegetables from farmers' markets, and signing up for a vegetable box scheme.

Switching from disposable to reusable sanitary protection may be a difficult option for many people. Choice of sanitary protection is often made at the onset of menstruation during puberty, and Peberdy *et al.* (2019) report that product familiarity is a consideration in menstrual products that may affect the uptake of reusables.

The low uptake of the pledge to use refill options for dried food may be simply a lack of access to shops offering this option, or there may be cost considerations. Finally, buying fruit and vegetables from farmers' markets and through vegetable box

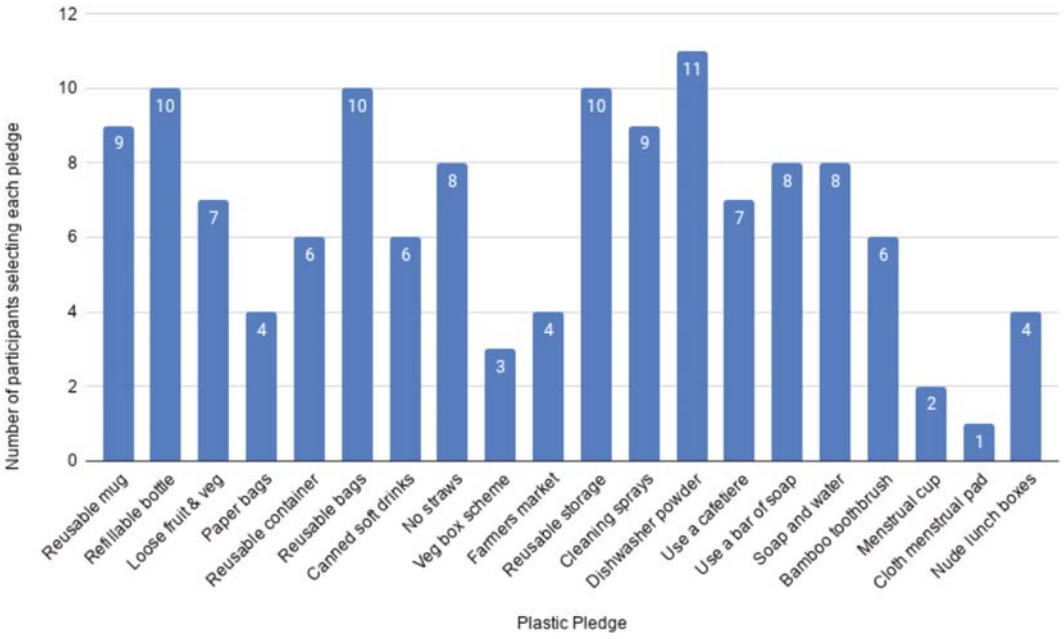

Figure 4.2. Number of household programme participants selecting each plastic pledge.

schemes may not be a financially viable option for all of the participants, and this may be a factor in the low uptake of this pledge.

As expected, straightforward pledges such as “Use a reusable mug instead of take-away cups”, “Bring my own reusable shopping bags”, “Use a refillable water bottle instead of buying water” and “Ask for drinks to be served without straws” were selected by over half of the participants. These simple solutions to reducing personal single-use plastic use have been well publicised and a cultural shift away from these disposable items is well under way in Ireland.

However, several pledges that were considered easily achievable by the project team had a lower than expected uptake-, with only four households pledging to “Make nude lunch boxes for the children, without single-use plastic” and “Pack a nude lunch box for work or take a reusable container along when buying lunch at a deli counter”. A nude lunch box is one in which the food is unpackaged.

4.2.2 Maintaining plastic pledges

Following on from pledge setting, contact was maintained with households to offer support and to establish how successful pledge setting was in changing ongoing behaviour.

The pledge system prompted participants to take action and make changes to their plastic use. The participants reported on their progress over the 4–5 months that followed their signing up to the pledges. The responses were positive: participants engaged with the pledges and made changes where they could, and reported successfully keeping the majority of their pledges. In their check-in emails, some of the participants commented:

> All going well. We have changed from soap dispensers to normal soap and got soap trays instead, also changed to soap body bars instead of shower gel and using bamboo toothbrushes, too. The only one on the list we have not made progress on is the clingfilm wrap for leftovers, so I’ll work on that.
>
> I’m doing pretty good on the pledges. Still trying to cut as much plastic out of my daily life as possible. It’s very frustrating how much plastic there is. But it’s normal for me now to try to avoid plastic. I’m trying to encourage friends to do the same.
>
> I have bought my first bamboo toothbrushes for the kids and have also sourced shampoo bars from a stallholder at the weekly market. So, I’m happy to make even slight improvements.

> We have really been making an effort to reduce plastic and it's a great feeling coming home without the packaging! Since starting to really look at plastic consumption, I really cannot believe how much plastic is all around! It's crazy…
>
> Cloth nappies are working very well on my newborn – I thought I'd want to use eco-disposables as the easy option but my husband is keeping up with the washing and the cloth is so much more reliable!
>
> The water filter jug has been a great success. There have been no bottles of water purchased since it arrived! Clingfilm has now been almost completely eliminated from the house, replaced instead by beeswax paper and reusable tubs.
>
> Shampoo bars working well – my husband has found a bar he loves cos it leaves his hair textured. I'm going to trial a child's shampoo bar on the girls and conditioner bar on all of us when what we have run out.
>
> I am doing ok [with the pledges]. I am more mindful of buying loose fruit and vegetables and must start taking containers to the deli.
>
> I have cut down on take-away tea and coffee. I generally have a quick cup before leaving home or when I return. When I do, I bring a reusable cup in the car. I bring water in the car or drink tap water when I am somewhere. We bring water bottles for our children. We have metal washable straws for home and bring them when we go out (when we remember).
>
> Our plastic pledges are going well. Some of them were easier than others. We cannot realistically travel or afford to shop all the time in any of the refill shops. Biggest problems experienced are lack of alternatives at reasonable costs. We are retired now and like most people have to watch what we spend. Think we are pretty much achieving most of the others ... most of the time.

Participating in the household programme provided people with a list of small and specific changes they could make to their shopping habits to reduce plastic use. This gave them a space in which to try new products and ways of shopping and see if they found these changes were a possibility for them going forward.

The experiences of households in maintaining their selected pledges varied. There was no common theme of ease or difficulty for any particular pledge. For example, households reported both positive and negative experiences of using shampoo bars. Those that had positive experiences planned to continue using them, while those that had negative experiences decided not to continue with this pledge. In addition, households started from different levels of experience of plastic-free living, with some at the beginning of their journey and taking on reusable cups for the first time, and others experienced in cutting out plastic and taking on ambitious pledges such as using reusable nappies.

By maintaining these changes over a period of between 4 and 5 months as part of the programme, it is hoped that the behaviours have become normalised and embedded in the participants' daily lives and will be maintained into the future as the programme ends. Responses from participants in the final pledge progress check-in at the end of the programme indicate that this is the case, with several mentioning that the switches they made are now part of normal life. One participant concluded by saying, "The changes we have previously made are now embedded into our behaviour and I do not see us lapsing".

4.3 Key Findings from the Household Programme

- The central objective of the household programme was to raise participants' awareness of their plastic use. With 62% of participants expressing surprise at the amount of plastic the audit revealed, the household programme has succeeded in achieving this objective.
- The participants who chose to engage further with the programme, set plastic reduction pledges and maintain contact with the project team succeeded in reducing their disposable plastic use. On completion of the programme, pledge participants expressed intentions to continue making reduced plastic choices in the future, as they feel that these behaviours are now normalised within their lives.

5 The School Programme

5.1 Success of the School Programme: Raising Awareness

5.1.1 Raising awareness of levels of home plastic use

As part of the school programme on plastic reduction, each post-primary school pupil was asked to undertake an audit of the disposable plastic in their home. One hundred post-primary school pupils undertook the audit. Directly following on from this audit, they were asked questions to determine whether or not the amount of plastic surprised them by being more than they had realised. The audit succeeded in raising awareness in the majority of the participating secondary school pupils, with 63% surprised by the amount of plastic it revealed.

When asked "Was the amount of plastic present in your life different than you had thought before you did the audit? Were you surprised by the amount of plastic?", post-primary school pupils said:

> Yes, I thought I was using less plastic.
>
> Yes. Very scary.
>
> Yes. There was way more plastic use than I expected.
>
> Yes, I didn't realise how much we rely on plastic.
>
> Yes, it's a huge amount of plastic.
>
> Yes, too much plastic in my life.
>
> Yes, I thought my family was better at their use of plastic. It's pretty disappointing.

Based on the above quotes, the audit of home and personal disposable plastic use succeeded in its aim to raise awareness among many of the teenage participants.

5.1.2 Raising awareness of the issues surrounding plastic use

Teachers from the 15 participating schools were asked to complete an evaluation form following the programme. Twelve teachers submitted the form.

They were asked if the programme had prompted a change in pupils' awareness of problems created by the use of plastic. They could select to reply "no change", "a small change" or "a large change". All teachers reported an increase in pupils' awareness of plastic issues, with 58% of teachers reporting a large change in awareness levels.

Teachers were asked what level of awareness of plastic issues they felt that their students had prior to the programme. Seven teachers felt that their pupils had a low awareness level prior to the programme, while five felt that their pupils already had a high level of awareness. On examination of the relationship between pupils' prior awareness levels and the changes in awareness levels prompted by programme participation, the chi-squared test results do not show a significant difference in the changes of awareness experienced by each group. The chi-squared test examines the relationship between two variables. In this case, the variables are prior awareness levels and increases in awareness levels. The chi-squared test revealed that prior levels of awareness did not affect the levels of increased awareness of the topic following participation (Figure 5.1).

5.2 Success of the School Programme: Behaviour Change

As part of the programme, schools were encouraged to develop a plastic reduction action plan. The programme supported this through auditing current plastic present in the classroom to allow schools to identify the main sources of plastic, providing details of alternatives to commonly found disposable plastics in schools and having in-class discussions and action plan development built into the programme timetable.

