An Analysis of Factors Influencing Environmental Behaviours in Irelands' Biopharmaceutical Industry Employees

By

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Abstract

This study analyses the factors influencing environmental behaviours in Irelands' biopharmaceutical industry employees utilising secondary research and qualitative primary research methods. The secondary research undertaken indicates that several factors positively impact environmental behaviours including convenience and belonging to a group with positive environmental intentions i.e. peer influence. Within an industry setting, a combination of factors is evident. This includes individual factors e.g. beliefs and environmental awareness, group factors e.g. feedback and financial incentive, organisational factors e.g. culture and management support and external factors e.g. actions at home and legislation. The primary research carried out with employees of 10 biopharmaceutical companies in Ireland shows that several individual, group, organisational and external factors impact the behaviours of employees, thereby reflecting the secondary research findings. The data shows that to optimise efforts a combination of these factors is required. However, company culture, infrastructure and regulation were found to be the most influential factors. Company culture improvements must move from a profit driven mindset, to improve environmental behaviour through voluntary corporate social responsibility. Research suggests a culture shift is a long-term change. In the short to medium term regulation and infrastructure changes are advised. Introducing requirements to align with positive environmental action through regulation drives companies to ensure compliance, as not doing so can affect release of product and lead to financial cost. Both infrastructure and regulation serve to make the positive environmental choice the most obvious. The presence of environmental infrastructure makes the choice easy resulting in employee cooperation. This research indicates that current efforts within the biopharmaceutical industry to ensure optimal environmental impact is moderate. Therefore, further work is required in this area to improve the effort of both the individual and the company and to lessen the environmental impact going forward. The findings of this study may be used within the biopharmaceutical and similar industries to analyse, promote and improve current efforts of ensuring positive environmental behaviour.

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List of Abbreviations

AER	Annual Environmental Report
ACS	American Chemical Society
CSR	Corporate Social Responsibility
EHS	Environmental Health and Safety
EPA	Environmental Protection Agency
EU	European Union
GCI	Green Chemistry Institute
IE	Industrial Emissions
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevention Control
NAO	North Atlantic Oscillation
PPE	Personal Protective Equipment
PPM	Parts Per Million
WEEE	Waste and Electrical and Electronic Equipment
WFD	Water Framework Directive

Chapter One: Introduction

1.1 Research Topic

The research topic of this study was to determine the factors which influence positive environmental behaviours within employees of the Irish biopharmaceutical industry, with the aim of recommending positive environmental actions to be implemented within the biopharmaceutical industry. Driven by environmental regulations and increasingly so, the biopharmaceutical industry has a social responsibility to reduce any negative environmental impact to safeguard our natural amenities and the health of Ireland's people. This study seeks to analyse the factors which influence positive environmental behaviour within Irish biopharmaceutical employees and to evaluate current efforts to implement such factors. Three objectives as follows have been implemented to achieve this:

1. Identify factors that have the potential to positively impact environmental behaviours.
2. Identify factors that have the greatest potential to positively impact environmental behaviours of employees within the Irish biopharmaceutical industry.
3. Analyse current efforts to implement these factors within the Irish biopharmaceutical industry.

1.2 Purpose and Scope

The purpose of this chapter, chapter one, is to introduce the research topic and objectives. Additionally, this section serves to give some background to the research topic, its scope and relevance. The aim of this research is to provide the biopharmaceutical industry and other comparable industries with information that can aid organisations in evaluating and

improving upon their environmental impact. The scope of this research is limited to the Irish biopharmaceutical industry. Research is conducted through primary and secondary research. Chapter two details the secondary research carried out through a literature review, chapter three captures the methodology of the research presented here and chapter four encapsulates the analysis and findings of qualitative primary research. The final chapter, chapter five, provides a research conclusion.

1.3 Environmental Concerns 2020

In 2020 alone there has been numerous damaging events throughout the globe that truly call attention to climate change and environmental devastation.

- January - Over 60 people dead in Indonesia capital of Jakarta following severe down pour resulting in flash flooding (Press, 2020).
- February - Storm Gloria sweeps inland of Mediterranean Ebro Delta Spain, rice fields irrigation systems and farms were destroyed and houses flooded (Burgen, 2020).
- February - Hundreds left with flooded homes across England and Wales and six dead following consecutive storms and downpour highlighting the significance of climate change (Busby, 2020).

FIGURE 1: ENGLAND FLOODING (WESTON, 2020)

- Australian Bush fire season of 2019-2020. Over 40% of land mass burned releasing approximately 830 million tonnes of carbon dioxide (editor, 2020). In January 25,000 koalas are valued to be dead on Kangaroo Island (Mariuz, 2020).

FIGURE 2 KOALA DEATHS OF KANGAROO ISLAND (MARIUZ, 2020)

- March - Cyclone Idai hit Africa devastating Mozambique, Malawi and Zimbabwe. Over 1,000 people were killed, and millions were left without basic amenities as landslides ruined villages and infrastructure. Weeks later cyclone Kenneth hit the northern area of Mozambique an area where no prior cyclones had ever been reported ("5 natural disasters that beg for climate action", 2020).

FIGURE 3 CYCLONE IDAI DAMAGE IN SOUTHERN AFRICA (TRENCHARD/ OXFAM, 2020A)

- June- Hurricane Harvey study estimated cost of 67 billion US dollars attributed to climate change (Frame et al., 2020).
- July- Flooding in India's Nepal and Assam result in approximately 200 dead and 2.75 million people forced to leave their homes. Increase in global temperature has resulted in increased flooding and mud slides during monsoon season (Ellis-Peterson, 2020).
- July- Bangladesh monsoon crisis following cyclone Amphan has resulted in one third of the land being flooded. Reports have stated (as of 22nd of July) 550 people have died and greater than 9 million peoples' residences have been flooded ("South Asia floods: 9.6 million people swamped as humanitarian crisis deepens").

1.4 Ireland's Environment

Ireland is at a crucial point in time, where decisions made for our environment, to manage and protect it, will have ripple effects. Evidence of which will be seen for generations to come. As we approach the end of the fossil age it is clear, on a global scale, the damage caused by over consumption of fossil fuels to our future planet and health. For this reason, it is of great importance that we evolve and move to renewable energy resources with a sense of urgency. We must eliminate our dependency on fossil fuels and excessive consumption of natural resources by moving to clean energy. It is Ireland's responsibility as a society and an economy to protect our invaluable natural resources in order to preserve our environment and therefore our health as a nation. To achieve this we must make changes, in our society, in our economy and in ourselves. Doing so will impinge on our daily lives, how we live, travel, work, power our homes and generate our food. These changes should not be feared but embraced and seen for their positives in the aim to bring about a higher quality of life.

As an island on the east of the Atlantic Ocean Ireland is particularly exposed when it comes to concerns associated with climate change and therefore our incentive to ensure global success in the fight against climate change. Ireland has instigated environmental policies and legislation. The task now is to take action to see results from these policies and legislation to bring about the change we need. Ireland's laws are implemented in line with Europe and there has been success in areas such as landfill waste reduction and lowering industrial emissions. However, Ireland faces challenges in meeting climate change goals amongst others, for example the habitats and water frameworks directives in addition to European union complaints. More investment is required in Ireland in order to eradicate

complaints and ensure compliance with directives and policies. Investment into the environment must compete with other sectors and policies within the country for funding. It is important that the environmental consideration is given when dealing with other policies as environmental gains can positively impact other sectors such as healthcare.

1.5 Environmental Categories

The Environmental Protection Agency (EPA) break Ireland's environment down in to eight categories; air, climate, waste, nature, environment & wellbeing, water, sustainable economy and land & soil.

In Ireland we risk poor air quality more during the winter months when the burning of domestic fuel increases. The increasing levels of particulate matter is of concern particularly in larger towns and cities where there is a risk of exceeding nitrogen dioxide limits, large volumes of cars on the road attribute to this greatly (Agency (EPA)).

The entrapment of relatively stable gases known as greenhouse gases, such as carbon dioxide and nitrous oxide, within our atmosphere poses a great threat to our environment. In 2017 carbon dioxide levels reached 405 parts per million (ppm), levels not seen for over 800,000 years (Agency (EPA)).

Ireland's waste management has improved greatly over the past two decades. Focus now is on essentially reducing, reusing and recycling waste and utilising this waste as fuel in the replacement of fossil fuels (Agency (EPA)).

Nature refers to biodiversity in which the balance of organisms from all sources e.g. marine, earth bound etc. must be safeguarded to maintain environmental balance (Agency (EPA)).

The environment, health and wellbeing describe the link between our quality of air, water soil etc. that is reflected in our health as a population. In Ireland 13% of deaths have been linked to environmental causes. Primarily cancer and cardiovascular diseases are of note of this percentage accounting for approximately 53 deaths per 100,000 citizens (Agency (EPA)).

Water is a vital natural resource for both aquatic species and for human consumption. Clean water requirements are vital to ensure wellbeing of the population. The water framework directive (WFD) exists in Ireland to protect water quality (Agency (EPA)). Ireland faces challenges when it comes to our water quality with periodic bans and restrictions proven necessary at times due to pollution. In 2007 a cryptosporidium outbreak in Galway forced residents out of drinking previously safe tap water for a 5-month period. Cryptosporidium is a parasite found in faeces and entered the water supply in the form of human and animal waste. The parasite lives in the intestine of infected humans and can cause digestion issues such as diarrhoea, cramps and can even lead to death for the immunocompromised ("Cryptosporidium outbreak cost €19m"). In November of 2019 a series of “boil water notices” were put in place for large areas of Dublin as a result of pollution cause by heavy downpour at the Leixlip water treatment facility (Cullen et al.). June of 2020 saw Portmarnock, Sandymount and Dollymount beaches of Dublin closed as a result of contamination due to overflows of waste water tanks at Ringsend waste water treatment facility. This resulted in discharge entering Dublin Bay.(Sullivan, 2020)

The category of sustainable economy refers to the unbreakable link between the economy and environment. A thriving economy is dependent on the environment in many ways and although without an economy and presence of everything the economy encompasses the

environment would naturally thrive. However, the same cannot be said for the opposite (Agency (EPA)).

Land and soils of Ireland are vast and diverse and support the life of organisms, forestry, farming, water filtration, flood prevention and many more. Soils are made up of air, water, minerals and are considered biologically active. To ensure the survival of natural resources the use of soils must be managed carefully to avoid exhaustion of land (Agency (EPA)).

1.6 Environmental Regulations

Ireland imposes a “polluters pay” stance when it comes to regulations. Derived from the EU directive 2004/35/CE, Ireland introduced the European Communities Regulations 2008 for environmental liability with the purpose of reducing and correcting environmental damage. These regulations add to other current European and Irish legislation currently in place (Agency (EPA)). The EPA enforce environmental regulations within the pharmaceutical industry through licenses such as the integrated pollution control (IPC) and industrial emissions (IE) licenses. Enforcement of such regulations was identified as one of the key actions detailed in EPA 2016 environmental report. The purpose of an IPC licence is to prevent or reduce emissions from industrial facilities to air, water land or sea. A company must show that any emissions are not causing significant harm to the environment in order to meet EPA standards and receive an IPC licence ("EPA - Ireland's Environment 2016 - An Assessment"). Progress has been seen in several areas however Ireland still has open complaints and infringements answerable to the EU. The pharmaceutical industry has both a legal and social responsibility not just to adhere to regulations but to make every effort to remove negative environmental impact. In order to

enforce regulations companies licenced with the EPA must supply an annual environmental report. In addition to this the EPA carry out unannounced inspections to ensure compliance. Those out of compliance run the risk of prosecutions and fines.

1.7 Management of the Environment in the Biopharmaceutical Industry

In a typical biopharmaceutical company, the responsibility surrounding environmental concerns lie with the Environmental Health and Safety (EHS) department. Companies detail their environmental details, environmental management systems as well as current trends and targets for a given time period. This can be seen in annual environmental reports available to the company. This report additionally captures any environmental complaints or incidents.

Chapter Two: Literature Review

2.1 Aim

The aim of the literature review is to gather relevant secondary information related to the research topic which may directly satisfy objectives or may steer the course of primary research. The geography of this research is limited to Ireland and therefore the current state of Ireland's environment is examined. Previous research with no geographical boundaries, surrounding the topic of environmental concern, behaviours and the factors influencing these behaviours is included in the scope of this literature review. This will allow the exploration of previous work on this topic to contribute to final discussions and enhance the quality of primary research. The literature review seeks to establish relevance of this study in addition to satisfying objective one: Identify factors that have the potential to positively impact environmental behaviours.

2.2 The State of Irelands Environment

The environment, depending on its state, can impact our health and well-being in a positive or negative way. As a whole, Irelands environment is currently in a good state compared with other countries according to the Environmental Protection Agency (EPA)s report "Ireland's Environment 2016- An Assessment". However, it is not without its challenges. The negative factors in Ireland can be seen to affect certain areas, regions or local communities, for example; air pollution, due to vehicle emissions, in the form of air particulates may be more negatively impactful to human health and the health of Irelands climate in a densely populated city than that of a rural townland. Further efforts are required in Ireland to ensure safe and stable drinking water. Many areas are on prolonged boil water

notices and further safety and protection actions are required for more than 180,000 households utilizing private wells ("EPA - Ireland's Environment 2016 - An Assessment"). Climate change has become increasingly topical as the effects of greenhouse gases on our environment are realised. Ireland’s initiatives aim to gradually reduce carbon dioxide by 80% by 2050 from levels measured in the year 1990. The Paris agreement of 2015 aims to maintain global temperatures to within 2 degrees Celsius of that prior to the industrial era (The Paris Agreement |2015). To achieve this the use of fossil fuels must decrease and Ireland must become more energy efficient. Trends, in accordance with the Environmental Protection Agency 2016 Report, do not show promising progression to meet our set targets for this. Emissions are likely to be between 6% and 11% by the time of reporting in 2020, where the target is 20%. The impact of climate change can be seen globally. Temperature rise resulting in glaciers and ice sheets melting and causing water levels to rise is the most evident ("EPA - Ireland's Environment 2016 - An Assessment"). These changes have and continue to effect water sources, eco systems, human health and cause flooding. Such geographical events are seen to be increasing in intensity, such as the Australian fires of 2020 (McDonald, 2020).