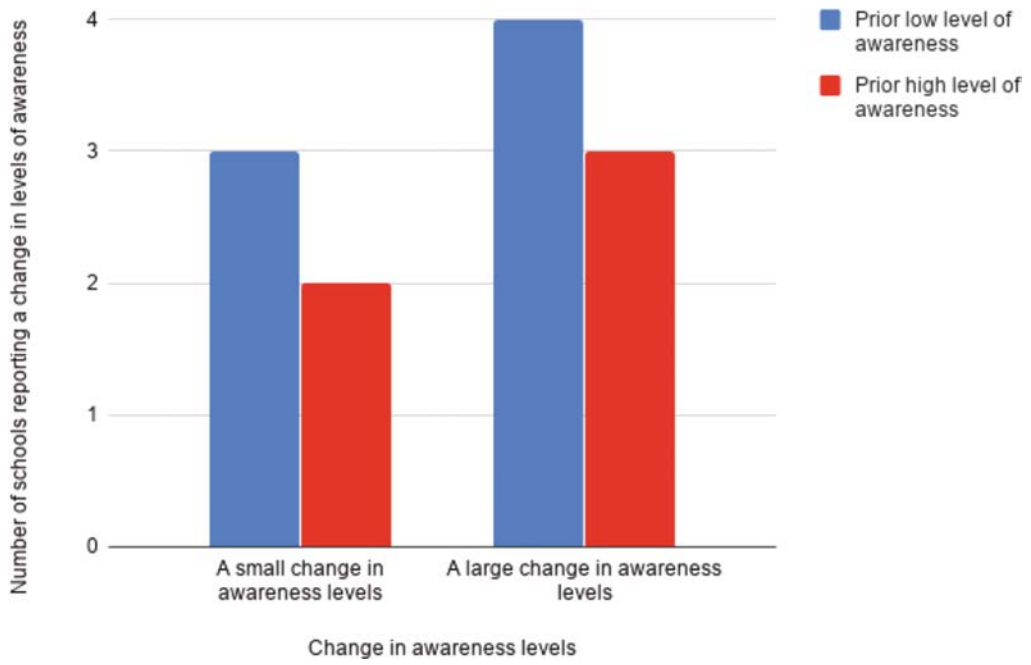

Figure 5.1. Change in pupils' awareness levels of plastic issues subsequent to the school programme.

In the evaluation of the programme, teachers were asked whether or not the programme had helped them to develop a plastic reduction action plan for the school. Six of the 12 schools that completed the evaluation report stated that they had used the programme to develop a plastic reduction action plan – half of the primary schools and half of the post-primary schools.

We asked teachers to let us know of any changes to plastic in lunch boxes or in the classroom as a result of participating in the programme. They said:

> Children have been encouraged to pack reusable lunch boxes, use reusable plastic bottles, no single-use bottles allowed, spot checks to encourage plastic-free lunch boxes.
>
> [There has been a] reduction in single-use plastic and an increase in reusable containers and water carriers.
>
> I have seen a lot more children with reusable bottles as opposed to plastic ones!
>
> The canteen has switched to wooden knives and forks and lets you bring in your own lunch boxes for hot food.
>
> It hasn't come about yet, but it has added fuel (and student voices!) to our aim to lower the amount of single-use plastic bottles in school, by encouraging the purchase of aluminium reusable canisters or even getting the school to sponsor/subsidise same.
>
> We already have a reusable lunch box and drink bottle policy in the school. We have decided as a school to NOT buy Christmas crackers this year to reduce plastic (wrapping and contents) waste.

Two teachers reduced plastic waste in their classroom through children taking waste home with them:

> We encourage children to take home their own waste as part of a green school.
>
> The children also bring home uneaten food and lunch litter to reduce waste in school.

Changes were made to the programme following this feedback to clarify to teachers that the aim is to reduce plastic waste overall by moving towards plastic-free lunches, rather than to simply reduce the plastic waste left in the classroom.

Notably, in schools in which school meals are provided, participation in the programme did not prompt changes in their plastic use:

> Not many [changes], a lot of wrappers come from food supplied to school for breakfast club.
>
> Supplied lunches to the school is a big problem as SO much is plastic packaged.

Further work is required in this area, particularly given the January 2019 Irish government decision on single-use plastics. This stated that all government departments and public bodies, including state agencies and schools, will not purchase or supply, directly or indirectly, single-use plastic cups, single-use cutlery and single-use straws. Further work is necessary to establish ways to implement this in school catering.

Finally, teachers were asked if, overall, they would say the programme has had an impact. Eight replied with a yes, two said no (notably, both of these schools were on the school meals scheme), one teacher said that more time was needed to see the impact, and the final school did not answer directly but replied that the programme would have a great impact as part of a Green School theme.

5.3 Feedback on the School Programme

In total, 12 schools completed evaluation forms providing us with feedback on the programme: eight primary and four post-primary schools. Feedback is divided into a number of sections and any changes made to the programme in response to teacher feedback are outlined.

5.3.1 Running the programme

First, we asked questions on how they had selected to run the programme.

The recommended time frame for running the programme was 4 weeks, with one class a week. Seven (58%) of the schools had used the recommended time frame, four schools had run the programme in less time, and one school had taken 6 weeks.

When asked how they felt about the recommended time frame of 4 weeks, teachers responded:

> Very good. Long enough to keep their interest. I did not lose them.
>
> Very doable – we were able to complete in 2 weeks as we had completed very similar work for our Green Flag application – Global Citizenship – Litter and Waste.
>
> It is possible to do it over 2 weeks.
>
> Good, time was sufficient to see progress.
>
> Four weeks is plenty of time to run the programme.
>
> This would be adequate for primary schools, but in secondary schools class contact is 40 mins, maybe 3 or 4 times per week. This made continuity difficult.
>
> This is adequate. It gives the option of 2 weeks of two lessons or 4 weeks of one. Teachers want flexibility.
>
> Certainly achievable, but flexible enough to be extended or adjusted as needed.
>
> Good for beginners of Green Schools programme. Can be adapted.

As only one school had taken more than 4 weeks to complete the programme, the recommended time frame was left unchanged.

Fifty per cent of the schools chose to participate in some of the suggested additional activities. One class wrote to the head offices of the major supermarkets, another participated in a beach clean and students from one Dublin-based post-primary school went to plastic protests.

Eleven of the 12 schools chose to use the recommended resources provided, such as the PowerPoint presentation, video clips and websites. Teachers said:

> It was a good “hook” to get their attention. Plastic in the food chain shocked them.
>
> Very good – visual impact drove home the message.
>
> They were very helpful and child friendly.
>
> Video clips very effective.

> Yes, the videos appealed to visual learners and made for more engaging lessons!
>
> Yes, the class found them very informative.
>
> Very much so, effective and attention grabbing but not too detailed that students lost interest.
>
> Yes, the videos are very good and age appropriate.

However, two teachers made suggestions for improvements to the PowerPoint lesson:

> PowerPoint sent was very useful, more of this would have been good.
>
> The PowerPoint presentation was a bit repetitive.

The responses to the resources provided were positive overall, so no changes were made.

All teachers felt that the programme had met their expectations and gave positive feedback on the programme. Teachers said:

> It provided the students with an opportunity to reflect on the misuse of plastic. Look at their role in this debate.
>
> Very well laid out – strong science and geography curricular links.
>
> Good programme, great to inform kids and families about the effect of plastics.
>
> Very suitable for each age group.
>
> Good resources and activities. Easy to follow.
>
> Awareness was raised, action was taken, a result was achieved.
>
> The programme made significant changes to the way we deal with plastic in our school.
>
> It had a lot of information and a very good structure, designed to follow through and put learning into action.
>
> The programme is well thought out and practical.

Eleven of the teachers said that they would run the programme again. All said that they would recommend it to other schools.

5.3.2 Information in the programme

Teachers were then asked questions on the age appropriateness of the programme and the level of information provided. All felt that the programme was age appropriate. While 11 teachers stated that the information level was just right, one felt it was too complex. Teachers said:

> There was flexibility. I could use or add to the material. I added additional video clips and I did not use the animation clip with 5th and 3rd years.
>
> Child-friendly, modern, effective use of language.
>
> Lessons were very detailed and informative and suited to class level.
>
> The actions taken were age relevant and required decision-making and planning.
>
> It is clear that thought has gone in to differentiating the content between upper and lower ends of the primary system. Well done.
>
> Everyone was able to understand everything and complete the tasks.
>
> It was certainly age appropriate and fit with our GCE theme for the group. Plenty of hands-on, active methodologies to keep them engaged.

Two teachers found the material too complex for the age group they taught:

> It was fine for first class but junior classes found it a difficult concept.
>
> Appropriate for senior classes. Just a lot of information provided.

As the majority found the information level just right, we did not make changes in this area.

5.3.3 Ease of teaching the programme

Teachers were then asked about the ease of teaching the programme. Half of the teachers found the programme either easy or very easy to teach, three found it neither easy nor difficult and one found it difficult. When breaking down the data into individual components of the programme, we found that the area that caused an issue for primary school teachers was the use of the science notebook. Only two of the eight primary school teachers chose to use the science notebook, though it was listed as a core part of the programme.

Three found gathering data on plastic use in the classroom and plastic present in school lunches difficult. Following on from this finding, the text in the programme has been changed to clarify the steps necessary to gather these data. The main area of confusion was in schools where pupils are required to take their lunch waste home with them.

Eleven teachers felt that they were provided with enough information to allow them to teach the programme effectively, while one felt that they did not have enough information.

Teachers were asked to comment on any issues they had in teaching the programme, and several made suggestions at this point.

- Five stated that their difficulties in teaching the programme were due to a shortage of time in the school week.
- One teacher felt that the programme could be simplified, with a breakdown of what to do in each lesson for ease of use. Changes were made to the programme to reflect this.
- One teacher said that something extra was needed at the end for dealing with the plastic bottles collected. As plastic drinks bottles are recyclable, they can be placed in the recycling bin at the end of the programme.
- A teacher said that an active workshop might have given them more support. Providing a workshop to schools is outside the remit of the programme and it is not possible to offer this service to schools.
- One teacher said the follow-up (e.g. what to do with the home and school audit) could be somehow improved; for example, sending a checklist and getting children to tally the totals would make it easier to complete and to collate data. We are trying to avoid overuse of worksheets and instead encourage use of the science notebook for data gathering.

5.3.4 Enjoyment of the programme

The majority of teachers (10) felt that participating in the programme was either enjoyable or very enjoyable from the perspective of the pupil. The remaining two teachers felt that their pupils found the programme neither enjoyable nor unenjoyable.

Teachers felt that the most enjoyable aspects of the programme from a pupil's perspective were the PowerPoint lesson on plastic and the classroom discussions on ways to reduce plastic at home and in school:

> The pupils were very engaged with the topic and eager to learn more. Increased everyone's awareness around plastic use.
>
> Children have enjoyed learning about reducing plastic and really took it on board. More aware of cutting down plastic in lunch boxes.
>
> They were very interested and surprised with the findings.
>
> The pupils were content to go about this work. They were not as excited as they might be for an art or PE lesson, but they were well engaged throughout and enjoyed a new take on a topic they'd covered.
>
> The group of students I have would not be highly academic and in other classes I would have had trouble getting them to focus. This programme and the hands-on nature and active teaching really suited them. I was questioned, the debates were meaningful and there was an audible sigh in the room when we came to the end. "Can't we do it again?", "What about getting aluminium bottles!", "We can't stop now!"

All of the teachers stated that they found teaching the programme enjoyable. When asked to expand on this, they said:

I felt I was making a difference, challenging the students to think and act responsibly. Many did not think it was worth doing as "it was not their problem". This provided me with the opportunity to give an alternative to that attitude.

I'm the Green-Schools coordinator, so really enjoyed the programme, just wished I had heard about the programme earlier on in our Green-Schools application (i.e. it would have been fantastic at whole-school level if we were in year 1 of our application. We had already covered a lot of the content).

The children were enthusiastic and had lots of ideas. We also had a local shopkeeper in to talk about reducing plastic use and waste on groceries, etc., which was great.

Yes, as it's such an important issue as well. It was great to have clear lessons provided.

Content was good and subject matter is very important.

The programme was interesting, well resourced and informative for both staff and students alike.

It is an area I had some work done in previously, but being able to focus on just plastic and its overuse was great. The practical idea of collecting the plastic would never have occurred to me but was very impactful and, because we used my classroom, other year groups became interested and asked what was going on with all the plastic, so I know we've raised awareness.

5.3.5 Suggested improvements to the programme

Finally, we asked teachers how they felt we could improve the programme:

It's a very good programme – perhaps more PR/social media/link to schools to highlight that such a programme exists/speaker to the school, etc.

More guidance or a workshop within the schools, maybe programme could be confined to 1 month at the beginning of the year for overall participation.

More child-friendly presentations, videos, etc. Lessons ready to be used to save teacher planning.

I do not think it is fair to say improved as it is an excellent programme. No doubt new material and statistics will come along and they can be added. I did adjust the walking debate, showed another YouTube clip and made a PowerPoint, which I am happy to pass onto you.

The supermarket visit was too difficult to organise properly. Some other activity needs to be substituted, even though the idea is great. Too much organisation required.

Have a quiz before the programme to see how much people know and then do the same quiz on the students to see how much they improve.

I know the school gets a certificate but could this be expanded to include student certificates? Or some kind of recognition of their work – a competition for the creativity of the collection of bottles?

Simplify content for teachers. Lesson layout on one page. Reduce home audit worksheets to one or two pages.

Just keep getting it out to more schools!

You could team up with An Taisce and use it in Green Schools programme. Repak also run a similar programme. There seems to be some overlap between organisations and unfortunately there is limited time in the primary school day to do more.

Where possible, the comments were taken on board and improvements were made to the final programme.

5.4 Key Findings of the School Programme

- The plastic use audit succeeded in raising awareness of household plastic use in the majority

of the participating post-primary school pupils, with 63% of pupils surprised by the amount of plastic it revealed.

- The school programme succeeded in raising pupils' awareness of the issues surrounding plastic use. All teachers reported an increase in pupils' awareness of plastic issues, with 58% of teachers reporting a large change in awareness levels.
- Pupils' awareness levels of plastic issues prior to participating in the programme were not related to gains in their awareness levels.
- Fifty per cent of schools that completed the evaluation form stated that they used the programme to assist them in developing a plastic reduction action plan.
- In schools provided with school meals, participation in the school programme did not prompt changes in their plastic use.
- Teachers reported that the programme met their expectations and was of sufficient length, age appropriate and well resourced.
- Overall, teachers did not find the programme difficult to teach and felt that they had enough information to teach it effectively. However, the use of a science notebook was not favoured by participants, and changes were needed to assist classes in conducting the plastic audit. Changes were made to the programme following feedback from teachers taking part in the pilot programme.
- Teachers felt that pupils enjoyed the programme and they enjoyed teaching the programme themselves.
- Teachers felt that they would be happy to run the programme again and would recommend it to other schools.

6 Environmental Attitudes, Self-efficacy and Pro-environmental Behaviour

6.1 Environmental Attitudes

6.1.1 The urgency of environmental issues

Participants were asked how urgent they feel environmental issues are. All household programme participants felt that environmental issues were an urgent issue. Ninety-three per cent of the 100 teenage respondents felt that environmental issues were an urgent issue, 3% felt that they were an issue for the future and 4% were unsure.

6.1.2 Most pressing environmental concerns

Participants were asked to tell us about any environmental issues they felt strongly about. In the household programme, 28 participants responded. The responses were coded and then categorised to reveal the participants' environmental concerns.

Waste was the biggest category of concern that emerged from the data. Under the waste category, there were statements falling under five codes. These were lack of recycling infrastructure, littering, plastic in oceans, unwanted packaging and lack of education. There were 23 references to codes within this category. It is unsurprising that waste was raised as the biggest concern, as the households had selected to participate in this waste reduction programme and waste was therefore an issue of concern for them and was at the forefront of their minds at that time.

The second biggest category of concern that emerged from the data was climate change, with 12 references to either climate change directly or to codes within this category. There were three codes under the category of climate change: lack of adequate access to environmentally friendly transport options, home heating and lack of government and business action on climate change.

The third category of concern was biodiversity. We found seven references to biodiversity directly or to codes within this category.

Teenagers participating in the school programme were also asked which environmental issues they feel strongly about. Forty-seven per cent of the 100 pupils offered their thoughts on the environmental issues that concern them. The concern most frequently mentioned was climate change, with 25 references either to climate change directly or to the effects of climate change. This is unsurprising given the level of current public concern over the issue and the involvement of teenagers in this issue. Waste issues were raised 13 times, with many focusing on the negative impacts of pollution from waste on animal life and habitats. Six participants responded that they had no environmental issues they felt strongly about.

6.1.3 Caring about the environment is important to me

Participants were then asked if caring about the environment was important to them. The majority of respondents felt that it was very important.

All of the household programme participants felt that caring for the environment was important to them.

Of the 100 secondary school participants, 87% agreed or strongly agreed with the statement "Caring about the environment is important to me". Nine per cent of teenagers were unsure if caring about the environment was important to them and 4% felt that it was not important to them.

6.1.4 I think about how what I do affects the Earth

With the majority of people feeling that environmental issues were urgent, expressing concern over waste and climate issues and stating that caring for the environment was important to them, we went on to ask them whether or not they thought about how what they do affects the Earth.

Participants in the household programme were very conscious of their impact on the environment, with 100% agreeing or strongly agreeing with the statement "I think about how what I do affects the Earth". This was a self-selecting group of households, with 100%

feeling both that environmental issues were urgent and that caring for the environment was important to them.

Sixty-one per cent of teenagers agreed or strongly agreed with the statement “I think about how what I do affects the Earth”. Twenty-three per cent were unsure and 16% disagreed or strongly disagreed. It is interesting to see that, while 93% of 100 teenagers surveyed reported feeling that environmental issues were urgent, and 87% reported that caring for the environment was important to them, only 61% thought about the impact of their actions on the environment.

6.2 Self-efficacy

Self-efficacy is defined as the belief in one’s ability to influence events that affect one’s life and have control over the way these events are experienced (Bandura, 1994). It is the belief in one’s ability to succeed in specific situations or accomplish a task. In areas where we feel we have low levels of self-efficacy, we are less likely to engage (Bandura, 1986). If we feel we have no control or influence over a situation, there is no motivation to engage with it. Self-efficacy is an important concept in the field of environmental psychology, as a belief in our own ability to make a difference is vital to the decision to engage in pro-environmental behaviours.

Very high levels of self-efficacy were expressed by the participants in the household programme, with 98% either disagreeing or strongly disagreeing that they cannot do anything about the state of the environment (Figure 6.1). Only one participant felt that there was nothing they or their family could do about the state of the environment. This level of empowerment among participants is unsurprising, as people who feel they cannot do anything about environmental issues are unlikely to sign up to a plastic reduction programme.

Teenage participants reported lower levels of self-efficacy than the adult participants. While 98% of adults disagreed or strongly disagreed with the statement “There is nothing my family and I can do about the state of the environment”, only 74% of teenagers felt the same (Figure 6.2).

This disparity between the two groups can be explained by the adult group being self-selecting, while the teenage group was required to participate as part of a class in school; this should not be used to infer lower levels of environmental self-efficacy in teenagers than in adults.

We examined the effect of a number of variables on levels of environmental self-efficacy expressed by the 100 teenagers who participated in the programme. We found that age is not a statistically significant variable in determining self-efficacy. Data were submitted from all post-primary school year groups, from first to sixth years, and the age group of the teenager did not affect feelings of empowerment.

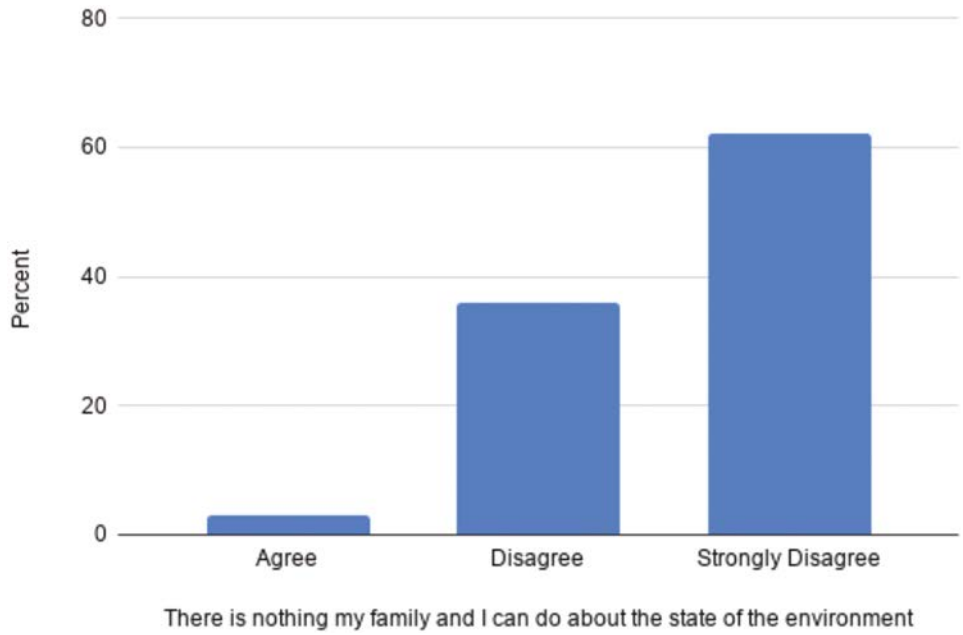

Figure 6.1. Environmental self-efficacy in household programme participants.