In a study of climate change within Ireland focusing on water flow from both precipitation levels and stream flow levels measurable changes were identified from the year 1975 to 1999. This study reviewed five decades of data through which an increase in annual rainfall was observed, particularly in counties on the west of Ireland. In addition, this study revealed an increase in harsh weather events from 1975. Months most heavily affected by increased rainfall hours were March and October. Increases in North Atlantic Oscillation (NAO) was identified from 1975. The NAO refers to fluctuating atmospheric pressures, these changes

strongly effect the weather realities seen in Ireland. A low pressure is associated with unsettled weather conditions whilst high pressure brings about more settled conditions. The results of an increased NAO are seen as greater fluctuation in weather conditions (Kiely, 1999).

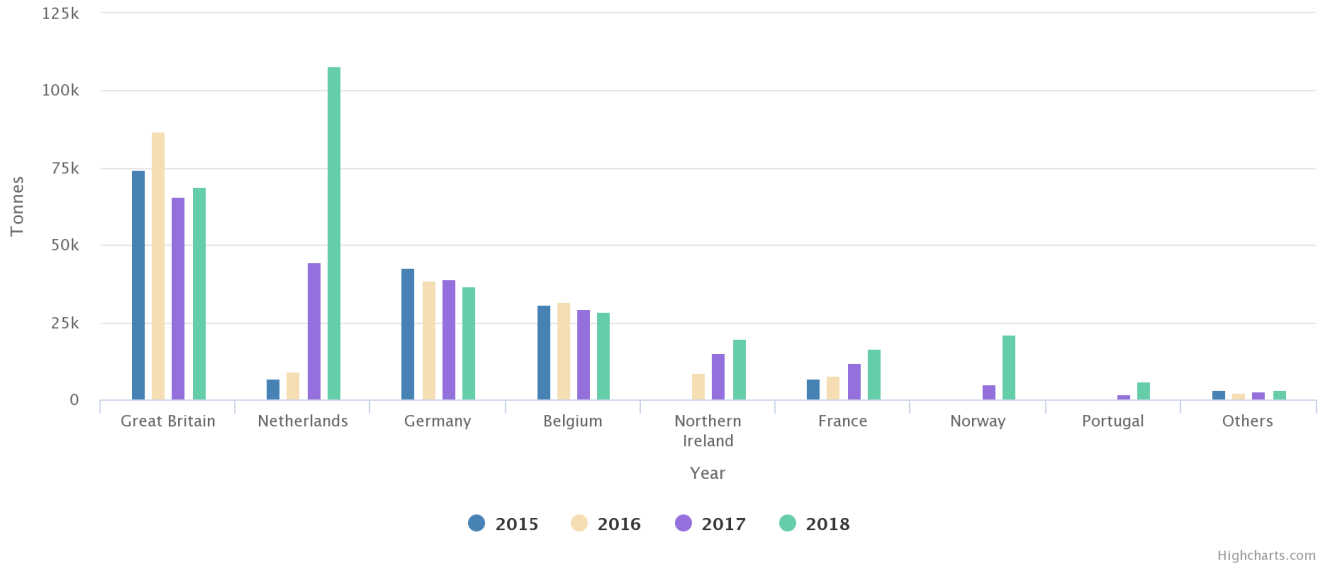
Specie distribution and habitat structure are vulnerable to changes in climate and thus conservation methods must be dynamic in their protection as the environment changes. A modelled system studied the potential changes to these factors in species of Ireland and Britain. Results showed the climate change effects different species in different ways some remain largely unchanged, those with cooler artic-alpine and montane lands were effected the most followed by pine land and beach woodland (Berry et al., 2002). Likely effects of climate change to aqua marine species through increased rain, warming waters and rising sea levels likely will affect fishing industry. Water composition changes with temperature and pH can have adverse effects on local species and potentially result in a change in specie types found in Irish water (Callaway et al., 2012).

Air pollution, water usage and management, climate change, transport and waste are all areas of focus, within which improvements are required to sustain and protect Irelands environment, protect nature and wild places, to protect and restore water quality and to deal with climate challenges. Increasing efforts must be made to reduce the adverse effects and become more durable against the pressures of climate change.

2.3 Hazardous Waste

Hazardous waste is a topic of concern for Ireland, one of which is particularly topical for pharmaceutical companies. Hazardous waste is defined as anything that can cause harm to the environment or human health. Hazardous waste is identified by various qualities (oxidizing, flammable, mutagenic, carcinogenic). In Ireland, the largest generating sector of hazardous waste is industry. Strict regulations are in place to manage hazardous waste and its treatment. All hazardous waste must be treated appropriately to reduce hazardous properties. Ireland's hazardous waste is either treated onsite at the location of production/use, offsite at hazardous waste treatment facilities or is transported out of the country for treatment. From the year 2012 to 2018 the quantity of hazardous waste generated has continued to grow. In the year 2018 526,397 tonnes were generated in total in Ireland. Industrial facilities treated 20,127 tonnes on site in 2018 78% of this was for disposal the remain was treated for re-use. Landfills such as Auginish Alumina in County Limerick as well as onsite incineration were utilized to for the disposal of a large amount of the hazardous waste that was treated on site. Irish hazardous waste facilities treated 112,367 tonnes in 2018. 78% of total biohazardous waste generated in Ireland in 2018 was exported to mainly European countries. The facilities do not exist in Ireland to treat all types of hazardous waste. An increase in ash from incineration of municipal waste which resulted in a spike in the quantities of hazardous waste sent to the Netherlands in 2018. Figure 4.0 details the tonnes of hazardous waste excluding soil waste sent to various countries (Agency (EPA)).

FIGURE 4 IRELAND HAZARDOUS WASTE EXPORTS (AGENCY (EPA)).



In summary 6% of hazardous waste is treated on site, 21% is treated off site in Irish waste treatment facilities and 73% is exported for treatment.

2.4 Previous Research in Factors Influencing Environmental Behaviours

In 2007, a study on the factors influencing environmental behaviours in UK households' regarding waste was performed. This study focused on reducing, reusing and recycling of waste. The sample size was 673 (usable) households. A 69% response rate was achieved. The study showed, in regard to recycling, the majority of households either always recycled or never recycled with fewer in between. For reduction and reuse, which were considered more complex in terms of variability, an even spread in activity was evident. The greatest factor influencing reduction of waste was shown to be knowledge and the awareness of policy. Those who had a front of house recycling bin were less likely to reduce their waste as it appeared, they felt they had already contributed by recycling and therefore did not need to consider reducing. A belief that a waste problem is damaging to the environment

and self-increased intentions acted to combat this. Those with a combination of knowledge, awareness of the issue and good values proved to reduce waste more than those that did not. Reuse behaviour in comparison was seen to be influence by convenience. Those who found it easy to reuse or had sufficient storage to retain items for reuse wore more likely to do so. Those who felt they got personal satisfaction for reusing in addition to those involved in a society such as a club, politically or as part of an environmental group were more likely to reuse. Recycling did not have as strong an influence from core environmental values than that observed for reducing and reusing. A societal belonging factor was not seen to increase levels of recycling it was more so done as it was seen as the normal thing to do. This was supported by convenience of recycling and knowledge of local recycling. The most important factor shown to increase recycling was access to a recycling facility for house collection. Awareness, access and convenience were the key factors that enabled greater recycling (Barr, 2007).

Sustainable frameworks within corporations have become increasingly topical (Young and Tilley, 2006). The introduction of new systems and workplace environments are seen to increase environmental efficiency, for example sustainable buildings (Ucci, 2010). However these additions appear limited in their contribution to positive environmental performance (Hertin et al., 2008). It has been shown, in a Canadian based case study, that employee participation in the establishment of strategies for this purpose increase its successful performance (Boiral, 2005). Davis et al., signified the vital need for employee responses to environmentally driven changes required to drive higher rates of uptake success (Davis et al., 2011).

A thorough study was carried out by Young et al. 2013 which researched “Changing Behaviour: successful Environmental Programmes in Workplace” using an altered baseline framework originally developed by (Tudor et al., 2007):

FIGURE 5 FRAMEWORK OF MACRO DETERMINANTS OF CORNWALL NHS FOR SUSTAINABLE WASTE MANAGEMENT BEHAVIOUR (TUDOR ET AL., 2007).

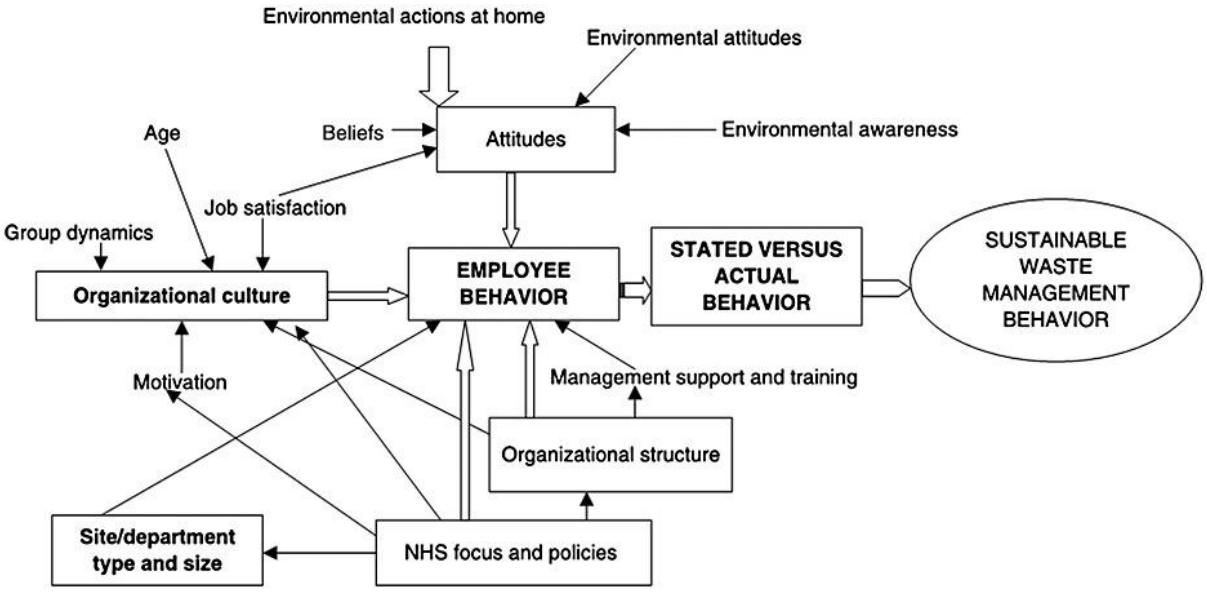


Figure 5 shows the results of a study on a variety of workers within the workplace. Sizing of arrows indicates the greater influencing factors which all converge and lead to employee behaviour which leads to sustainable waste management behaviour. As seen above environmental actions at home directed into attitudes is shown to have a larger arrow than the majority of factors influencing employee behaviour.

A thorough review method including a variance of industry types (e.g. banks, construction companies, universities, manufacturers, health organisations) for previous literature on changing behaviours within workplaces to promote a positive environmental change with three criteria; to be published post 1980, to include measurable outcomes and to examine

an intervention in the workplace for positive environmental gains was carried out. The study key word search over many informative sites provided 17 suitable papers- indicating low volume of detailed research in regards to this (Young et al., 2015). This research resulted in additions to the framework of Tudor upon comparison:

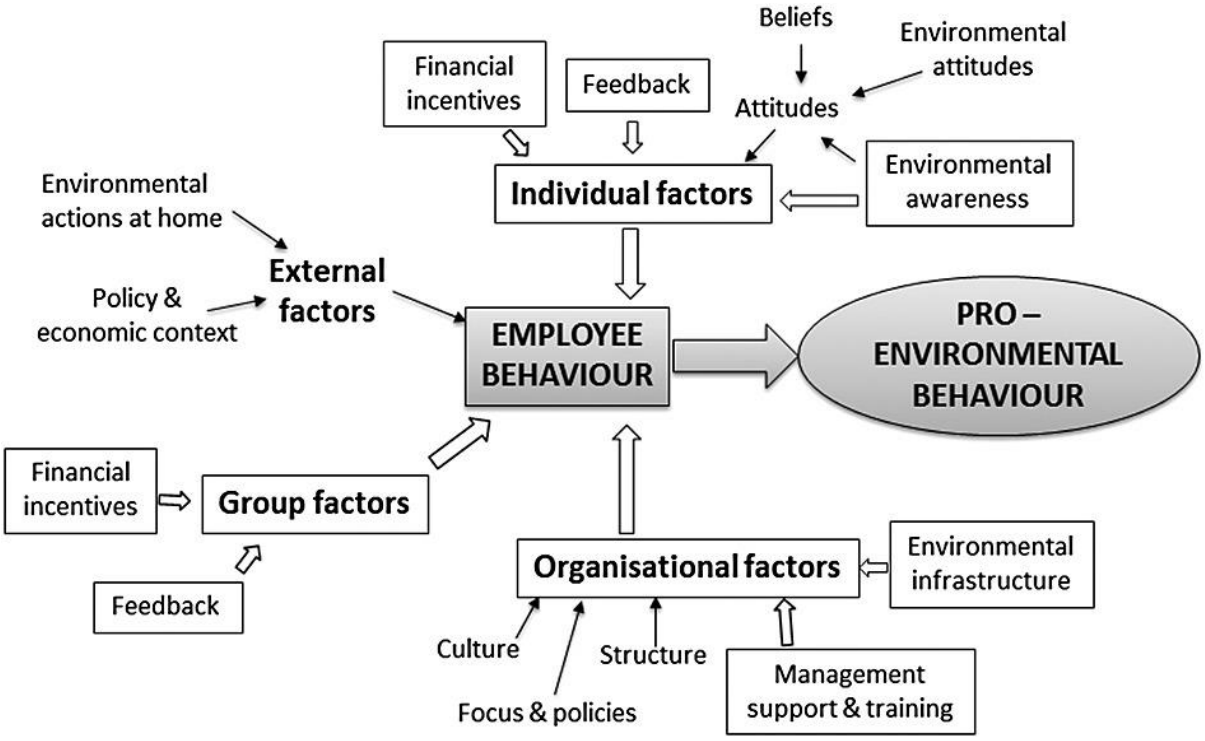


FIGURE 6 FACTORS FOR INDUSTRY FRAMEWORK FOR WORKFORCE PRO-ENVIRONMENTAL BEHAVIOUR (YOUNG ET AL., 2015).