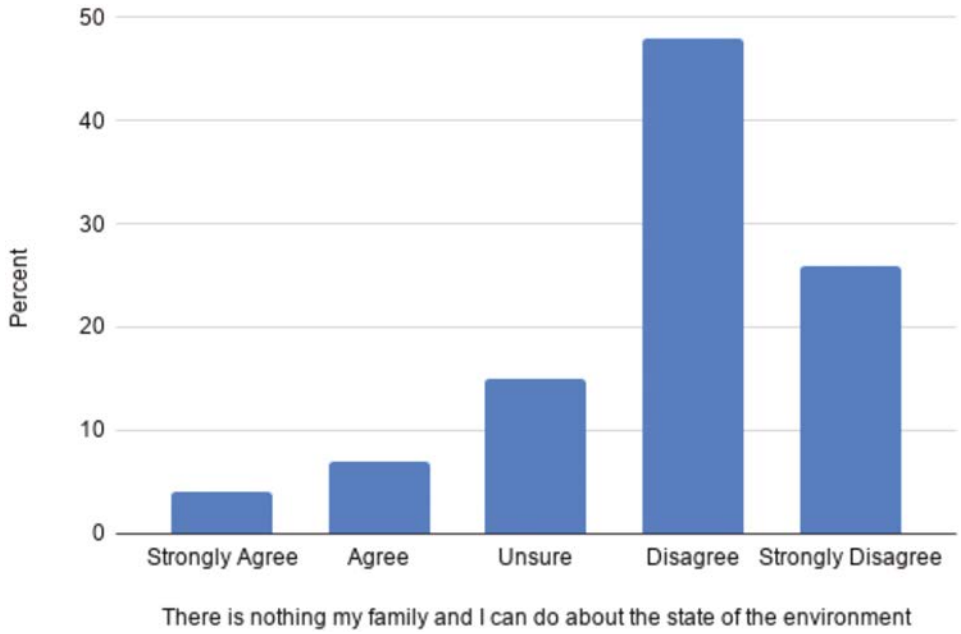

Figure 6.2. Environmental self-efficacy in school programme participants.

We also found that the school participants attended did not significantly affect feelings of self-efficacy. However, the chi-squared test shows that gender is a significant variable ($p = 0.027$), with girls feeling more empowered to make an impact on the environment than boys (Figure 6.3).

A belief in the ability to make a difference to the state of the environment is a requirement for environmental action. Therefore, low levels of environmental self-efficacy in boys is a concern. Thirty-nine per cent of the boys surveyed either were unsure whether they could make a difference to the environment or felt that they could not make a difference.

Can we foster feelings of environmental self-efficacy through environmental school programmes? All teachers stated that the school programme prompted a change in pupils' belief in their abilities to reduce plastic use, with 50% feeling that it prompted a large change and 50% feeling that it prompted a small change.

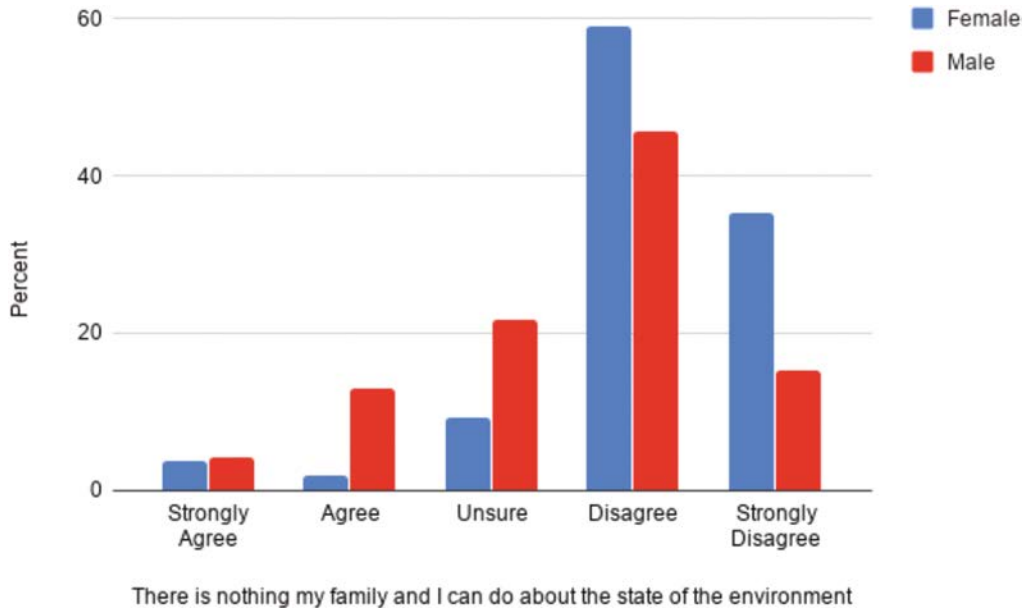

Figure 6.3. Gender differences in levels of environmental self-efficacy.

6.3 Pro-environmental Behaviour

Participants were asked to tell us about any pro-environmental behaviours they currently engage in. The self-reported pro-environmental behaviours were coded into different types of behaviours. Analysis of the responses led to the development of 19 codes. These were then grouped together to form seven categories of pro-environmental behaviours. The work of Stern (2000) was consulted when developing the categories; however, additional categories were developed for reported environmental behaviours that were not covered by his classification system.

In Stern's 2000 paper, "Towards a coherent theory of environmentally significant behavior", he developed a classification of environmentally significant behaviour. These behaviours are categorised as activism, non-activist public sphere and private sphere. Within the private sphere there are several subcategories: purchase of major household goods or services, use and maintenance of environmentally important goods, waste disposal and green consumerism. This system of classification was used to inform the analysis of the self-reported behaviours of the programme participants.

The main categories that emerged from the analysis are shown in Table 6.1.

6.3.1 Private sphere pro-environmental behaviours

The majority of the activities undertaken by the participants were private sphere behaviours, with most falling within the subcategories of green consumerism and waste disposal.

Table 6.1. Self-reported behaviours of the programme participants

Behaviours	
Private sphere	**Public sphere**
Green consumer choices	Activism[a]
Waste disposal[a]	Non-activism public sphere[a]
Use of environmentally important goods[a]	
Gardening for biodiversity	
Green transport	

[a]Categories developed by Stern (2000).

Green consumer choices

Green consumerism is a large category that encompasses statements on upcycling, reducing consumption, selecting reusable items over disposable items and choosing to buy more environmentally conscious food or growing your own food in preference to buying it, to name just a few. Behaviours grouped within this category were mentioned 63 times. Below are some quotations from participants that were categorised as green consumerism behaviours:

> We don't buy new clothes and try and keep toys made from natural materials.
>
> Shop for veg and fish at the farmers' market.
>
> Get a veg box with no plastic every 2 weeks.
>
> Small things only, e.g. bamboo toothbrushes, metal water bottles and coffee cups.
>
> Try refill options when available in soap and shampoo.
>
> I have gone vegetarian and my husband and kids only have meat 2–3 times a week now.
>
> Use bread soda and vinegar for cleaning!
>
> Trying to avoid plastic.
>
> Stop buying bottled water.
>
> Upcycling and reusing everything, from furniture to clothes.
>
> Grow organic veg.
>
> Shop local.
>
> Buy only what I need.

Waste disposal

There were 22 references to selecting particular waste disposal options as a pro-environmental behaviour, with recycling listed by 15 participants and composting listed by 7. Recycling can be considered a low-effort pro-environmental behaviour in Ireland, as kerbside recycling services are readily available and recycling is a normalised behaviour. While only 15 explicitly mentioned it, it is likely that all 39 participants recycled.

Gardening for biodiversity

Six participants listed gardening as an environmental activity they undertook. The aim of the gardening was to increase biodiversity. Below are some quotations from participants within this category:

> Rewilding the garden.
>
> Not using pesticides.
>
> Planting trees and pollinators. I'm currently planting a native wood.

Green transport

Five participants listed making green transport choices as a pro-environmental behaviour. They stated that they walked or cycled when possible, in preference to driving.

Use of environmentally important goods

Two participants responded with behaviours falling under Stern's category "Use of environmentally important goods". The responses focused on reducing home heating oil use and home insulation.

6.3.2 Public sphere pro-environmental behaviours

The two categories of public sphere pro-environmental behaviours outlined by Stern (2000) and engaged in by our household programme participants were activism and non-activism public sphere.

Activism

Statements on pro-environmental behaviours that were coded as involvement in environmental organisations and spreading environmental messages to others were grouped under the category of activism. There were nine statements within this category. Below are some quotations from participants whose responses were categorised as activism behaviours:

> I am running an environmental campaign in the village I live in to help others to live more sustainably.
>
> I joined the local environmental network to share ideas and organise events, visiting schools to inform and encourage teachers and students on environmental and sustainability issues.
>
> Talk to people, and generally try to influence my acquaintances.

The statements above are forms of community activism, with participants putting on events and promoting ideas that are alternatives to the dominant system. However, definitions of activism can include economic activism, in which people use their economic power for change. In this way, it is possible to view green consumerism as a public sphere activism behaviour as well as a private sphere behaviour, as listed above.

Non-activism public sphere

Two of the participants listed their voting choices as a pro-environmental behaviour, with both stating that they vote for the Green Party.

6.4 Key Findings on Environmental Attitudes, Self-efficacy and Pro-environmental Behaviour

- All household programme participants felt that environmental issues were urgent. Ninety-three per cent of the 100 teenage respondents felt that environmental issues were urgent.
- Waste issues and climate change were considered the two most pressing environmental concerns by participants, with waste issues being of most concern to adult participants and climate change being most important for teenage participants.
- All of the household programme participants and 87% of the teenage participants felt that caring for the environment was important to them.
- All of the household participants and 61% of the teenage participants agreed or strongly agreed with the statement "I think about how what I do affects the Earth".
- It is interesting to see that, while 93% of 100 teenagers surveyed reported feeling that environmental issues were urgent and 87% reported that caring for the environment was important to them, only 61% thought about the impact of their actions on the environment.
- Very high levels of self-efficacy were expressed by the participants in the household programme, with

98% either disagreeing or strongly disagreeing that they cannot do anything about the state of the environment. This level of empowerment by participants is unsurprising, as people who feel that they cannot do anything about environmental issues are unlikely to sign up to a plastic reduction programme.

- Seventy-four per cent of teenagers either disagreed or strongly disagreed that they cannot do anything about the state of the environment.
- Gender differences were observed in levels of environmental self-efficacy, with girls displaying higher levels than boys. Thirty-nine per cent of the boys surveyed were either unsure whether they could make a difference to the environment or felt that they could not make a difference.
- Seven main categories of environmental behaviour emerged from the research.

7 Key Findings and Recommendations

The findings presented below are based on data from 39 adult householders, 100 post-primary school pupils, 318 primary school pupils and 12 teachers.

7.1. Key Findings on Plastic Use

- Plastic use in the kitchen is difficult to avoid. While plastic can be reduced in several cases (such as surface wipes), the main sources are unavoidable food packaging.
- Plastic use in the bathroom can be reduced easily, as many people are currently choosing to use avoidable plastics such as facial wipes and plastic toothbrushes. Sanitary protection is a large source of avoidable plastic waste.
- Approximately half of the 136 people reporting on their plastic use out of the home used crisp and biscuit packets, disposable drinks bottles and clingfilm-wrapped sandwiches in the week of the audit.
- The largest source of single-use plastic in the classroom is clingfilm wrapping. The majority of lunch box plastic waste generated currently is easily avoidable.
- Households perceive the main barrier to reducing their plastic use as the lack of readily available plastic-free shopping options.

7.2 Key Findings from the Household Programme

- The central objective of the household programme was to raise participants' awareness of their plastic use. As 62% of participants expressed surprise at the amount of plastic the audit revealed, the household programme succeeded in achieving this objective.
- The participants who chose to engage further with the programme by setting plastic reduction pledges and maintaining contact with the project team succeeded in reducing their disposable plastic use. On completion of the programme, participants expressed intentions to continue making choices to reduce plastic use in the future, as they feel that these behaviours have now become normalised within their lives.

7.3 Key Findings from the School Programme

- The plastic use audit succeeded in raising awareness of household plastic use among the majority of the participating post-primary school pupils, with 63% of pupils surprised by the amount of plastic it revealed.
- The school programme succeeded in raising pupils' awareness of the issues surrounding plastic use. All teachers reported an increase in pupils' awareness of plastic issues, with 58% of teachers reporting a large change in awareness levels.
- Pupils' awareness levels of plastic issues prior to participating in the programme was not related to gains in their awareness levels.
- Six of the 12 schools that submitted an evaluation of the programme stated that they used the programme to assist them in developing a plastic reduction action plan.
- In schools in which school meals are provided, participation in the school programme did not prompt changes in their plastic use.
- Teachers reported that the programme met their expectations and was of sufficient length, age appropriate and well resourced.
- Overall, teachers did not find the programme difficult to teach and felt that they had enough information to teach it effectively. However, the use of a science notebook was not favoured by participants, and changes were needed to assist classes in conducting the plastic audit. Changes to the programme were made following feedback from teachers taking part in the pilot programme.
- Teachers felt that pupils enjoyed the programme and they enjoyed teaching the programme themselves.
- Teachers felt that they would be happy to run the programme again and would recommend it to other schools.

7.4 Key Findings on Environmental Attitudes, Self-efficacy and Pro-environmental Behaviour

- All household programme participants felt that environmental issues were an urgent issue. Ninety-three per cent of the 100 teenage respondents felt that environmental issues were an urgent issue.
- Waste issues and climate change were considered the two most pressing environmental concerns by participants, with waste issues being of most concern to adult participants and climate change being most important for teenage participants.
- All of the household programme participants and 87% of the teenage participants felt that caring for the environment was important to them.
- All of the household participants and 61% of the teenage participants agreed or strongly agreed with the statement “I think about how what I do affects the Earth”.
- It is interesting to see that, while 93% of the 100 teenagers surveyed reported feeling that environmental issues were urgent and 87% reported that caring for the environment was important to them, only 61% thought about the impact of their actions on the environment.
- Very high levels of self-efficacy were expressed by the participants in the household programme, with 98% either disagreeing or strongly disagreeing that they cannot do anything about the state of the environment. This level of empowerment by participants is unsurprising, as people who feel that they cannot do anything about environmental issues are unlikely to sign up to a plastic reduction programme.
- Seventy-four per cent of teenagers either disagreed or strongly disagreed that they cannot do anything about the state of the environment.
- Gender differences were observed in levels of environmental self-efficacy, with girls displaying higher levels than boys. Thirty-nine per cent of the boys surveyed were either unsure whether they could make a difference to the environment or felt that they could not make a difference.
- Seven main categories of environmental behaviour emerged from the research.

7.5 Recommendations Based on the Findings

- **Action.** Making plastic-free options easily available in major supermarkets and at affordable prices comparable to those of packaged goods is a crucial step in allowing people to make plastic-free choices. The Irish government should adopt policy to disincentivise the overuse of plastic packaging in supermarkets and other retail outlets through increased extended producer responsibility fees for the amount of plastic packaging placed on the market, adopting new economic instruments and establishing mandatory reuse targets for packaging. **Why?** A key finding from the study was that environmentally aware and motivated people are frequently unable to make better choices around plastic consumption on account of a lack of readily available affordable options. The combination of inconvenience and expense is a major barrier to reducing plastic use.
- **Action.** The link to the web-based plastic use auditing tool should be made available to the public, further developed to incorporate autogenerated feedback and promoted. **Why?** The household plastic use auditing tool succeeded in raising levels of awareness of plastic use, even in an environmentally aware group of people.
- **Action.** Research should be conducted into methods to increase the uptake of reusable menstrual products in Ireland. Such products should be promoted as an option to adolescents. Currently, the standard booklet given to all sixth class pupils on the topic of puberty lists only disposable menstrual product options. **Why?** The research revealed a low uptake of reusable menstrual products among the household participants and found none of the teenage participants used reusables. As a major source of plastic waste over the duration of menstruation, this is an area where switching to reusables would make a substantial difference.
- **Action.** The school programme should continue to be available for schools. The programme should be promoted and linked in with the Green Schools initiative to get it added to the list of resources under the waste theme. Schools should be encouraged to develop plastic-free lunch policies.

Why? The school programme succeeded in raising levels of pupils' awareness of plastic issues and led to the development of plastic reduction action plans in schools.

- **Action.** Research should be conducted into methods to reduce the amount of single-use plastic generated by school meals schemes and examine the implementation of the government decision on single-use plastic by schools. **Why?** Schools participating in school meals schemes reported being unable to develop plastic reduction action plans for their school.

References

Ajzen, I. and Fishbein, M., 1980. *Understanding Attitudes and Predicting Social Behavior*. Prentice Hall, Englewood Cliffs, NJ.

Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review* 84(2): 191–215.

Bandura, A., 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory*. Prentice Hall, Englewood Cliffs, NJ.

Bandura, A., 1994. Self-efficacy. In Ramachaudran, V.S. (ed.), *Encyclopedia of Human Behavior Volume 4*. Academic Press, New York, NY, pp. 71–81. [Reprinted 1998 in Friedman, H. (ed.), *Encyclopedia of Mental Health*. Academic Press, San Diego, CA.]

Blake, J., 1999. Overcoming the "value–action gap" in environmental policy: tensions between national policy and local experience. *Local Environment* 4(3): 257–278.

Bonney, R., Phillips, T.B., Ballard, H.L. and Enck, J.W., 2016. Can citizen science enhance public understanding of science? *Public Understanding of Science* 25: 2–16.

Chawla, L. and Cushing, D.F., 2007. Education for strategic environmental behavior. *Environmental Education Research* 13(4): 437–452.

Department of Communications, Climate Action and Environment, 2019. Minister Bruton announces government will lead the way in reducing single use plastics. Press release, 4 January 2019. Available online: https://www.gov.ie/en/press-release/231ea7-minister-bruton-announces-government-will-lead-the-way-in-reducing-s/ (accessed 2 November 2020).

Dickinson, J.L. and Bonney, R., 2012. *Citizen Science: Public Collaboration in Environmental Research*. Cornell University Press, Ithaca, NY.

EC (European Commission), 2018a. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A European Strategy for Plastics in a Circular Economy". COM(2018) 28 final, 16.1.2018, Brussels. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52018DC0028&from=EN (accessed 16 October 2020).

EC (European Commission), 2018b. Commission proposes new EU-wide rules to target single-use plastic products. Available online: https://ec.europa.eu/ireland/news/commission-proposes-new-eu-wide-rules-to-target-single-use-plastic-products_en (accessed 26 June 2018).

EC (European Commission), 2020. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "A New Circular Economy Action Plan". COM(2020) 98 final, 11.3.2020, Brussels. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0098&from=EN (accessed 16 October 2020).

EPA (Environmental Protection Agency), 2017. Progress to EU targets. Available online: http://www.epa.ie/nationalwastestatistics/targets (accessed 26 June 2018).

EPA (Environmental Protection Agency), 2019. Waste packaging statistics for Ireland. Available online: http://www.epa.ie/nationalwastestatistics/packaging/ (accessed 16 October 2020).

Eriksen, M., Lebreton, L.C.M., Carson, H.S., Thiel, M., Moore, C.J., Borerro, J.C., Galgani, F., Ryan, P.G. and Reisser, J., 2014. Plastic pollution in the world's oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea. *PLoS ONE* 19: e111913. https://doi.org/10.1371/journal.pone.0111913

EU (European Union), 2019. Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment. OJ L 155, 12.6.2019, p. 1–19.

Evans, C., Abrams, E., Reitsma, R., Roux, K., Salmonsen, L. and Marra, P., 2005. The Neighborhood Nestwatch program: participant outcomes of a citizen-science ecological research project. *Conservation Biology* 19(3): 589–594.

Forrester, T.D., Baker, M., Costello, R., Kays, R., Parsons, A.W. and McShea, W.J., 2017. Creating advocates for mammal conservation through citizen science. *Biological Conservation* 208: 98–105.

Frensley, T., Crall. A., Stern, M., Jordan, R., Gray, S., Prysby, M., Newman, G., Hmelo-Silver, C., Mellor, D. and Huang, J., 2017. Bridging the benefits of online and community supported citizen science: a case study on motivation and retention with conservation-oriented volunteers. *Citizen Science: Theory and Practice* 2(1): 4. https://doi.org/10.5334/cstp.84

Geyer, R., Jambeck, J.R. and Law, K.L., 2017. Production, use, and fate of all plastics ever made. *Science Advances* 3: e1700782.

Hilliard, M., 2018. Little Skellig looks like a rubbish tip due to plastic pollution. *Irish Times*, 8 June 2018.

Hilliard, M., 2020. Wet wipes a growing beach waste. *Irish Times*, 6 March 2020. Available online: https://www.irishtimes.com/news/environment/wet-wipes-a-growing-beach-waste-says-coastwatch-report-1.4194385 (accessed 16 October 2020).

Hines, J.M., Hungerford, H.R. and Tomera, A.N., 1987. Analysis and synthesis of research on responsible pro-environmental behavior: a meta-analysis. *Journal of Environmental Education* 18(2): 1–8.

Jordan, R.C., Gray, S.A., Howe, D.V., Brooks W.R. and Ehrenfeld, J.G., 2011. Knowledge gain and behavioral change in citizen-science programs. *Conservation Biology* 25(6): 1148–1154.

Kollmuss, A. and Agyeman, J., 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research* 8(3): 239–260.

Krasny, M. and Bonney, R., 2005. Environmental education through citizen science and participatory action research. In Johnson, E. and Mappin, M. (eds), *Environmental Education and Advocacy: Changing Perspectives of Ecology and Education*. Cambridge University Press, Cambridge, UK, pp. 292–333.

Montalto Monella, L., 2020. Will plastic pollution get worse after the COVID-19 pandemic? *Euronews*, 13 May 2020. Available online: https://www.euronews.com/2020/05/12/will-plastic-pollution-get-worse-after-the-covid-19-pandemic (accessed 16 October 2020).

Oberhauser, K.S. and Prysby, M.D., 2008. Citizen science: creating a research army for conservation. *American Entomologist* 54(2): 97–99.

Peberdy, E., Jones, A. and Green, D., 2019. A study into public awareness of the environmental impact of menstrual products and product choice. *Sustainability* 11(2): 473.