Again, larger arrows or bold text indicates a stronger influencing factor.

This study showed it is a complex task with a variety of factors to change and create pro-environmental employee behaviour. The main factors found here, that influence employee behaviour are group factors, individual factors, external factors and organizational factors. Individual behaviours are influenced by beliefs, environmental attitudes, and environmental awareness.

The European Union defined corporate social responsibility (CSR) as “a concept whereby companies decide voluntarily to contribute to a better society and a cleaner environment” (Anon, 2001). CSR is seen as a way in which companies can pursue sustainable development. The view of a company partaking in CSR, contributing to work in a positive manner toward the environment and other social matters is a contrast to the traditional view of companies as solely supplying a services or a good to the market (Hausman, 2008). Two prime and inter-related elements of the CSR policy are the business case and voluntary actions. The business case focuses on key positives brought to a company through implementation of the CSR policy. A company becomes more appealing to employees, stakeholders, socially responsible investors and consumers through implementation of positive social and environmental voluntary action (Cowe 2003). Voluntary actions are congruent with the stance that compliance with regulations will not satisfy sustainable development (Bruijn and Tukker, 2002). CSR tends to be more widely seen in large scale, multinational companies and although the same methods to employ this may not translate down to smaller and medium sized business, these companies can still employ CSR and may benefit from a more dynamic pragmatic workforce due to smaller numbers (Jenkins, 2009), (Castka et al., 2004). Small to medium sized business, classed as those with less than 250 employees additionally having 50 million euro or less of a turnover or 43 million or less balance sheet total (Anonymous, 2016). In a study examining how small to medium sized enterprises deal with the environmental component of CSR it was found that environmental action is driven by two factors: regulation and business performance. (Williamson et al., 2006) argue that this is the result of current market thinking in a supply and demand, free market economy where the focus is on

profitability as opposed to CSR and thus puts social factors at risk. This study suggests that CSR policy will have little impact unless the foundational free market thinking framework is changed. Without a change in this, voluntary action in the name of CSR is out of focus and unlikely to become a common occurrence. This leaves the two most likely factors to improve sustainability as regulations and business performance. Regulations bring about change through ensuring a company remains in compliance with current environmental legislation, as stated in section 2.5. Business performance can bring about environmental changes inadvertently through cost reduction targets e.g. reduction of raw material waste results in cost savings but also lessens impact on sources and packaging required. The business performance drives cost saving and efficiency as opposed to the business case noted in the CSR policy which details positive social performance that can attract stakeholders and consumers. Based on analysis of environmental behaviour through efforts in monitoring and complexity of the monitoring as opposed to the study of attitudes Williamson indicated that regulation is the primary factor that influences environmental impact. When there is no benefit to the business in terms of finances it is the companies requirement to remain in compliance that drives the actions that contribute to sustainability (Williamson et al., 2006).

It is clear from secondary research that understanding and utilising the factors that influence employees to create or enhance behaviours is key to nurture a positive environmental impact. Within the pharmaceutical sector the question is what are these factors? Do they mirror previous research as per this literature review? Can companies do more to contribute to an environmentally positive future? These reflect the objectives

of this study. The basis of the conceptual framework is as per (Young et al., 2015) above. Using this as a platform the study looks to compare and contrast this to findings in as much a capacity as possible with the acceptance of limitations within research

2.5 Environmental Laws for Pharmaceutical Manufacture

In Ireland, the Environmental Protection Agency (EPA) is responsible for implementation and enforcement of environmental European Union (EU) legislation. Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control ("EUR-Lex - 31996L0061 - EN") is known as “The EU Integrated Pollution Prevention and Control (IPPC) Directive” which was established in Ireland through a 2003 Act- Protection of the Environment Act 2003 (Book (eISB)). Through this legislation large industries with potential for pollution must submit an application for and obtain an IPPC license. Therefore, this is a requirement for biopharmaceutical industries in Ireland. The aim of this legislation is to reduce pollution such as air, water, atmosphere, soil and waste pollution. Every year EPA licensed biopharma companies must submit an Annual Environmental Report (AER). Within the AER companies must capture a summary of their environmental activity performance and the progress of their environmental goals and improvement goals for the year (Agency (EPA)). The report should include emission measurements and waste generation data (Agency (EPA)). AERs are available to the public and can be found on the EPA website. AERs contain statistical data surrounding facility management, energy and water, environmental incidents and complaints, environmental emissions (e.g. noise, air, wastewater, groundwater, fugitive solvent emissions and storm water) and waste generated. Within AERs, companies capture their goals and accomplishments. A sample of the environmental goals in some of Irelands biopharma industries is captured below in table 1.

TABLE 1 ENVIRONMENTAL GOAL SAMPLE BY COMPANY

Company	Location	Goal Description
Alexion Pharma International Operations Unlimited Company(Alexion AER,2019)	College Business & Technology Park, Blanchardstown Road North, Blanchardstown, Dublin 15, Dublin.	Optimisation of water treatment to decrease water and salt utilisation
		All electricity to be supplied through renewable sources
		Additional woodland to increase biodiversity
		Waste segregation in canteen
Novartis Ringaskiddy Limited (Novartis AER,2018)	Ringaskiddy, Cork.	Process formulation reworks to reduce potential batch dumping.
		Set waste reduction goals
Eli Lilly Kinsale Limited(Eli Lily AER, 2019)	Dunderrow, Kinsale, Cork.	Energy efficiency increase by 20%
		Waste reduction of 20%. Recycling increase to greater than 70%. Waste to landfill reduction to less than 10%
		Phosphorus emissions to wastewater decrease.
Amgen Technology	Pottery Road, Dun Laoghaire, Dublin.	Replacement of autoclaves to more energy effective type

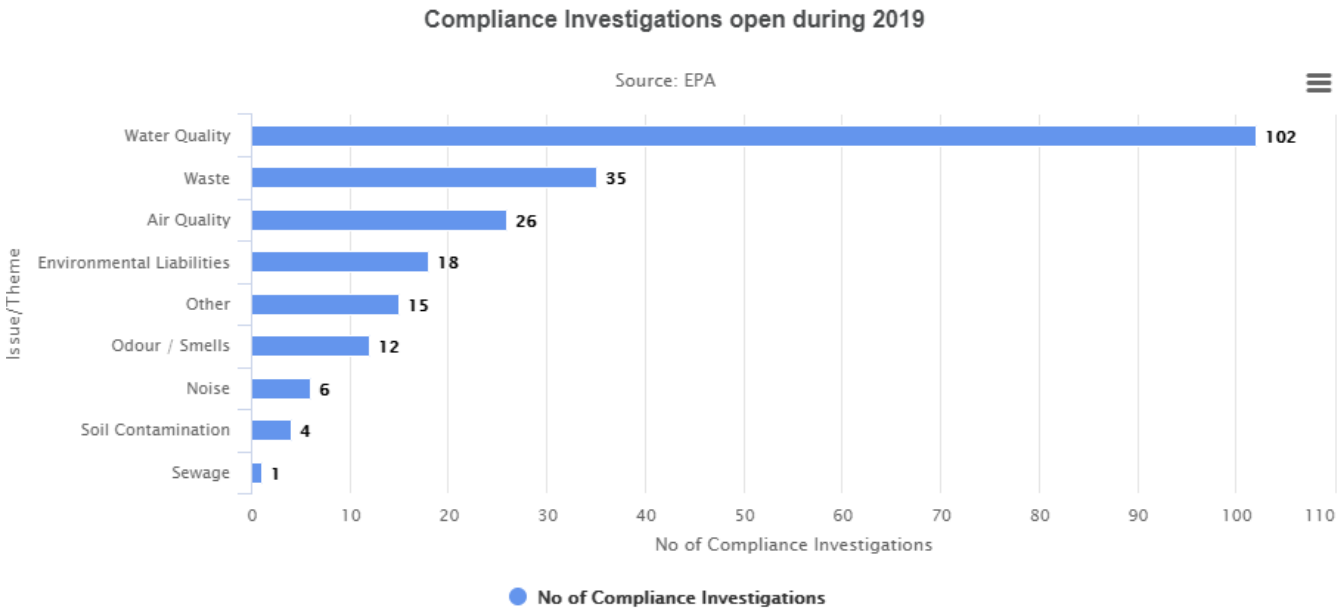
Company	Location	Goal Description
(Ireland) Unlimited Company (AER, 2019)		Removal of all single use plastic from restaurant
		Hold an environmental awareness day
		Remove disposable cup use
		Wastewater reduction
		Implementation of energy efficient lighting and timers for less occupied areas
		Reprogramming to reduce water for injection (WFI) and purified water
Allergan Pharmaceuticals Ireland - Mayo (AER Anon,2019)	Castlebar Road, Carrowbeg, Westport, Mayo.	Community outreach program to clean community area- beach
		Audit waste management systems (hazardous and non-hazardous)
		Remove use of mercury preservatives in manufacturing
		Monthly meetings for waste management team for optimization.

Company	Location	Goal Description
Pfizer Ireland Pharmaceuticals	The Pfizer Biotech Campus at Grange Castle, Grange Castle International Business Park, Kilmahuddrick, Grange and Nangor Townlands, Nangor Road, Clondalkin, Dublin 22, Dublin.	Reduction of lab smalls waste
		Disposable waste generation reduction to year previous
		Water use reduction to year previous

A waste license one of many licenses required for pharmaceutical facilities. This license is required for facilities that carry out activities for the treatment or disposal of waste. In 2018, 833 waste and industrial licenses were enforced in Ireland. The EPA work to enforce these licenses using a risk-based approach where actions are more heavily focused on aspects with greater potential to pose a hazard to human health. Similarly, the actions taken to enforce are proportional to the health hazard posed. The EPA pride themselves on transparency and strive to communicate openly of expectations from industry. In the case of a breach in licenses the ownness is put on the offender to pay for the required remediations. In the year 2019 a total of 1472 inspections were performed by the EPA at 574 sites in Ireland of which 93% were unannounced. EPA prosecutions resulted in greater than €90,000 spend in costs and fines. When action is required due to

potential non compliances of licensed facilities a compliance investigation is opened by the EPA. It is worth noting that for all licensed facilities, not pharmaceuticals alone, the highest number of issues were related to water quality, followed by waste and then air quality. Investigations are ranked from high to low risk dependent on the given risk to the environment (Agency (EPA)). See figure 7 for a graphical representation of compliance investigations which were in the open state during 2019.

FIGURE 7 OPEN COMPLIANCE INVESTIGATIONS 2019(AGENCY (EPA)).



2.6 Pharmaceutical Manufacturing Concern

It is evident that the pharmaceutical industry does show concern surrounding environmental impact and efforts can be seen to produce greener research, development and manufacturing of drugs. In the area of chemical drug synthesis, the American Chemical society (ACS), several leading pharmaceutical companies and the Green Chemistry Institute (GCI) collaborated to form the Pharmaceutical Round Table. A group created to develop greener, more environmentally friendly processes in the drug life cycle.

The mission of the Pharmaceutical Round Table is:

"…to catalyze the implementation of green chemistry and green engineering in the global pharmaceutical industry."

The objective of the round table is to spark the employment of greener processes globally. Companies included in the Pharmaceutical Round Table include Pfizer, Merck, Novartis and many more pictured in figure 8 (at time of report writing).

FIGURE 8 CURRENT ACS GCI PHARMACEUTICAL ROUND TABLE MEMBERS ("THE ACS GCI PHARMACEUTICAL ROUNDTABLE")

The priorities of the Pharmaceutical Roundtable are to support the research of new and improved engineering and chemistry, to monitor the development of novel ideas in addition to new tools to enhance the capacity for greener processes. The Roundtable influence and invest to support member companies achieve green goals including grant allocation. This society aims to inspire pharmaceutical business leaders to employ more environmentally friendly methods to deliver safe and efficacious treatments to patients whilst minimally impacting the environment.

Since 2007 the Round table have dedicated over two million US dollars, in 10 years this has resulted in 28 funded projects and 73 scientific journal publications which are peered reviewed (Koenig et al., 2018).

With such a large proportion of Irelands hazardous waste exported to Great Britain it is understandable that there would be some concern surrounding this as a result of Brexit as reported on in the Irish Examiner (Friday et al., 2018).

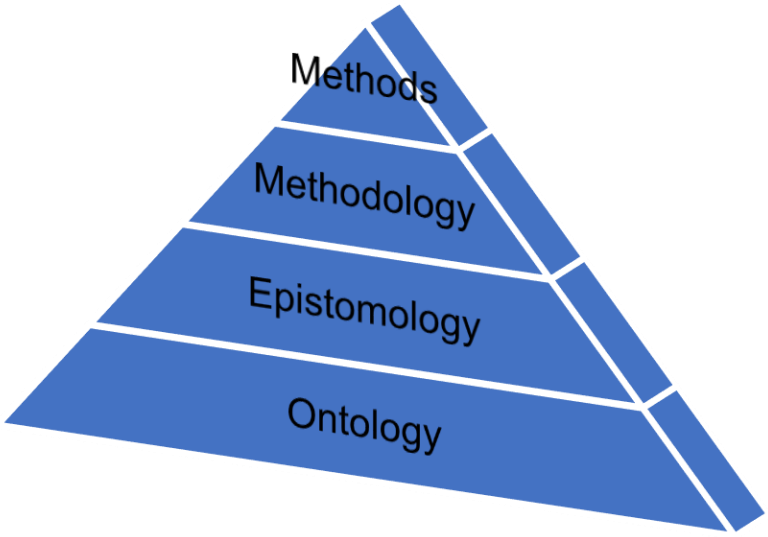
Chapter Three: Methodology

3.1 Research Paradigm and Overall Approach

In terms of ontology and epistemology this study lies in the area of relativism, more specifically constructivism. The reasonings for this are explained in the following.