Statista, 2020. Generation of plastic packaging waste in the United Kingdom (UK) from 2002 to 2017. Available online: https://www.statista.com/statistics/995590/plastic-packaging-waste-generated-uk/ (accessed 16 October 2020).

Stern, P.C., 2000. Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues* 56(3): 407–424.

Theobald, E.J., Ettinger, A.K., Burgess, H.K., DeBey, L.B., Schmidt, N.R., Froehlich, H.E., Wagner, C., HilleRisLambers, J., Tewksbury, J., Harsch, M.A. and Parrish, K., 2015. Global change and local solutions: tapping the unrealized potential of citizen science for biodiversity research. *Biological Conservation* 181: 236–244.

Trumbell, D.J., Bonney, R., Bascom, D. and Cabral, A., 2000. Thinking scientifically during participation in a citizen-science project. *Science Education* 84(2): 265–275.

Turrini, T., Dorler, D., Rickter, A., Heigl, F. and Bonn, A., 2018. The threefold potential of environmental citizen science – generating knowledge, creating learning opportunities and enabling civic participation. *Biological Conservation* 225: 176–186.

UNEP (United Nations Environment Programme), 2014. *Valuing Plastics: The Business Case for Measuring, Managing and Disclosing Plastic Use in the Consumer Goods Industry*. UNEP, Nairobi.

Van Doremalen, N., Bushmaker, T., Morris, D.H., Holbrook, M.G., Gamble, A., Williamson, B.N., Tamin, A., Harcourt, J.L., Thornburg, N.J., Gerber, S.I., Lloyd-Smith, J.O., de Wit, E. and Munster, V.J., 2020. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *New England Journal of Medicine* 382: 1564–1567. Available online: https://www.nejm.org/doi/full/10.1056/NEJMc2004973?query=featured_home (accessed 16 October 2020).

Wieczorek, A.M., Morrison, L., Croot, P.L., Allcock, A.L., MacLoughlin, E., Savard, O., Brownlow, H. and Doyle, T.K., 2018. Frequency of microplastics in mesopelagic fishes from the Northwest Atlantic. *Frontiers in Marine Science* 5. https://doi.org/10.3389/fmars.2018.00039

Wilcox, C., Van Sebille, E. and Hardesty, B.D., 2015. Threat of plastic pollution to seabirds is global, pervasive, and increasing. *Proceedings of the National Academy of Sciences of the USA* 112(38): 11899–11904.

Abbreviations

CS	Citizen science
EPA	Environmental Protection Agency
EU	European Union
SPSS	Statistical Package for the Social Sciences
SUP Directive	Single-Use Plastics Directive

Appendix 1

Template Feedback Report Used in the Household Programme

Thank you for taking the time to complete an audit of your current plastic use! Your comments and feedback on the difficulties of trying to avoid plastic when shopping are very useful. We are compiling a report on the challenges and barriers people face in reducing plastic use, which will go to the EPA and the Department of Communication, Climate Action and Environment. We agree that it shouldn't be so hard to make environmental choices and VOICE works on a policy level to push for changes, as well as working on an individual and community level to empower people to make changes in their lives.

Looking through the list of plastic-packaged items you have in your fridge, we can see that there is no plastic-free option available for some of the items. For some food items, plastic is required to prevent food waste issues. Food waste is a significant environmental issue, both in terms of the resources used to produce and transport the food, and the greenhouse gas emissions released when food waste rots. For this reason, plastic wrapping is needed for some items to ensure they stay fresh long enough to be transported, sold and eaten. However, in many cases packaging is unnecessary and in these areas we can try to make changes. This means that going completely plastic free is not an option, instead we can just make plastic-free choices where they exist and push for more options through letter-writing to supermarkets, brands and TDs.[2] Additionally, the Sick of Plastic campaign that VOICE runs jointly with Friends of the Earth holds shop and drop days, where people are encouraged to leave their plastic packaging at the till in supermarkets across the country, to highlight levels of unwanted plastic.

Having looked at your plastic use audit, we feel that there are several switches that could be made to reduce your plastic use. Please take the time to look through this list and consider which pledges you feel you would be able to take on. Once you have made your decision, please follow the link to the online tool again. This time, select "I want to submit my household's plastic pledge list". As well as the suggestions below, there are several other ideas on the pledge list. If you do not find these suggestions helpful, please let us know how we can best support you in reducing your plastic use.

First steps. These are the changes that can be made with the least effort and that will make an immediate difference to your plastic use.

Bathroom

- Switch facial wipes for a liquid cleanser.
- Switch from shower gel to a bar of soap bought wrapping-free from a farmers' market stall or health food shop. Or use refill shops to refill your shower gel bottle.
- Switch from hand soap to a bar of soap bought wrapping-free from a farmers' market stall or health food shop. Or use refill shops to refill your hand soap bottle.
- Switch from a plastic toothbrush to a bamboo toothbrush. These are available in health food shops and some SuperValu stores.
- Switch from buying new bottles of shampoo/ conditioner to a shampoo bar and a conditioner bar. Available in health food shops.
- Switch from cotton buds with a plastic stem to cotton buds with a bamboo stem. These are available in health food stores.

Out and about

Food on the go is often an area people struggle in. The key is preparation; however, often we are in a position where plans change and we haven't got a planned packed lunch on us. For this reason, it is useful to have a few basics to keep in the car, such as a reusable container, cup and bottle. Here are some tips for reducing single-use plastic on the go:

2 Member of Dáil Éireann.

- When buying soft drinks out and about, choose cans rather than plastic bottles as they are more efficient to recycle than bottles. Once the aluminium has been produced, it can be recycled over and over again. Bottles use more energy because they require the use of petroleum.
- Use a reusable cup and bottle for hot drinks and water on the go. These are easily available at a number of price levels, with reusable cups and bottles for sale in shops such as Penneys and Dunnes for less than €5. See refill.ie for bottle refills when out and about, or simply ask in a cafe to get your bottle refilled. See consciouscup.ie for a list of cafes offering a discount on hot drinks to customers with a reusable cup.
- Consider trying to make a nude lunch box. Plastic-wrapped snacks can be replaced with unpackaged sesame sticks, Bombay mix, dried fruit such as banana chips, and nuts placed in a lunch box compartment. Buy large tubs of yogurt, rather than small tubs, and decant individual portions into reusable pots. Juice boxes currently in the lunch box can be easily replaced by simply buying large bottles of juice and filling a reusable bottle with individual portion sizes.
- Switch Ziploc bags and clingfilm around sandwiches for beeswax wraps or reusable sandwich bags. These are now widely available in health food shops.
- If ordering food at a take-away counter, you can bring your own container or lunch box and get the take-away food placed directly into it to prevent single-use plastic packaging. This can work for anything from sandwiches freshly made up at a deli counter to evening take-away food.
- Keep a set of cutlery in a small pencil case in your bag to prevent using single-use plastic cutlery when out and about. If you use straws, there is the option to carry a reusable straw. These can be bought online (see https://littlegreenshop.ie/product-category/out-about/reusable-straws/ or https://ecostraws.ie) or in many health food shops.

Shopping

- Switch from using individually plastic-wrapped dishwasher tablets to using loose dishwasher powder. However, this is not available in all shops, and does require a trip to SuperValu or Tesco.
- Take reusable Tupperware-style containers to the shops with you for meat and deli counter purchases.
- If you like to buy sliced pan in several supermarkets, such as SuperValu and Lidl, you can buy bread and have it sliced at the bakery counter for you. You can then place this in a paper bag (if available) or a reusable cloth bag.
- Buy small and medium-sized fabric bags to take shopping with you. Choose loose fruit, vegetables and bread and place in the reusable bags to prevent using disposable plastic bags when buying these items where possible. However, many supermarkets do not offer a large selection of loose fruit and veg or unpackaged bread. SuperValu tends to give more options in terms of fruit, vegetables and bread choices, with more items unpackaged than in the other major supermarkets.
- Switch from bottled water to tap water! Buy a water filter if this would help with the switch. Regular use of bottled water will amount to a substantial amount of plastic over time and is easily avoidable.
- Switch coffee pods for cafetière or stove pot coffee. Single-use disposable coffee pods are easy to substitute with these much more environmentally sustainable ways to drink coffee. If you have a machine that uses pods, consider buying reusable coffee pods instead of using disposable pods. These fit in your machine in the same way as disposable pods and can be emptied and refilled with fresh coffee. See https://theacornbrew.ie/ for just one example.

Storage

- Switch clingfilm covering leftovers for placing leftovers in a reusable Tupperware-style container, covering leftovers with beeswax wraps in place of clingfilm, or by simply placing leftovers in a bowl and covering with a plate.

Further steps. These changes may be more challenging at first and some require a little advance preparation, but over time these changes become habit and easy to maintain. The programme aims to support households in making these changes through identifying farmers and shops in your local area. If

you are interested in making these changes and want support in doing so, please let us know when filling out the online plastic pledge form.

- In the audit you said that some of your fruit and veg comes in plastic. Some options to reduce plastic packaging are:
  - Sign up to a veg box scheme. A weekly vegetable and fruit box order placed with a local farmer will provide you with locally produced and often organic food without the plastic wrapping that is so prevalent in the supermarkets. Great news for the environment on a number of levels! Green Earth Organics offers a delivery service for their veg boxes across the country (https://www.greenearthorganics.ie). However, in your local area there will be farmers that supply veg boxes also. We are happy to look these up and get an idea of prices and contents for you if this is something that interests you! A box with a delivery service offers an easy and convenient way to get plastic-free food!
  - Shop in a local farmers' market. Please follow the link provided to see if there are any farmers' markets that are close to your area: https://www.bordbia.ie/lifestyle/information/farmers-markets/market-schedule/ or see https://www.neighbourfood.ie/ to buy produce online, direct from your local farmers and food producers.
  - Shop for fruit and veg in local grocery shops, if available to you. They provide unpackaged fruit and veg at a lower cost than organic equivalents often found in veg box schemes and some farmers' markets.
- Visit a zero-waste shop with your own containers if there is one local to you and stock up with bulk buys of grains, legumes, herbs and spices, dried fruit, nuts and olive oils. Make use of refills of household cleaning products, shampoos, conditioners, shower gels and hand soap! Simply refill bottles as they empty instead of throwing them out and buying new ones. These items last for some time, so even an occasional visit to a refill shop will make a real difference. This website has a map of businesses offering refills: https://livinglightlyinireland.wordpress.com/map-of-eco-businesses/
- Make your own cleaning products that will be less toxic and eliminate the need for multiple plastic bottles of cleaner.
- Switch from using tampons to a menstrual cup if you feel that this is a possibility for you. There are a range available online and in health food shops. This will reduce your waste significantly over the years and works out cheaper. If menstrual cups don't feel like a possibility for you then select to use tampons that use a cardboard rather than plastic applicator or use non-applicator tampons.
- Switch from using disposable sanitary towels to using reusable sanitary towels. This will reduce your waste significantly over the years and works out cheaper. There are a large range available online and in some health food shops. Alternatively, use Natracare Sanitary Pads, which do not contain plastic.
- Switch from using disposable nappies to reusable nappies if you feel that this is a possibility for you and if you feel that you will be continuing to use nappies for the foreseeable future. Cloth nappies have changed significantly over the years and are totally unlike the nappies we think of from our own childhood. The Cloth Nappy Library (www.clothnappylibrary.ie) runs Nappuccinos monthly. At these meet-ups you can see the variety of nappies available and rent them. You can borrow 10 nappies at the Nappuccino for 3 weeks for €15 and try them out at home. Alternatively, they can be bought online.
- Alternatively, switch from using disposable nappies to biodegradable nappies. These nappies are also disposable; however, instead of taking 400–500 years to break down, biodegradable nappies take around 4 years to break down. They are available in health food shops, online and in Boots.