A research paradigm may be described as a set of interconnected beliefs and assumptions surrounding the social world which fosters a philosophical framework for a researcher. Simply put it is a way of thinking about the world. A research paradigm is comprised of ontological, epistemological, and methodological assumptions. Ontology relates to the reality of the study, beliefs surrounding the reality of the study determines what can be known about the research. “What is reality?” and “what exists?” are types of questions a researcher must ask themselves in order to determine the ontology of the study. Epistemology is influenced by ontology and refers to the actions or approaches that are deemed most suited and valid to generate the research knowledge. It describes the relationship between the researcher and what can be known. Methodology is a philosophy or a sphere of influence within the research paradigm that allows you to conduct research and guides selection of research methods. Various types of ontology, epistemology, methodology and methods must be explored and selected. Ontology forms the base of the pyramid which influences the selection of epistemology and so on.

FIGURE 9 RESEARCH PARADIGM PYRAMID



Axiology, which relates to the researchers position on values also plays a role in the selection of a research paradigm. (Saunders et al., 2009, p. 119),(Denzin and Lincoln, 2011), (Hallebone and Priest, 2008) readings shed light on four research paradigms formed through selection of the aforementioned factors. These are Positivism or naïve realism, post-positivism or critical realism, interpretivism or constructivism and pragmatism

The two main ontologies are realism and relativism and between these two strongly opposing ideologies lie variation. Realism, also known as objectivism, poses a reality where the truth can be known, it is objective and static and is not influenced by people's social beliefs and experiences. It is context free, there is one reality which can be found. Relativism also known as subjectivist or nominalist poses a reality where truths are subjective and circumstantial. It is recognised that there can be multiple truths with the

potential to conflict but remain the truths of the study and it is accepted that observations can change. Realities are influenced by social factors and experiences.

In line with the literature review the factors influencing environmental actions appear subjective, these may impact different people in different ways. Research suggests different experiences, belief systems, knowledge, social factors, systems and infrastructure determine the scale of pro-environmental action. This portrays a subjective research topic. For this reason, a positivism ontology which has an objective and external stance was ruled out. This reasoning points toward a constructivism reality in which it is recognized that individuals backgrounds, experiences and personal realities determine the social setting of the environmental situation in which they live and therefore any actions which are viewed necessary as the result of a given influencing factor. This ontology outweighs that of pragmatism; which favours changing approaches between positivism and constructivism, starting the research with a pre-defined research question (Wahyuni, 2012).

A positivism epistemology supports numerical data collection i.e. hard facts. To gather this information would require defined measurable experiments, through which potentially influencing factors for pro-environmental activity are introduced. The results of which must be measurable and comparable to the situation present prior to the introduction of the influencing factor. Due to limitations of research including access to pharmaceutical facilities, permissions to perform and measure such studies and time constraints this is an unsuitable research approach. An epistemology using this approach or a mix of approaches as pragmatism indicates will not be utilised. A constructivism research paradigm supports a qualitative approach to achieve the objectives of the research

subject which pursues to study the factors influencing environmental impact behaviours in pharmaceutical workplaces. Interpretivists seek to interact with the research subjects, creating a dialogue and utilizing a qualitative methodology. Axiologically an emic approach is taken where the researcher attempts to see the truth from the perspective of research subjects.

3.2 Primary Research Design

The research strategy will be qualitative, using surveys as a method for collecting data to identify factors influencing environmental impact behaviours of employees in Irish biopharmaceutical companies. It is the intention to identify companies as part of the questionnaire to allow potential of comparing and contrasting companies results on a whole and aid to further discussion on findings. However, companies will remain anonymous in reporting to allow for confidentiality. Participants will be questioned in regard to their level of consideration taken into account in their day to day work in terms of reducing reusing and recycling, their reasoning for their consideration and potential factors influencing their behaviours.

The information gathered will be reviewed and will seek to determine any variation or similarities between participants and companies, to identify any group norms and to pinpoint the most impactful factors.

A singular data collection will be completed through survey aiming to extract the most influential factors determined in round one and provide participants with a scale in order to rank factors in terms of positive influence.

The intention of this study is to utilise multiple pharmaceutical companies from which to draw knowledge and provide a greater understanding of commonalities or differences to determine the most influential factors in the workplace from the perspective of employees themselves. It is the expectation that company names will remain anonymous so as to avoid highlighting any potential shortcomings that may be addressed. Upon reporting companies may be identified by assigning a numerical/non-numerical identity to allow for informative discussion and to ensure clear reporting of results. Respondents will be

selected purely from availability standpoint to increase data collection. Both permanent employees and contractors and interns, where applicable, will be included in this study. Personal contacts from experience working within the industry will be utilised. A chain referral approach will be employed to increase sample size where possible.

Question format will be open ended. It is the perceived reality that people want to be environmentally friendly. To ask such a question as “Do you wanted to be environmentally friendly?” serves no purpose here as this is almost a rhetorical question. A simple yes to this question provides no viable data to analyse. Yes, people want to be greener, but at what cost? The reality is there are cost limitations, time limitations, varying priorities. Are people too rushed to concentrate on the environment? In this way participants are allowed to answer in their own words rather than yes/no providing more complex answers. The data collected will be textual. The research approach is semi-structured in that it is an iterative process. What is learned from surveying is interpreted and aids to findings discussed. Not all responses or quotes will be included in the report of this study, a satisfactory quantity will be included to provide evidence of findings which accurately represent the reality of employees within the Irish biopharmaceutical industry as determined through primary research.

In the view of research ethics, as previously mentioned, company names shall remain anonymous, in addition, participant names shall also remain anonymous. This serves to provide the participants to answer freely while removing any fear or concern regarding negatively impacting company policy, culture or dignity. The number one concern is to

protect the research participant. Informed consent will be communicated via survey to ensure participants understand the level of protection to their information and agree to the reporting of information gathered in this format.

Research data will be analysed with the intention of determining most impactful factors influencing these behaviours. Observations will be made to determine if different companies more strongly reflect the presence of these factors. This collated information will serve to identify the strongest of the factors in order to delve in to their (potential) application and provide suggestions to biopharmaceutical companies endeavouring to positively influence the carbon footprint.

Based on the information gathered; factors determined, and their level of impact it is the intention of this research to compare findings where possible to that of Young et. al., 2015 and as illustrated in figure 2.0. Highlighting visually the factors that play a role and to what apparent extent.

Chapter Four: Analysis and Findings

Analysis and findings are presented here in chapter four of this study. These results are offered in line with research objectives as defined in the introduction section of this dissertation. This study aimed to achieve three objectives as follows:

1. Identify factors that have the potential to positively impact environmental behaviours.
2. Identify factors that have the greatest potential to positively impact environmental behaviours of employees within the Irish biopharmaceutical industry.
3. Analyse current efforts to implement these factors within the Irish biopharmaceutical industry.

Objective one has been satisfied through literary review, refer to chapter 2 of this study for details. The analysis and findings of objective two and three are capture in this chapter, chapter 4. The second objective of this study was to identify factors that have the greatest potential to positively impact environmental behaviours of employees within the Irish biopharmaceutical industry. The third objective was to determine to what extent are these factors currently utilised within the Irish biopharmaceutical industry. The target audience of this survey was Irish pharmaceutical employees. An effort to include as much diversity in employees as possible within the Irish biotech facility was made. Employees of differing job levels i.e. senior management, upper management, senior staff and line workers were targeted. Employees of varying age and job role such as operators/ technicians, laboratory employees, those who worked in a mixed desk/production environment took part in the study . The purpose of this was to create a holistic view of different employee characteristics such

as job role and job level. Respondents who took part are currently employed throughout a number of different biopharmaceutical companies as detailed below.

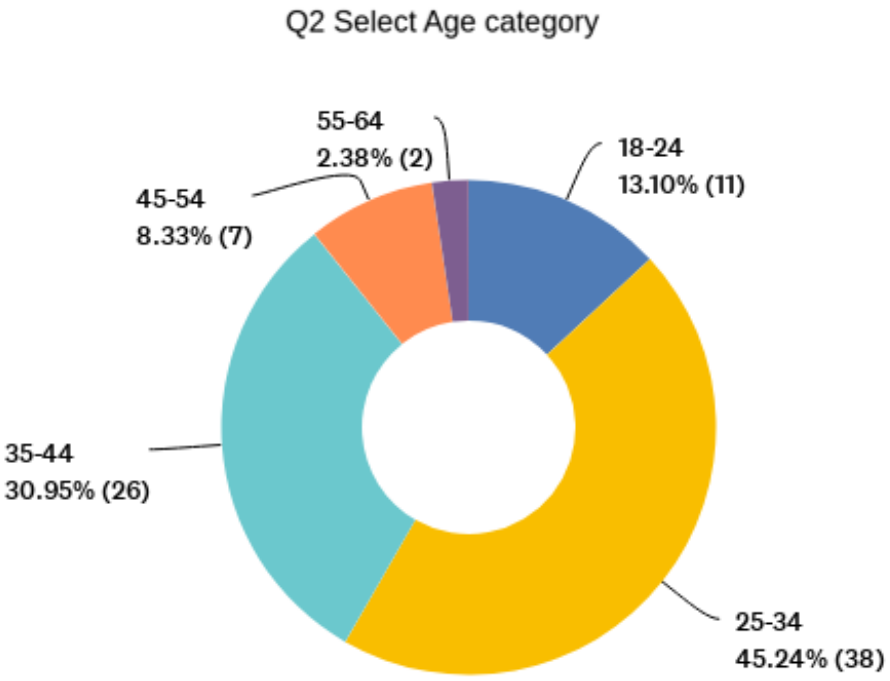
4.1 Respondent Demographic

The survey titled “Environmental Attitudes in the Pharmaceutical Industry (Ireland)” was shared to colleagues and connections working in this industry in Ireland. The survey remained open for a total of 15 days to gather as many respondents as possible. 84 respondents answered the survey, with a completion rate of 81%. The typical time spent on this survey was 13 minutes and 18 seconds. In total, respondents spanned across 10 different Irish biopharmaceutical companies. As previously stated, companies’ names are confidential in order to uphold ethical standards and to promote truthful responses. From here on out companies are assigned a letter as per table 2. The number of responses collected per company are as follows.

TABLE 2 RESPONSES PER COMPANY

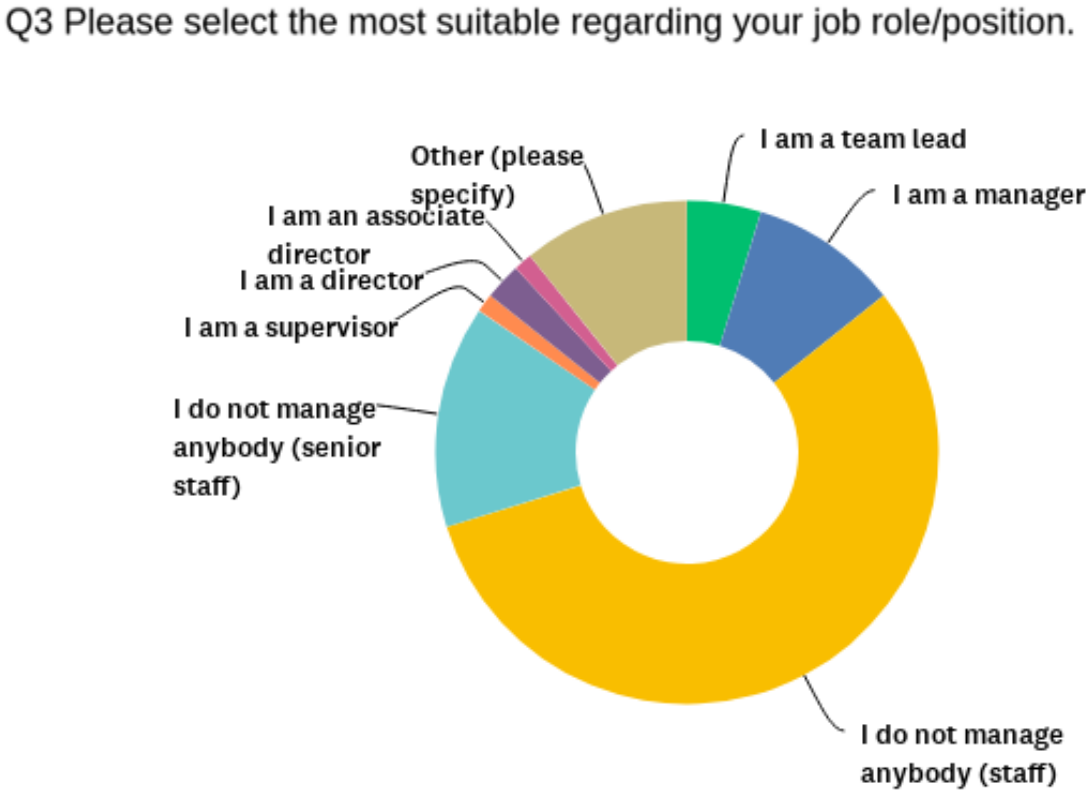
Company	Respondents
A	4
B	43
C	4
D	4
E	1
F	6
G	1
H	1
I	19
J	1

FIGURE 10 AGE CATEGORY



Respondents ages ranged from the category 18-24 to 55-64 years. The largest number of respondents, 45.24%, belonged to the 25-34 years category. Age category break down can be seen in figure 11 below. The large majority of respondents, slightly greater than 75%, were attributed to those between 25 and 44, a reflection of the age diversity of employees within Irish biopharmaceutical companies.