Appendix 2

Table A2.1. Education resources used when developing the school programme

https://www.eco-schoolsni.org (https://www.eco-schoolsni.org/eco-schoolsni/documents/006496.pdf)
https://www.eco-schoolsni.org/eco-schoolsni/documents/006497.pdf
https://repak.ie/for-home/schools/school-materials/
https://www.seai.ie/teaching-sustainability/
https://greenschoolsireland.org/resources/
http://epa.ie/pubs/reports/other/education/primary/waste/EPA_education_waste_pack_teachers_notes.pdf
https://www.breakfreefromplastic.org
https://www.ellenmacarthurfoundation.org/resources/learn/schools-colleges-resources
https://www.worldoceansday.org
https://www.plasticpollutioncoalition.org/latestresources
http://resources4rethinking.ca/en/resource/plastics-challenge
https://practicalaction.org/plastics-challenge-teachers
https://www.keepscotlandbeautiful.org/sustainable-development-education/eco-schools/
https://plasticoceans.org/
https://plasticoceans.org/wp-content/uploads/2018/11/PO_Educational_Sup_v16_NOV2018.pdf
https://www.unenvironment.org/interactive/beat-plastic-pollution/

Appendix 3

Outline of the No Home for Plastic School Programme

Steps of the programme – junior infants to 3rd class

The No Home for Plastic environmental school programme is designed to teach pupils about the issues surrounding the overuse of plastic in society and encourage a reduction in plastic in their lives.

The core programme can be taught over the period of a month with weekly lessons, or over the period of two weeks with twice-weekly lessons. However, a list of suggested additional activities is provided for those wishing to engage with the subject further.

A letter for parents is provided, informing them of their child's participation in the programme.

Steps:

Week one of the programme: Learning about plastic

1. The lesson on plastics is in the form of a PowerPoint presentation and class discussion. The presentation will contain a series of images:
   (a) Images of clean environments and environments polluted by plastic waste. Ask the class how each image makes them feel, does it make them feel happy or sad and why it makes them feel this way. Point out that plastic pollution looks unpleasant, is harmful to animals who eat plastic, get sick and die, and animals who get tangled in plastic and can't get out.
   (b) Image of more and less packaged items. Ask the class which are better for the environment. Point out that items without plastic packaging are best so that we have less plastic in the environment. Let them know that your school is going to reduce its plastic use to help the environment, and that this matters to you and the school.
2. In week two of the programme pupils will be conducting an audit of the plastic in the school. In preparation for this please read the document entitled "How to conduct a plastic audit". This document includes details on how to conduct the audit, what items to collect, etc. Plastic will need to be gathered for the week preceding the audit.

Week two of the programme: How much plastic is in our school?

3. Pupils will conduct an audit of plastic in their class. Details on how to complete the audit are included further on in this pack. Pupils can count the different items placed in the plastic bin during the week and call them out to you. They can read out the number of yogurt pots, drink cartons, etc., used during the week in school lunches from the table made during the week and pinned to the classroom wall. The teacher can submit audit data via the web link sent along with the school username at the beginning of the programme.
4. Pupils can draw pictures or write stories on the topic of plastic and plastic pollution.

Week three of the programme: How can we tackle plastic in the school?

5. The week following the audit discuss with the class ways the class can produce less plastic. Read out each idea on the plastic pledge idea list and see what the pupils think of each idea. Ask them if they have ideas of their own. Make a class list of ideas. Tell them you will pass their ideas onto the school green team.

Week four of the programme: Plastic in the home

6. The document entitled "Plastic use in my home – Jnr Infants to 3rd Class" can be printed off for pupils to fill out as part of the home component of the programme. For this homework assignment pupils walk around their home noting plastic use. An adult will have to accompany younger children to fill out the form. However, this is perfect as the aim of this component of the programme is to raise awareness of plastic use within the wider community. Pupils will also be provided with a recycling list magnet to take home and stick on their fridge.

7. When the children return with their completed home plastic audit you can discuss as a class ways to reduce plastic in the home using the home ideas list. Class discussion "I can …" what can you do to use less plastic.

A certificate of programme participation will be presented to the school on completion.

Steps of the programme – 4th, 5th and 6th class

Pupils will need an environmental science notebook each. Notebooks with plain unlined paper, or lines on just one side, can be purchased, or notebooks can made by pupils from used paper stapled together or tied together with string.

Steps:

Week one of the programme: Learning about plastic

1. The lesson on plastics is in the form of a PowerPoint presentation. Show your pupils the PowerPoint presentation outlining issues with plastic use and ways to tackle plastics in our lives. A short video on the topic could also be shown. Links to several videos of between 3 and 10 minutes long are in the section "Additional Programme Activities".
2. My knowledge of the environment question list is to consolidate the information presented in the PowerPoint presentation and to inform you of any part of the lesson misunderstood by pupils. Pupils can answer these questions into their science notebook following the PowerPoint presentation and hand them in to you.
3. In week two of the programme pupils will be conducting an audit of the plastic in the school. In preparation for this please read the document entitled "How to conduct a plastic audit". This document includes details on how to conduct the audit, what items to collect, etc. Plastic will need to be gathered for the week preceding the audit.

Week two of the programme: How much plastic is in our school?

4. Pupils will conduct an audit of plastic in the school. The audit will be completed via an online data collection tool, a web link will be emailed to the school along with a school username.
5. The plastic use audit analysis procedure is designed to be completed alongside the school plastic audit. The aim of the procedure is to provide education on scientific techniques and analysis in an age-appropriate manner. The analysis is to be completed in their science notebooks and handed in to you.

Week three of the programme: How can we tackle plastic in the school?

6. Following the audit and its analysis pupils will work on developing an action plan for their school. With the help of the plastic pledge idea list pupils will develop plastic pledges to commit to as a school and decide on a communication method for informing others of the pledges. Development of the action plan can be a whole class discussion, with pupils putting forward their ideas and suggestions. An overall action plan can be established from this discussion and passed onto the school green team to implement.

Week four of the programme: Plastic in the home

7. The document entitled "Plastic use in my home – 4th, 5th and 6th Class" can be printed off for pupils to fill out as part of the home component of the programme. For this homework assignment pupils walk around their home noting plastic use. The aim of this component of the programme is to raise awareness of plastic use within the wider community. Pupils will also be provided with a recycling list magnet to take home and stick on their fridge.

After completion of the programme

8. We ask that teachers also complete a feedback form to allow us to determine the value of the programme and to take on suggestions for improvements to the programme. The form can be accessed via the web link sent at the beginning of the programme.

A certificate of programme participation will be presented to the school on completion.

Steps of the programme – secondary schools

The No Home for Plastic environmental school programme is designed to teach pupils the issues

surrounding the overuse of plastic in society and encourage a reduction in plastic in their lives.

The core programme can be taught over a period of a month with weekly lessons, or over a period of two weeks with twice-weekly lessons. However, a list of suggested additional activities is provided for those wishing to engage with the subject further.

Steps:

Before the programme

1. Designate a space within the school as a drop-off point for all disposable drink bottles used by pupils within the school for the duration of the programme. The bottles can be displayed in a public place within the school in whatever manner you like; one school strung all bottles across the ceiling of the school hall. The bottles can be used as a strong visual. If we, one school, produce this much plastic just from drinks bottles during a month-long programme, think of how much plastic is being consumed every month across the country.

Week one of the programme

2. In class: the lesson on plastics is in the form of a short video and a PowerPoint presentation followed by a class discussion on the topic. The PowerPoint presentation outlines issues with plastic use and ways to tackle plastics in our lives. There are several useful videos on the topic of plastic. We have included a list of recommended videos in the additional materials section of the programme.
3. Homework assignment: supermarket visit and letter writing. The overpackaging of items we use daily is a huge driver of plastic consumption. In many cases making a choice to purchase items that are not wrapped in plastic simply isn't possible. Pupils will note items that cannot be purchased free from plastic packaging and write and send a letter to the supermarket, pointing this out and asking how the supermarket plans to tackle this to allow customers to make plastic-free choices.

Week two of the programme

4. In class: pupils will take part in a moving debate. In a moving debate pupils stand in the centre of the room while the teacher reads out a statement. Pupils then move to either side of the room, with one side for pupils who agree with the statement, and the other side for pupils who disagree with the statement. Pupils who are unsure can remain in the middle. Then pupils can explain why they agree or disagree with the statement. Statements can focus on ways to deal with the plastic crisis and change our current relationship to plastic. Example statements:

- We should choose to buy items that are not packaged in plastic.
- People are clever enough to find a way to get rid of plastic in the environment without us having to consume less.
- I am willing to make changes to reduce my plastic use.
- A tax should be put on single-use plastics to discourage their use.
- Single-use plastic should be banned.
- We are destroying wildlife through our overuse of plastic.

Pupils are free to move from one group to the other if an argument sways them. For more details see https://www.jct.ie/perch/resources/english/walking-debate-strategy-sheet-2.pdf

5. Homework assignment: pupils will undertake a short research project either individually or in groups, whichever works best with your pupils. Some ideas for class or pupil projects:

- plastic and climate change;
- unsustainable mass consumption and the plastic crisis;
- product design for better plastic; and
- plastic and the food chain.

Week three of the programme

6. In class: pupils will present their project findings to the class. The following headings are proposed:

- What were the main issues they identified within the topic they researched?
- What are the solutions proposed by experts?
- Do we as individuals have a role to play?

If research was conducted in groups, each group can present; if research was conducted

individually a presentation should be made for each topic.

7. Homework assignment: how do I contribute to the problem and how can I make a difference? Each pupil with undertake an audit of the plastic in their lives. The online auditing tool can be accessed via the link sent to the school at the beginning of the programme. This audit is a core part of the programme as students understand their contribution to the plastic problem. The audit should take between 15 and 25 minutes. Following this students will make two lists: a list of changes that can be made within the school to reduce the amount of plastic consumed and a list of changes that can be made within their own lives.