FIGURE 11 JOB ROLE

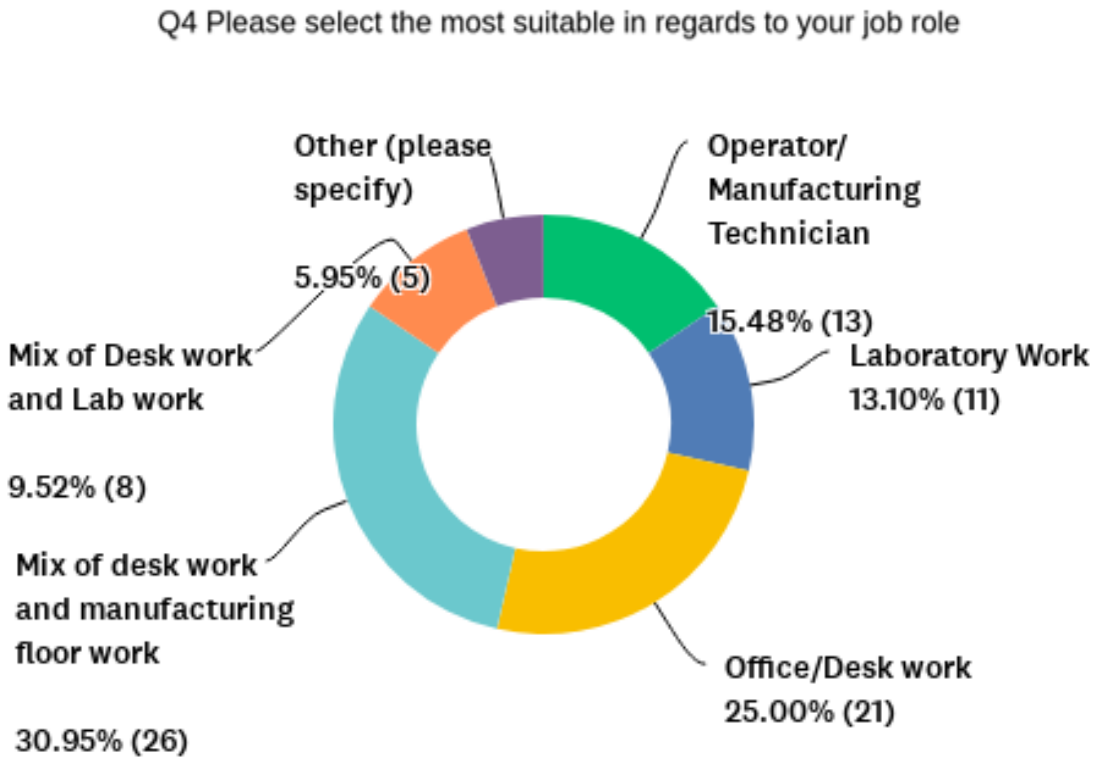


55.95% of respondents were staff members who did not manage other employees. 14.29% were senior staff. Supervisors, team leads and managers together accounted for 15.47%. Directors and associate directors made up 3.57% of responses. These figures portray typical proportions of job role levels within biopharmaceutical companies as job role positions reduce in quantity higher up the leadership chain. Efforts to include employees of various job role levels were very successful and helped to provide a holistic view of environmental behaviours within the Irish biopharmaceutical industry. The reasoning behind this was to eliminate as much bias as possible as a result of company pride. It is possible that there is greater potential for those in roles of higher management

e.g. directors and managers to paint their company in a brighter light than employees such as operators, technicians or office workers who do not manage other colleagues. Refer to figure 12 below which details the breakdown of job role levels.

An option for “other” was included for those outside of job levels listed. 10.7% of respondents selected this option. Responses included lead technician, consultant, and scheduler.

FIGURE 12 DATA CHART QUESTION 4



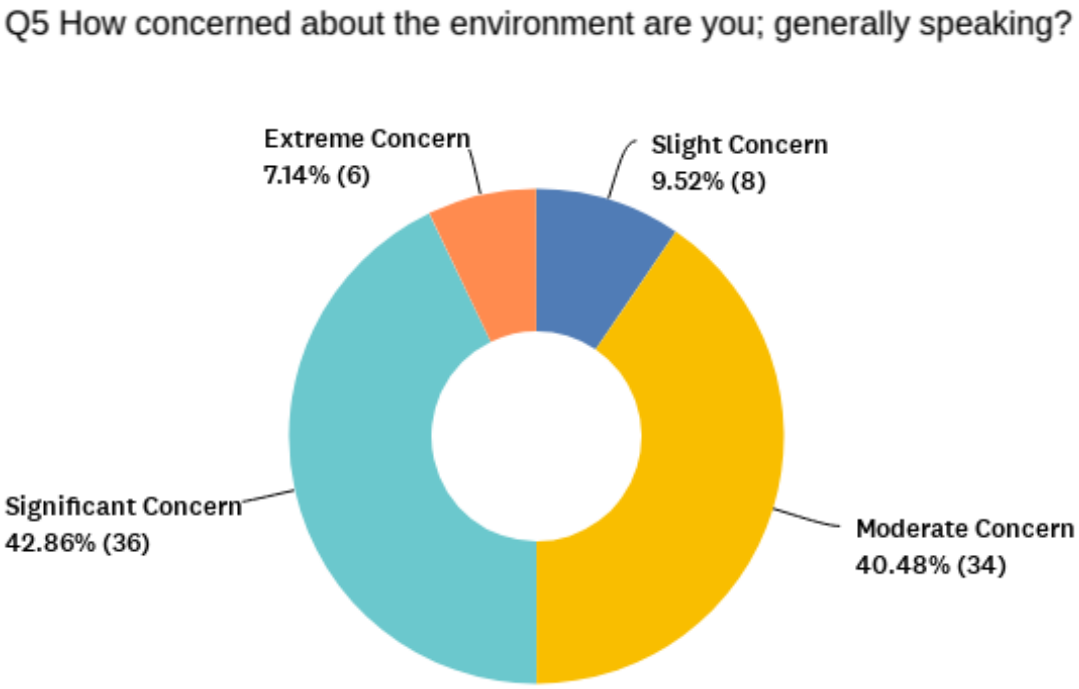
Respondents came from a mix of job roles. Diversity was seen across those working in office spaces, those working on the manufacturing floor or laboratories and those with a mix of office and manufacturing/ laboratory work. 28.58% worked purely in the

manufacturing or laboratory areas while 40.47% worked in a mix of office and manufacturing/laboratory areas. Figure 12details a summary of job roles.

Those who answered “other”, 5.95%, mainly comprised of engineering work.

4.2 Environmental Concern and Awareness

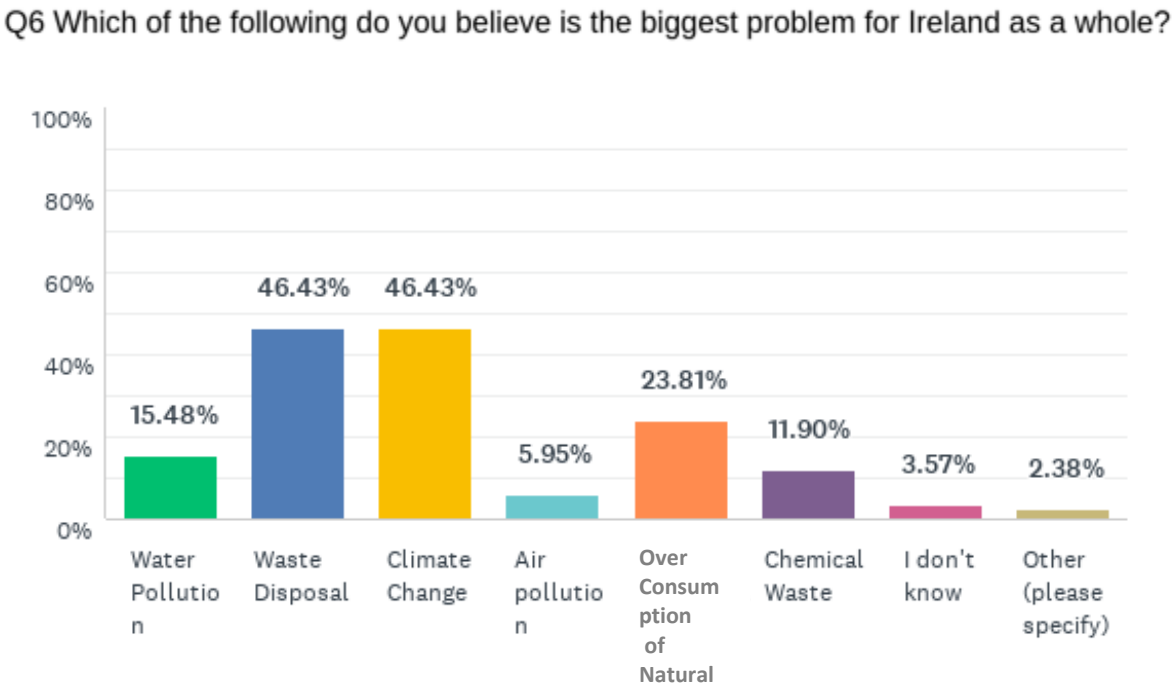
FIGURE 13 QUESTION 5 DATA CHART



Respondents were asked numerous questions to determine their personal level of environmental knowledge, concern and awareness in terms of self, company and Ireland as a whole. In order to engage in positive environmental behaviour a certain degree of awareness for the state of the environment is required. If a person had absolutely zero awareness of current environmental status, then they cannot be expected to be aware of the need for or benefits of positive environmental behaviours.

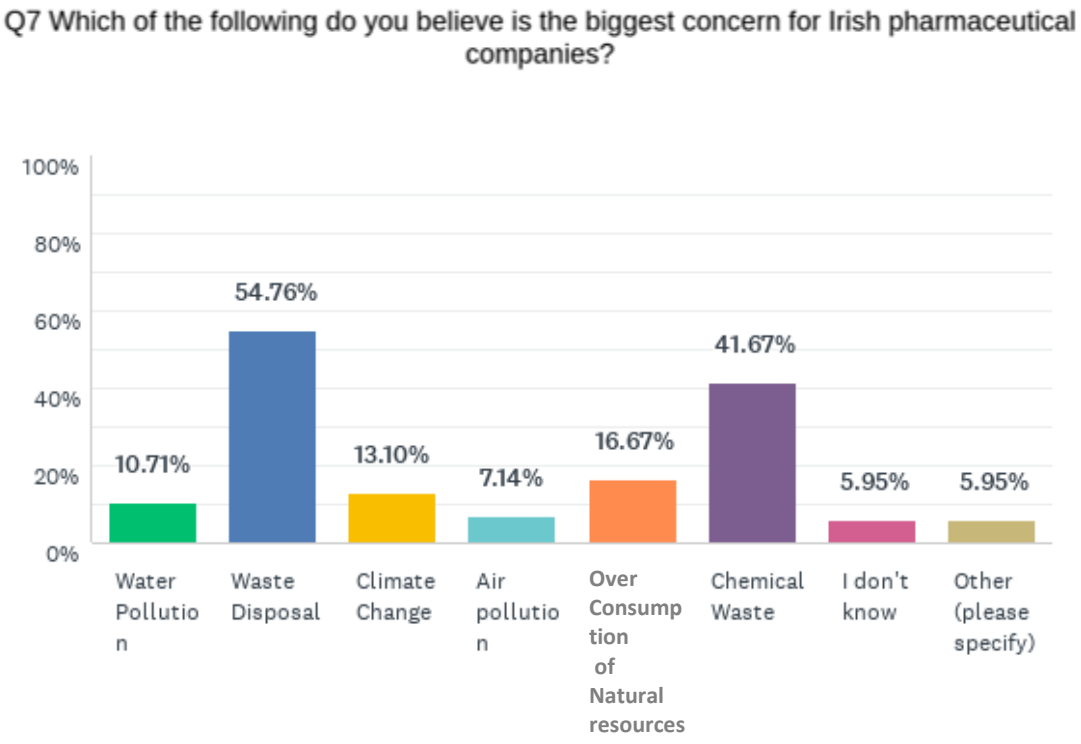
When asked how concerned about the current state of the environment are you mixed responses were received. 0% selected no concern while 7.14% have extreme concern. The most popular answer was significant concern with 42.86% of responds stating they have significant concern for the environment. Refer to figure 13for a graphical representation of results.

FIGURE 14 ENVIRONMENTAL CONCERN IN IRELAND



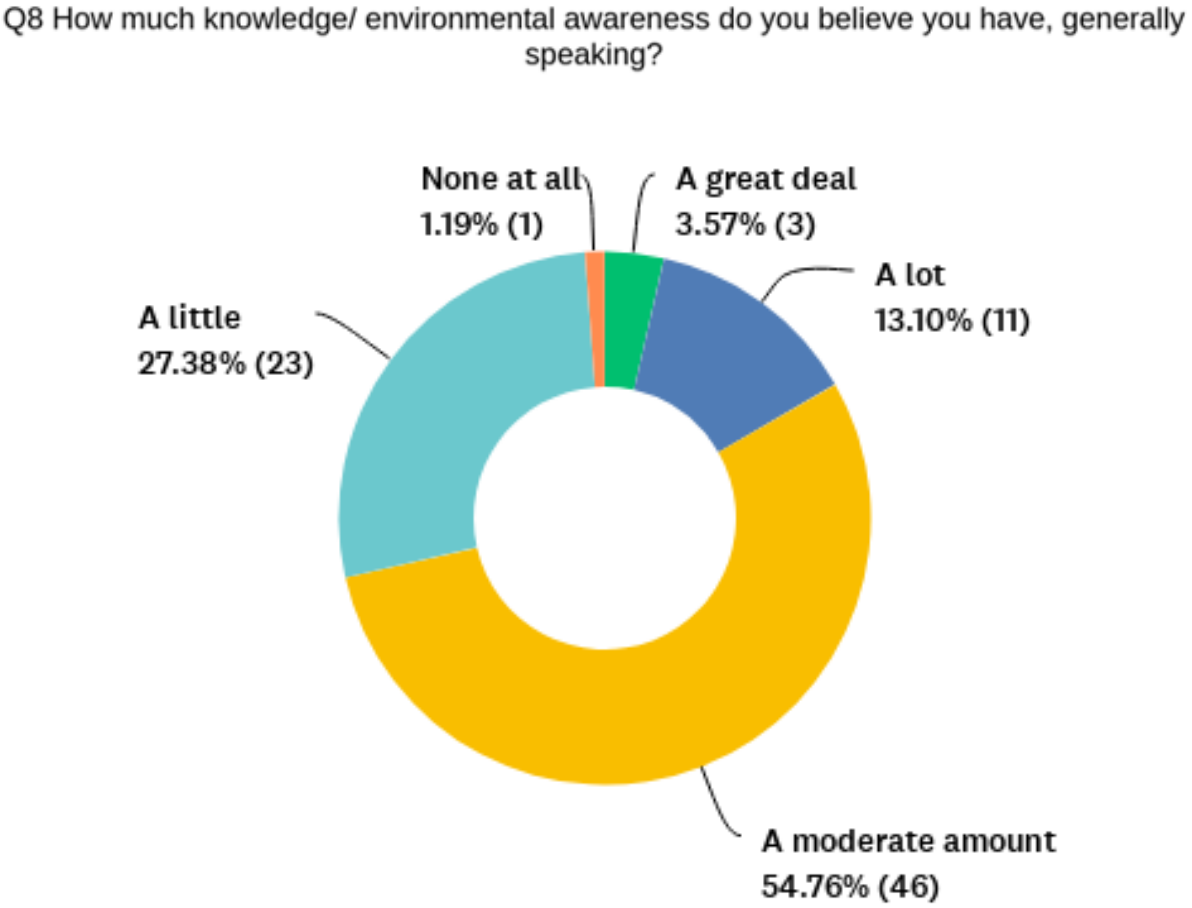
The greatest problems believed to be of environmental concern for Ireland as a whole were waste disposal and climate change followed by over consumption of natural resources. As can be seen in figure 14 concerns varied for respondents with 3.57% not knowing what they believe to be the greatest concern. A variance in responses may indicate that it is not clear to respondents where the issues lie in Ireland in terms of environmental concern. However, in this case it was observed that waste disposal and climate change were seen as the highest-ranking concerns for Ireland as a whole. This suggests a consensus of agreement and similar thinking between respondents.

FIGURE 15 ENVIRONMENTAL CONCERNS IN IRISH BIOPHARMACEUTICAL INDUSTRY



When asked for beliefs on the biggest environmental concerns within Irish biopharmaceutical companies, responses changed from that seen in Ireland as a whole. Again, the highest chosen concern was waste disposal. An increase was seen from 46.43% for Ireland as a whole to 54.76% within biopharmaceutical companies. This indicates that waste management presents itself as an area of environmental improvement opportunities within these companies. Solidifying this analysis, the second most chosen concern was that of chemical waste at 41.67%. As indicated in figure 16below all other concerns, although very relevant and of importance, lagged behind those of waste management.

FIGURE 16 ENVIRONMENTAL KNOWLEDGE/ AWARENESS



On average respondents showed to have a moderate amount of knowledge/ environmental awareness. 3.57% had a great deal and 1.19% had none at all. A small number of knowledge testing questions were put to respondents with a dual purpose. These “pop quiz” style questions relayed back a score to those completing the survey which served to maintain the target audiences’ interest in the survey and break up any potential monotony to optimise potential for full survey completion. Questions were not overly complicated and offered multiple choice. What was interesting here is scores reflected that employees did in fact have “a moderate amount” of knowledge in this area. Those stating to have a moderate amount of knowledge totalled to 54.76%. Average

correct answers across knowledge testing questions was 52.98%. Figure 16 gives a breakdown of knowledge in this area with 3.57% having a great deal, 13.10% having a lot, 54.76% having a moderate amount, 27.38% having a little and 1.19& having none at all.

FIGURE 17 ENVIRONMENTAL KNOWLEDGE/AWARENESS IN THE BIOPHARMACEUTICAL INDUSTRY

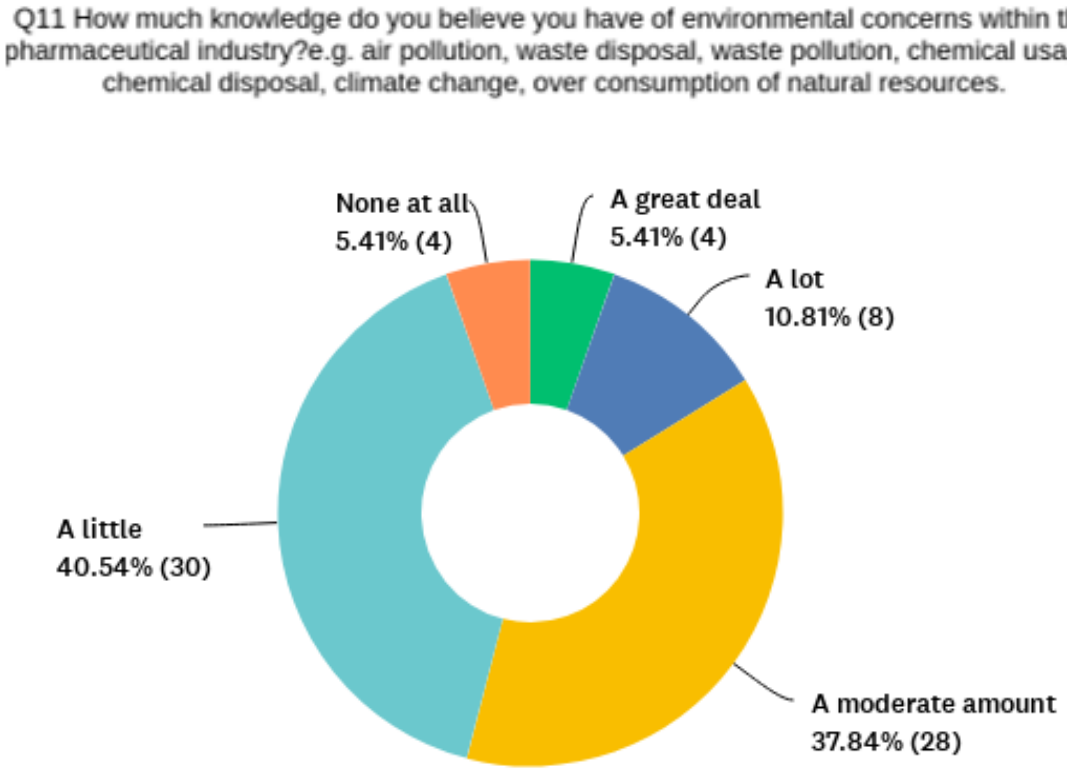


FIGURE 18 ENVIRONMENTAL KNOWLEDGE/AWARENESS FOR SOLUTIONS IN THE BIOPHARMACEUTICAL INDUSTRY

When questioned on environmental knowledge within the biopharmaceutical industry. All categories increased with the exception of “a moderate amount”, which decreased. Those with less than a moderate amount totalling 45.95% and those with more than a moderate amount totalling 16.22%, refer to figure 17.

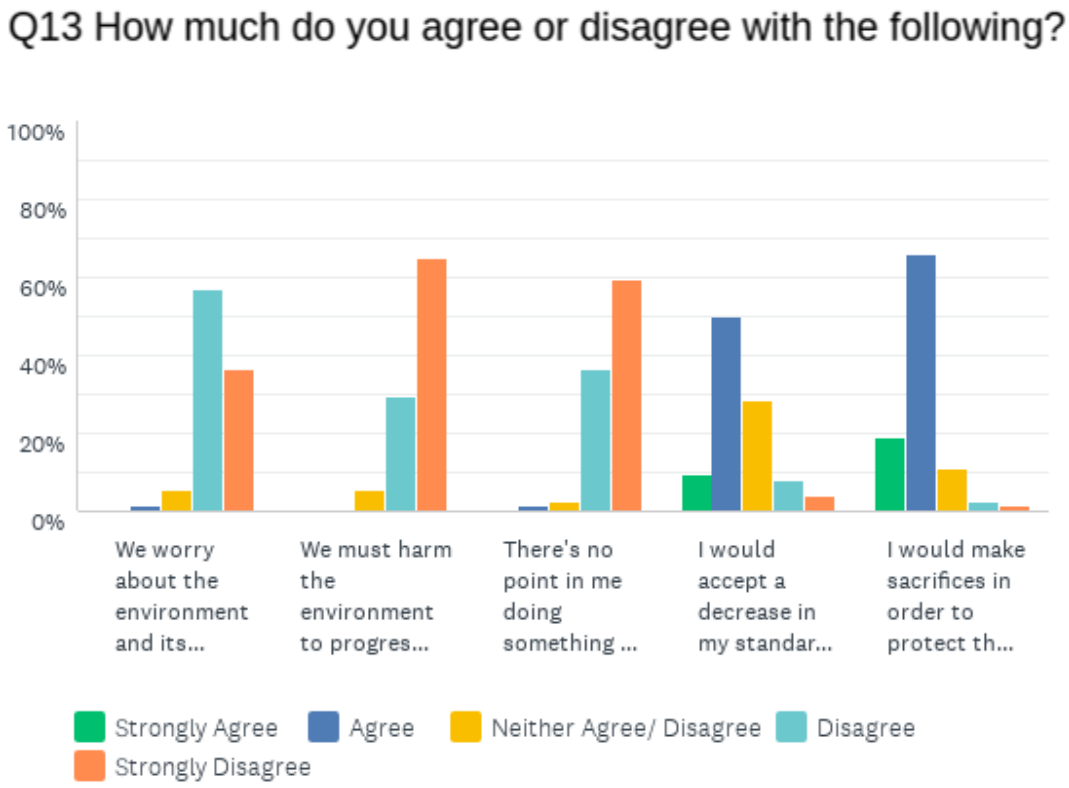
There is potential to improve knowledge in this area. To educate employees on environmental importance, the impact we can have on the environment, particularly in the work place, to meet legal requirements and to improve the state of the environment

serves to lay the foundations on which improvements in environmental behaviours and behaviours can be built.

Knowledge levels of environmental concerns within the biopharmaceutical industry reflected results for knowledge of solutions for these concerns. Refer to figure 18 for levels of knowledge regarding solutions held by respondents.

4.3 Individual Factors

FIGURE 19 QUESTION 13 DATA CHART



Note: Refer to table 3 below for full statements detailed in figure 19.

TABLE 3 QUESTION 13 SUMMARY DATA

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
We worry about the environment and its future too much	0.00%	1.35%	5.41%	56.76%	36.49%
We must harm the environment to progress as humans	0.00%	0.00%	5.41%	29.73%	64.86%
There's no point in me doing something to help the environment	0.00%	1.35%	2.70%	36.49%	59.46%
I would accept a decrease in my standard of living in order to protect the environment	9.46%	50.00%	28.38%	8.11%	4.05%
I would make sacrifices in order to protect the environment	18.92%	66.22%	10.81%	2.70%	1.35%

Likert Scales were highly utilised to identify the personal stance and determine the impact of individual factors on environmental impacts in Irish biopharmaceutical employees.

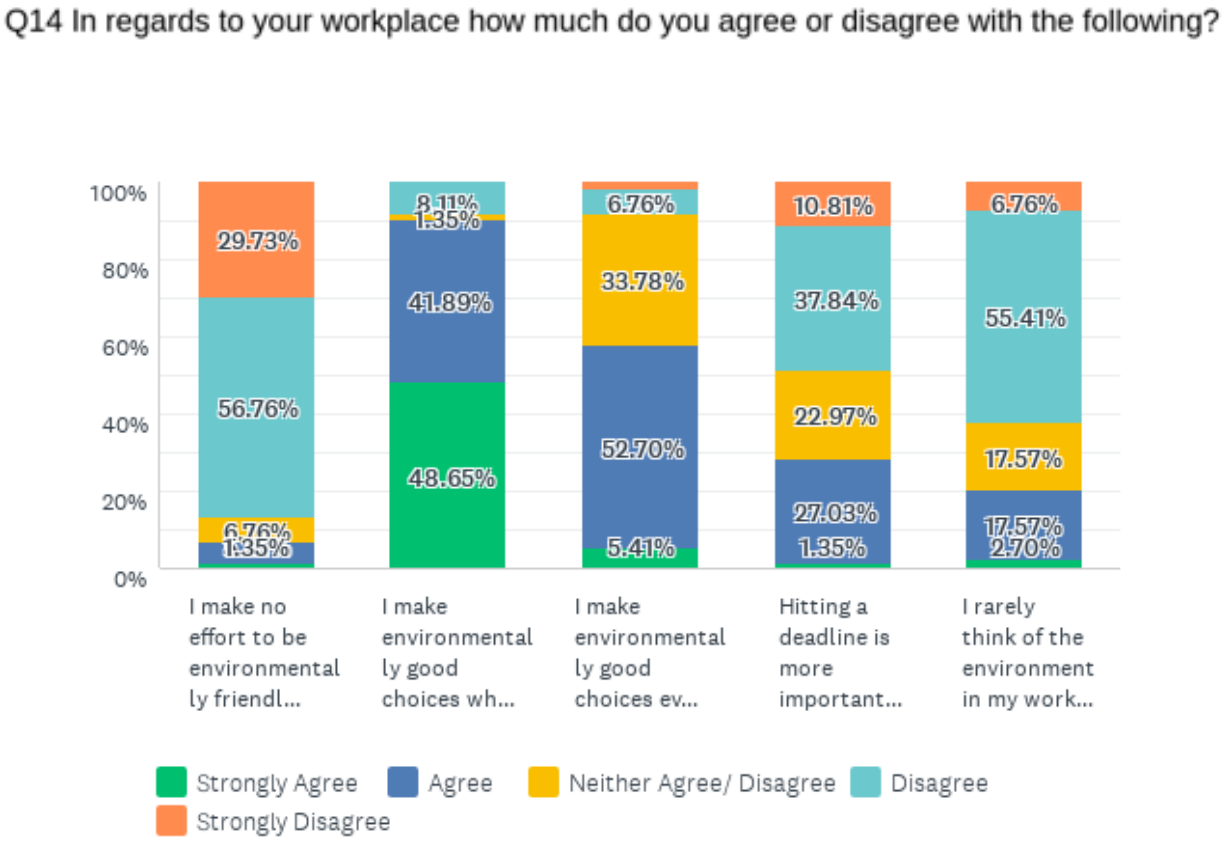
The large majority disagreed (56.76%) or strongly disagreed (36.49%) that we worry too much about the environment. No respondents agreed that we must harm the environment to progress as humans, in fact 64.68% strongly disagreed. When asked how much do

you agree that; “there is no point in me doing something to help the environment,” 59.46% strongly disagreed. Most employees strongly disagreed that we must harm the environment to progress as humans, which shows confidence that as a human race we have the capabilities to protect the environment whilst maintaining human progression. In addition, most respondents strongly disagreed that “there is no point in me doing something”, demonstrating a belief and willingness that an impact can be made on the individual level.