Week four of the programme

8. In class: using their homework assignment as a starting point pupils will work together as a class on developing an action plan for their school. With the help of the plastic pledge idea list pupils will develop plastic pledges to commit to as a school and decide on a communication method for informing others of the pledges. Development of the action plan can be a whole class discussion, with pupils putting forward their ideas and suggestions. An overall action plan can be established from this discussion and passed onto the school green team to implement.

A certificate of programme participation will be presented to the school on completion.

AN GHNÍOMHAIREACHT UM CHAOMHNÚ COMHSHAOIL
Tá an Ghníomhaireacht um Chaomhnú Comhshaoil (GCC) freagrach as an gcomhshaol a chaomhnú agus a fheabhsú mar shócmhainn luachmhar do mhuintir na hÉireann. Táimid tiomanta do dhaoine agus don chomhshaol a chosaint ó éifeachtaí díobhálacha na radaíochta agus an truaillithe.

Is féidir obair na Gníomhaireachta a roinnt ina trí phríomhréimse:

Rialú: *Déanaimid córais éifeachtacha rialaithe agus comhlíonta comhshaoil a chur i bhfeidhm chun torthaí maithe comhshaoil a sholáthar agus chun díriú orthu siúd nach gcloíonn leis na córais sin.*

Eolas: *Soláthraímid sonraí, faisnéis agus measúnú comhshaoil atá ar ardchaighdeán, spriocdhírithe agus tráthúil chun bonn eolais a chur faoin gcinnteoireacht ar gach leibhéal.*

Tacaíocht: *Bímid ag saothrú i gcomhar le grúpaí eile chun tacú le comhshaol atá glan, táirgiúil agus cosanta go maith, agus le hiompar a chuirfidh le comhshaol inbhuanaithe.*

Ár bhFreagrachtaí

Ceadúnú
Déanaimid na gníomhaíochtaí seo a leanas a rialú ionas nach ndéanann siad dochar do shláinte an phobail ná don chomhshaol:
- saoráidí dramhaíola *(m.sh. láithreáin líonta talún, loisceoirí, stáisiúin aistrithe dramhaíola)*;
- gníomhaíochtaí tionsclaíocha ar scála mór *(m.sh. déantúsaíocht cógaisíochta, déantúsaíocht stroighne, stáisiúin chumhachta)*;
- an diantalmhaíocht *(m.sh. muca, éanlaith)*;
- úsáid shrianta agus scaoileadh rialaithe Orgánach Géinmhodhnaithe *(OGM)*;
- foinsí radaíochta ianúcháin *(m.sh. trealamh x-gha agus radaiteiripe, foinsí tionsclaíocha)*;
- áiseanna móra stórála peitril;
- scardadh dramhuisce;
- gníomhaíochtaí dumpála ar farraige.

Forfheidhmiú Náisiúnta i leith Cúrsaí Comhshaoil
- Clár náisiúnta iniúchtaí agus cigireachtaí a dhéanamh gach bliain ar shaoráidí a bhfuil ceadúnas ón nGníomhaireacht acu.
- Maoirseacht a dhéanamh ar fhreagrachtaí cosanta comhshaoil na n-údarás áitiúil.
- Caighdeán an uisce óil, arna sholáthar ag soláthraithe uisce phoiblí, a mhaoirsiú.
- Obair le húdaráis áitiúla agus le gníomhaireachtaí eile chun dul i ngleic le coireanna comhshaoil trí chomhordú a dhéanamh ar líonra forfheidhmiúcháin náisiúnta, trí dhíriú ar chiontóirí, agus trí mhaoirsiú a dhéanamh ar leasúchán.
- Cur i bhfeidhm rialachán ar nós na Rialachán um Dhramhthrealamh Leictreach agus Leictreonach (DTLL), um Shrian ar Shubstaintí Guaiseacha agus na Rialachán um rialú ar shubstaintí a ídíonn an ciseal ózóin.
- An dlí a chur orthu siúd a bhriseann dlí an chomhshaoil agus a dhéanann dochar don chomhshaol.

Bainistíocht Uisce
- Monatóireacht agus tuairisciú a dhéanamh ar cháilíocht aibhneacha, lochanna, uiscí idirchriosacha agus cósta na hÉireann, agus screamhuiscí; leibhéil uisce agus sruthanna aibhneacha a thomhas.
- Comhordú náisiúnta agus maoirsiú a dhéanamh ar an gCreat-Treoir Uisce.
- Monatóireacht agus tuairisciú a dhéanamh ar Cháilíocht an Uisce Snámha.

Monatóireacht, Anailís agus Tuairisciú ar an gComhshaol
- Monatóireacht a dhéanamh ar cháilíocht an aeir agus Treoir an AE maidir le hAer Glan don Eoraip (CAFÉ) a chur chun feidhme.
- Tuairisciú neamhspleách le cabhrú le cinnteoireacht an rialtais náisiúnta agus na n-údarás áitiúil *(m.sh. tuairisciú tréimhsiúil ar staid Chomhshaol na hÉireann agus Tuarascálacha ar Tháscairí)*.

Rialú Astaíochtaí na nGás Ceaptha Teasa in Éirinn
- Fardail agus réamh-mheastacháin na hÉireann maidir le gáis cheaptha teasa a ullmhú.
- An Treoir maidir le Trádáil Astaíochtaí a chur chun feidhme i gcomhair breis agus 100 de na táirgeoirí dé-ocsaíde carbóin is mó in Éirinn.

Taighde agus Forbairt Comhshaoil
- Taighde comhshaoil a chistiú chun brúnna a shainaithint, bonn eolais a chur faoi bheartais, agus réitigh a sholáthar i réimsí na haeráide, an uisce agus na hinbhuanaitheachta.

Measúnacht Straitéiseach Timpeallachta
- Measúnacht a dhéanamh ar thionchar pleananna agus clár beartaithe ar an gcomhshaol in Éirinn *(m.sh. mórphleananna forbartha)*.

Cosaint Raideolaíoch
- Monatóireacht a dhéanamh ar leibhéil radaíochta, measúnacht a dhéanamh ar nochtadh mhuintir na hÉireann don radaíocht ianúcháin.
- Cabhrú le pleananna náisiúnta a fhorbairt le haghaidh éigeandálaí ag eascairt as taismí núicléacha.
- Monatóireacht a dhéanamh ar fhorbairtí thar lear a bhaineann le saoráidí núicléacha agus leis an tsábháilteacht raideolaíochta.
- Sainseirbhísí cosanta ar an radaíocht a sholáthar, nó maoirsiú a dhéanamh ar sholáthar na seirbhísí sin.

Treoir, Faisnéis Inrochtana agus Oideachas
- Comhairle agus treoir a chur ar fáil d'earnáil na tionsclaíochta agus don phobal maidir le hábhair a bhaineann le caomhnú an chomhshaoil agus leis an gcosaint raideolaíoch.
- Faisnéis thráthúil ar an gcomhshaol ar a bhfuil fáil éasca a chur ar fáil chun rannpháirtíocht an phobail a spreagadh sa chinnteoireacht i ndáil leis an gcomhshaol *(m.sh. Timpeall an Tí, léarscáileanna radóin)*.
- Comhairle a chur ar fáil don Rialtas maidir le hábhair a bhaineann leis an tsábháilteacht raideolaíoch agus le cúrsaí práinnfhreagartha.
- Plean Náisiúnta Bainistíochta Dramhaíola Guaisí a fhorbairt chun dramhaíl ghuaiseach a chosc agus a bhainistiú.

Múscailt Feasachta agus Athrú Iompraíochta
- Feasacht chomhshaoil níos fearr a ghiniúint agus dul i bhfeidhm ar athrú iompraíochta dearfach trí thacú le gnóthais, le pobail agus le teaghlaigh a bheith níos éifeachtúla ar acmhainní.
- Tástáil le haghaidh radóin a chur chun cinn i dtithe agus in ionaid oibre, agus gníomhartha leasúcháin a spreagadh nuair is gá.

Bainistíocht agus struchtúr na Gníomhaireachta um Chaomhnú Comhshaoil
Tá an ghníomhaíocht á bainistiú ag Bord lánaimseartha, ar a bhfuil Ard-Stiúrthóir agus cúigear Stiúrthóirí. Déantar an obair ar fud cúig cinn d'Oifigí:
- An Oifig um Inmharthanacht Comhshaoil
- An Oifig Forfheidhmithe i leith cúrsaí Comhshaoil
- An Oifig um Fianaise is Measúnú
- Oifig um Chosaint Radaíochta agus Monatóireachta Comhshaoil
- An Oifig Cumarsáide agus Seirbhísí Corparáideacha

Tá Coiste Comhairleach ag an nGníomhaireacht le cabhrú léi. Tá dáréag comhaltaí air agus tagann siad le chéile go rialta le plé a dhéanamh ar ábhair imní agus le comhairle a chur ar an mBord.

EPA Research Report 363

No Home for Plastic

Authors: Abigail O'Callaghan-Platt and Mindy O'Brien

Identifying Pressures

Plastic has become a ubiquitous material globally. Recent research quantifying the amount of plastic in the environment has prompted calls for action to tackle the use of this problem material. Reducing our own plastic use is a small but simple way to tackle this issue on a personal level. To assist households and schools in reducing their plastic use, we developed a citizen science protocol for use in Ireland with the aim of raising awareness of levels of plastic use and leading to a reduction in plastic waste. Two forms of the protocol were developed: one for households and one for schools. The citizen science protocol takes the form of a technology-mediated plastic waste auditing tool, whereby individuals and schools submit data on daily plastic use. Following the audit, participants were supported in changing their habits and reducing their plastic use. The household programme was piloted with 39 households and the education programme was piloted with 15 schools (10 primary and 5 secondary).

Informing Policy

From the perspective of informing policies to reduce individual plastic consumption, the research revealed practical barriers to behaviour change. Barriers include a lack of easy access to plastic-free options, the cost of plastic-free shopping and a lack of information on the availability of plastic-free options, as well as personal barriers such as loyalty to particular items. Any policy aiming to reduce plastic use in the population must focus on removing the barriers to reducing plastic use experienced by the public.

Developing Solutions

Provision of affordable plastic packaging-free items in major supermarkets is required to overcome the barriers experienced in reducing disposable plastic use. The combination of a lack of readily available plastic-free items in major supermarkets where most people shop and the higher price charged for unpackaged goods makes plastic-free shopping an inconvenient and expensive option. With these barriers in place, only the most environmentally committed people with the income to do so will make plastic-free choices. In order to significantly reduce plastic use in Ireland, these two major barriers must be removed.

EPA Research: McCumiskey House,
Richiew, Clonskeagh, Dublin 14.

Phone: 01 268 0100
Twitter: @EPAResearchNews
Email: research@epa.ie

www.epa.ie

EPA Research Webpages
www.epa.ie/researchandeducation/research/