Respondents showed awareness of waste management procedures in their companies but a greater knowledge of waste management procedures in the home. Employee environmental behaviours at work are currently more strongly influenced by personal behaviours than by site policies. This indicates that where the responsibility is solely on respondents to follow waste management procedures, i.e. in the home, the knowledge and drive is present on an individual level. These behaviours at home then translate into the workplace. Employees in the Irish biopharmaceutical industry believe that this currently has a greater impact on behaviours in the workplace than workplace policies. Through this individual factor research this highlighted an organisational factor. In line with research carried out by Boiral et al, (Boiral, 2005) an increase in participation of employees and increased responsibility to drive on-site environmental initiatives has the potential to greatly improve positive environmental impact. This also indicates the importance of a top down approach for implementation of efforts. The role of management and site leadership to put these initiatives in place and to enforce and encourage employee participation can increase employee responsibility through ownership which in

turn can educate and increase environmental knowledge, ultimately leading to environmental gains.

FIGURE 20 QUESTION 14 CHART DATA



Note: Refer to table 4 below for full statements detailed in figure 20.

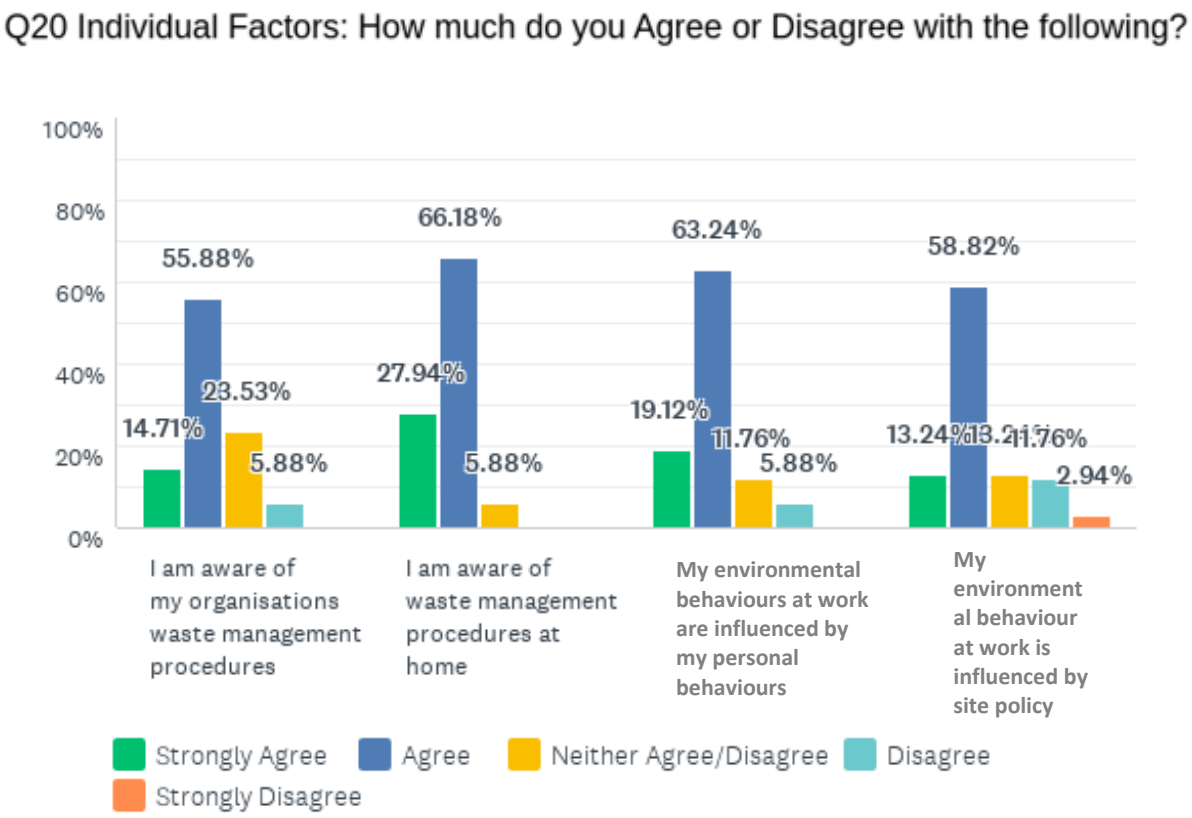
TABLE 4 QUESTION 14 SUMMARY DATA

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
I make no effort to be environmentally friendly at work	1.35%	5.41%	6.76%	56.76%	29.73%
I make environmentally good choices when it's easy	48.65%	41.89%	1.35%	8.11%	0.00%
I make environmentally good choices even when it costs me more money/time	5.41%	52.70%	33.78%	6.76%	1.35%
Hitting a deadline is more important than doing an environmentally friendly job	1.35%	27.03%	22.97%	37.84%	10.81%
I rarely think of the environment in my workday	2.70%	17.57%	17.57%	55.41%	6.76%

Upwards of 86.49% disagree or strongly disagree that they make no effort to be environmentally friendly at work. In making good environmental choices at work 90.54% agreed or strongly agreed that they make these choices when its easy while only 58.1% would make good environmental choices when it cost more time or money. 48.65% disagreed or strongly disagreed with the statement “Hitting a deadline is more important than doing an environmentally important job”. In addition, a majority of employees stated that they think of the environment in their workday, with 62.17 % disagreeing or strongly disagreeing with the statement, “I rarely think of the environment in my workday”. This

round of questioning indicates there is some level of concern for the environment in Irish biopharmaceutical employees, but challenges such as money time costs and the need to hit deadlines create barriers. Employees show a degree of concern for the environmental importance over these factors on a personal level. The question as to whether the support and engagement is present in the workplace to bring environmental impact higher on the priority list is further analysed throughout this chapter.

FIGURE 21 QUESTION 20 DATA CHART

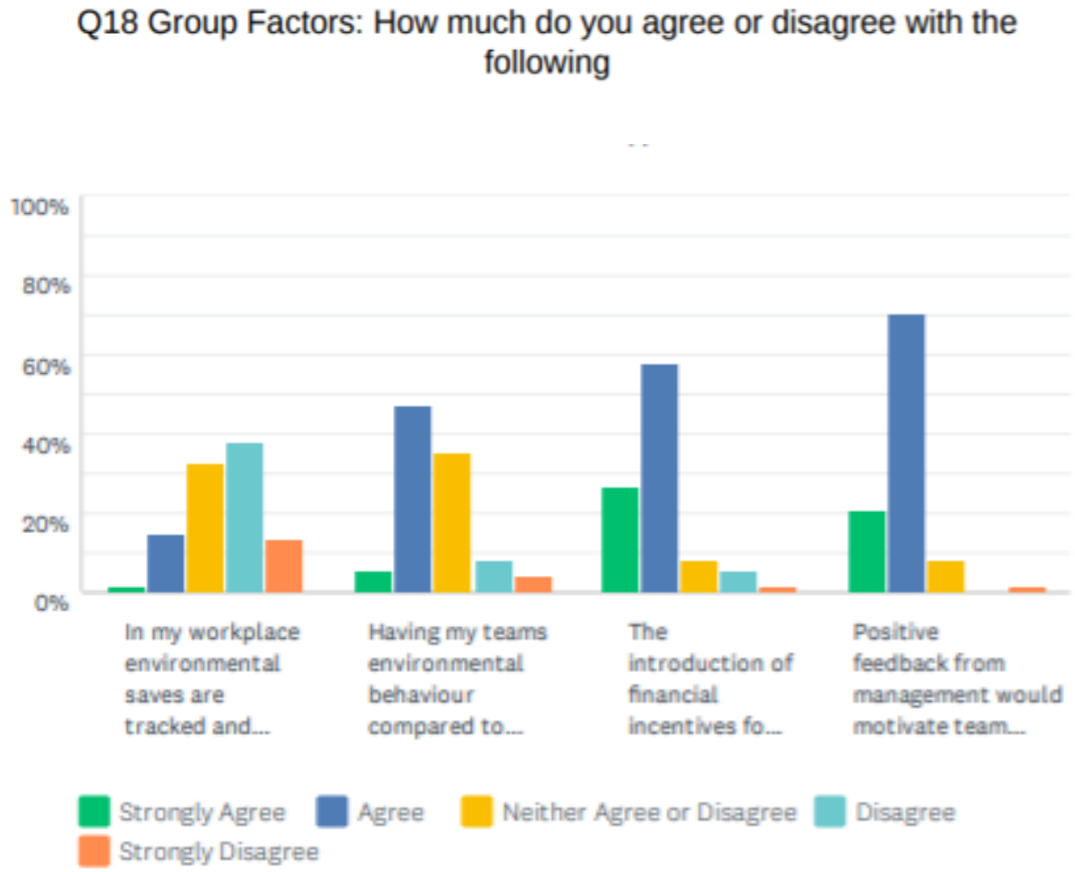


Respondents were asked for their individual feedback that they would provide at work. Based on the responses, there seems to be an opportunity to focus on paperless systems and waste reduction. Some of the opportunities for waste reduction included water, utilities, energy e.g. lighting and single use items. Guidance is needed from upper management to emphasise the importance of waste reduction to the environment, for example the correct use of waste management streams. Implementation through structured pathways was a repeated point observed in this primary research. Employees see the difficulty in implementing greater environmental successes post planning stages in the biopharmaceutical industry. If built in from the design phase this would be a hugely opportunistic time to prevent poor environmental outcomes as a company evolves and

moves in to manufacture. Thinking in terms of “reduce, re-use, re-cycle” the recurring theme throughout this primary research is to reduce prior to re-use and re-cycle.

4.4 Group Factors

FIGURE 22 QUESTION 18 DATA CHART



Note refer to table 5 below for full statements detailed in figure 22.

TABLE 5 QUESTION 18 SUMMARY DATA

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
In my workplace, environmental saves are tracked and compared to other teams	1.35%	14.86%	32.43%	37.84%	13.51%

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
Having my team's environmental behaviour compared to others motivate me to improve my environmental impact	5.41%	47.30%	35.14%	8.11%	4.05%
The introduction of financial incentives for groups would motivate teams to improve environmental impact	27.03%	58.11%	8.11%	5.41%	1.35%
Positive feedback from management would motivate teams to improve their environmental impact	20.27%	70.27%	8.11%	0.00%	1.35%

16.21% of respondents confirmed that their companies track environmental saves (positive environmental actions) and compare them to other teams/ departments. 32.43% were unsure as to whether these are tracked or not. This highlights a knowledge gap. While 51.3% disagreed that this was in place over half of respondents, 52.71% agreed that this would motivate them to improve their environmental impact. 85.14% agreed that the introduction of a financial incentive would motivate greater positive environmental behaviour yet the large majority saw positive feedback from management would motivate teams to improve their environmental impact with 90.54% either agreeing or strongly agreeing. Again, the role of management as seen through individual factor research is highlighted here as a key factor influencing positive environmental behaviours.

In question 19 participants were asked to comment on ways that their own departments can improve environmentally. The most commonly received answers for improvement were in the areas of waste, paper/stationery and utility consumption. Improvements in waste steam management both in manufacturing areas in terms of opportunities to recycle waste, to reduce packaging of consumables in particular, plastics, and to limit movement with cleanrooms in order to reduce usage of disposable personal protective equipment (PPE) where possible. Such PPE would include gloves, shoe covers, hair nets and garbs. Packaging of the product manufactured was also identified. Although it is acknowledged that certain regulations must be met and product and patient safety must meet requirements, use of materials and waste produced in this area can be reduced. Potentially through standardised bill of materials across different packaging in place of generic bills which may result in excess material which is ultimately dumped. The ability to reduce volumes of waste going to biohazardous waste storage and eventually for incineration by ensuring only that which is considered biowaste is included furthermore by becoming more efficient in dispensing of raw materials and utilising commonalities across processing step demands to cut down on raw material waste was identified. In addition to this, reduction of utilities such as water and other energy resources were noted as a “enormous” over expenditure in terms of quantity of that which is required to perform necessary tasks. These improvements have potential to reduce waste on site. Waste can also be reused and refunctioned for training purposes or trial work for particular items e.g. disposable filters from manufacturing areas for use in training activities. A large volume of answers portrayed opportunities to reduce paper usage, print double sided where needed but in general to move toward completely paper free operation. Reduction and proper disposal of this paper requires improvements such as separate bins in all areas for recycling, minor redesigns in location and sizing to allow increased recycling. Aside from these concerns, others pointed toward increased management encouragement and engagement,

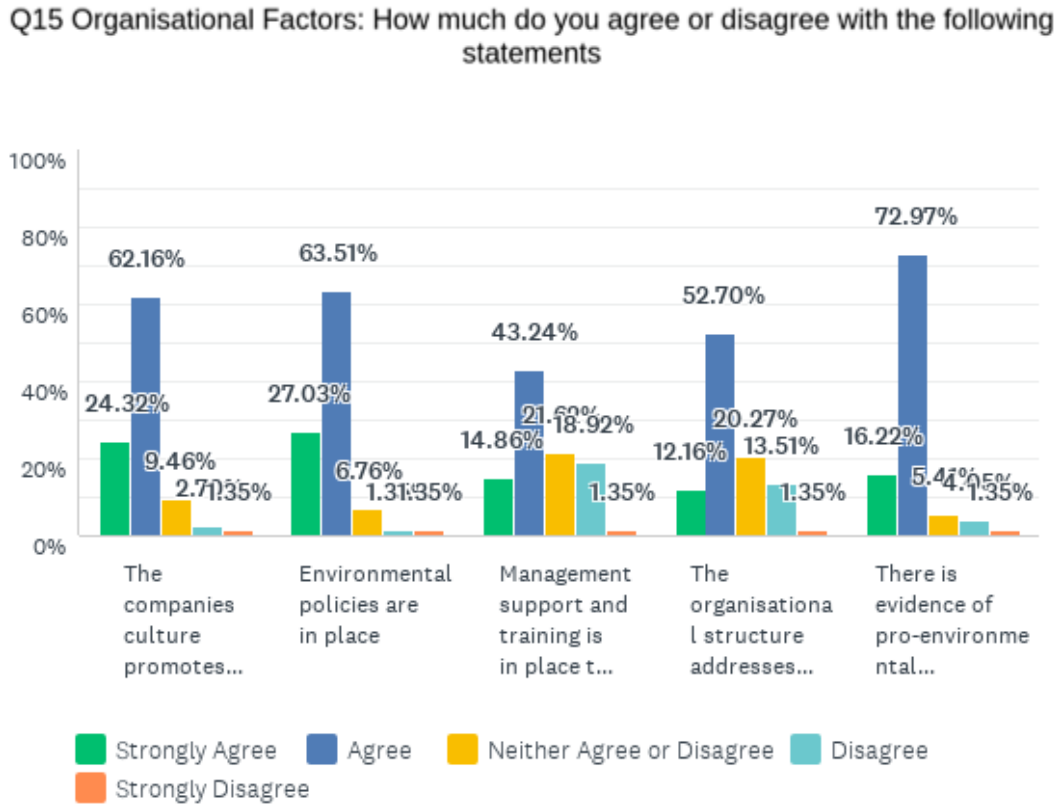
metric tracking of environmental saves and dedicating resources to improvements in environmental behaviours on site.

Across the globe the covid-19 pandemic continues to be seen as a major health risk to the public. With the increase in cases seen in April 2020, this respiratory virus has forced governments to take measures such as social distancing to prevent the spread of this disease ("Rapid Risk Assessment: Coronavirus disease 2019 (COVID-19) in the EU/EEA and the UK – eleventh update: resurgence of cases", 2020, 2020). In Ireland's current situation, following covid-19 government led quarantine a new normal was created with increased working from home to prevent spread of this virus. This guidance is in place as per directions of the Irish government which directs those who can work from home to do so ("Public health measures in place right now"). An opportunity to capitalise on this new way of work reduces commuting to site thus reducing emissions and also reduces paper usage as it forces employees to utilise electronic avenues over paper with lack of printing facilities in the home.

In Irelands biopharmaceutical industry seen by employees' greatest improvements within their departments is waste management in terms of raw materials, packaging, paper waste and large utility waste e.g. energy and water.

4.5 Organisational Factors

FIGURE 23 QUESTION 15 CHART DATA



Note: Refer to table 6 below for full statements detailed in figure 23.

TABLE 6 QUESTION 15 DATA SUMMARY

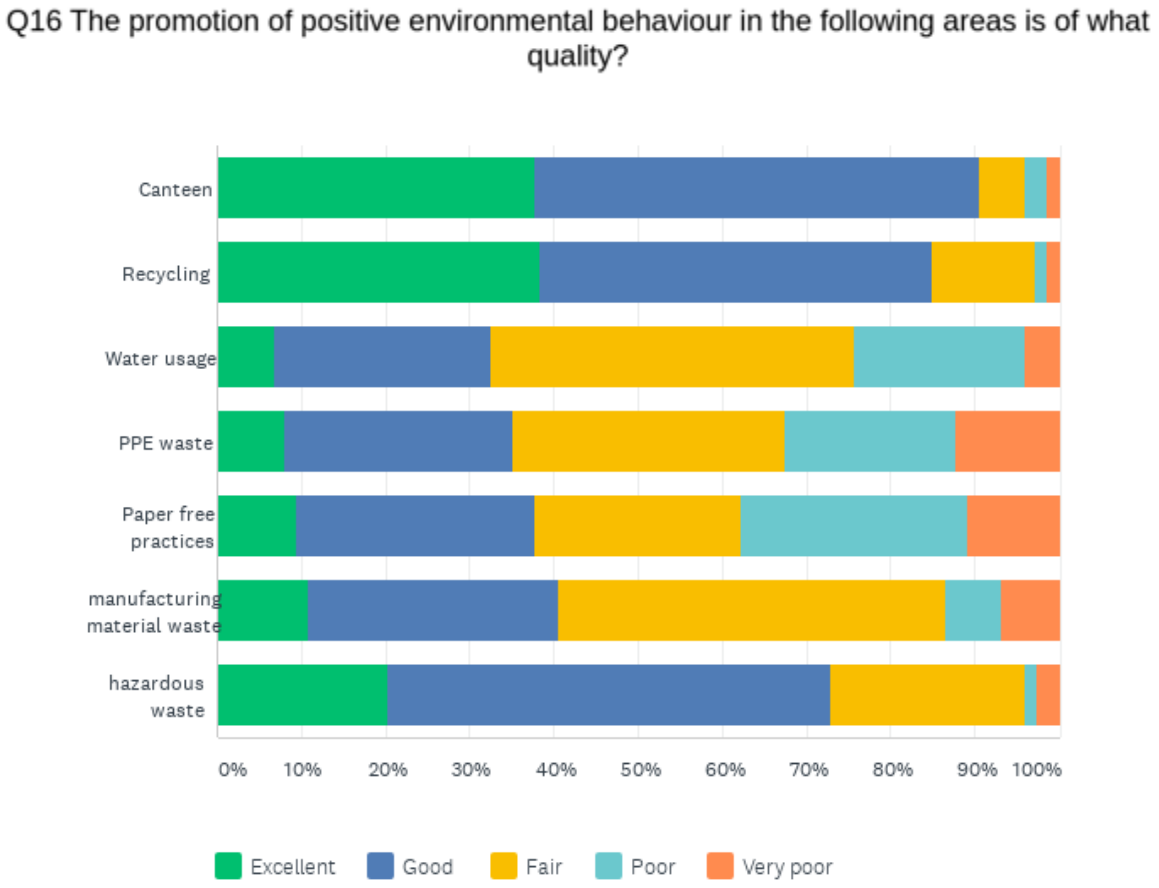
	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
The companies culture promotes positive environmental behaviour	24.32%	62.16%	9.46%	2.70%	1.35%
Environmental policies are in place	27.03%	63.51%	6.76%	1.35%	1.35%
Management support and training is in place to promote positive environmental behaviour	14.86%	43.24%	21.62%	18.92%	1.35%
The organisational structure addresses environmental factors	12.16%	52.70%	20.27%	13.51%	1.35%
There is evidence of pro-environmental infrastructure on site	16.22%	72.97%	5.41%	4.05%	1.35%

Over 50% off respondents agreed or strongly disagreed that companies culture promotes environmental behaviour, have environmental policies, has evidence of pro-environmental infrastructure and the organisational structure promotes positive behaviour. When asked whether management support and training is in place to promote environmental behaviour 64.86% agreed or strongly agreed, this was the lowest positive response of all five questions. It reflects well on organisational factors that positive feedback was received in this area. Although positive it must be noted that responses are not optimum and to receive maximum efforts from employees' organisations need to aim

for targets closer to 100%. Several respondents selected the option of “neither agree/ disagree” which indicates uncertainty. This could point to a lack of communication within the organisation needed for clarity on environmental expectations.

Companies were surveyed for standards across several areas. Results for which can be seen in figure 24 below. Areas within scope included the canteen, recycling, water usage, PPE waste, paper free process, manufacturing material waste and hazardous water. According to employees those scoring most highly were the canteen, recycling and hazardous waste in that order. The poorest area was water usage, followed by PPE waste and paper free practices. Refer to figure 24 for breakdown of all areas. Excluding the canteen all other areas were that which were detailed as areas of concern throughout other survey questions. In alignment with that the only result which could be considered surprising is that recycling scored quite positively. This indicates inconsistency across departments where some may see excellent or good recycling process where others do not. Some examples give in earlier questions by singular employees through open answer question format included location and design of bins and with some stating a lack of split bins. Although recycling seems to be working effectively in accordance with question 16 data this does not take in to account that there is huge potential to reduce waste which will lower the quantity of waste required to be recycled in the first place.

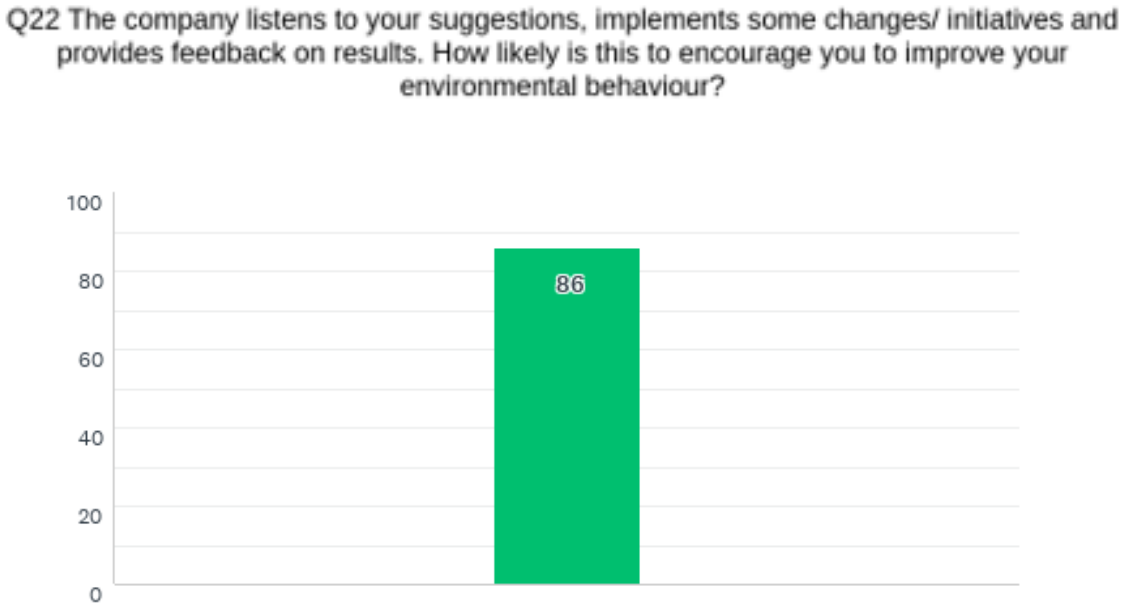
FIGURE 24 QUESTION 16 DATA CHART



Respondents offered ways in which their companies could improve environmental awareness. Largely the response centred around further education and training, more communication through site update meetings, more visible awareness. Sourcing of more environmentally friendly PPE, environmental champions for teams/ departments. Encouragement from management to work from home in order to reduce emissions caused as a result of so many commuting was highlighted. Actions such as moving to paperless and reduction in waste in terms of excess raw materials and water etc. again was highlighted through question 17.

4.6 Implementation

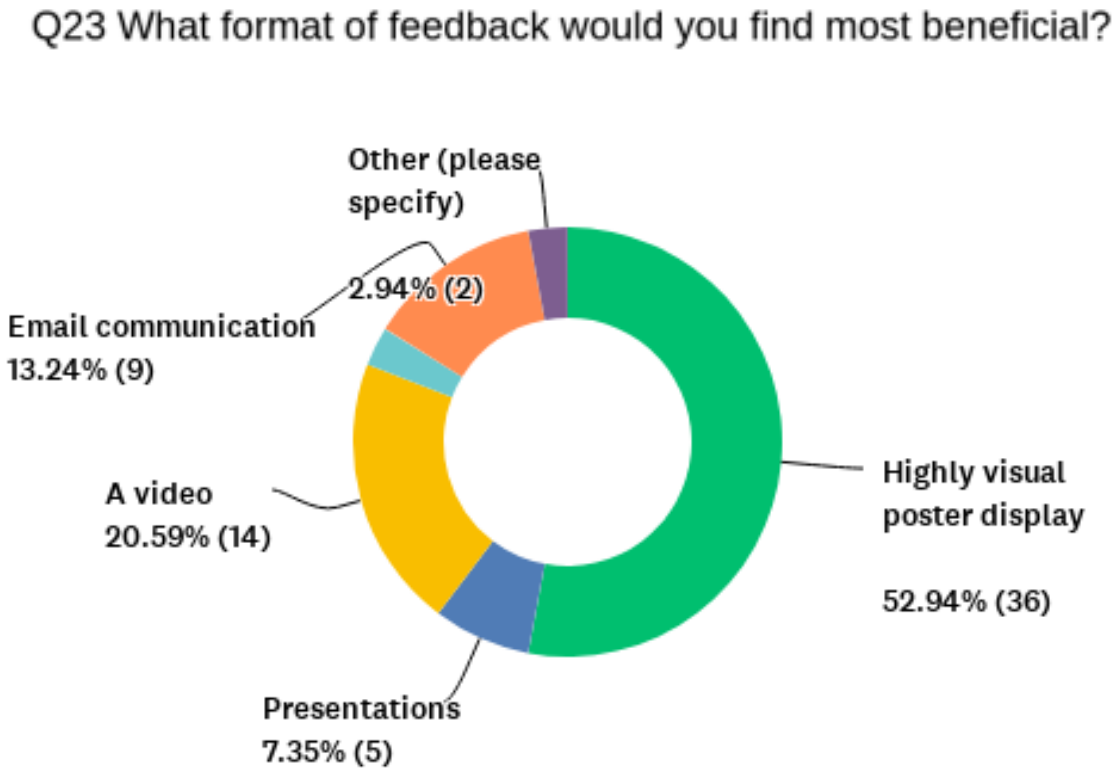
FIGURE 25 QUESTION 22 CHART DATA



Implementation driven by company to create initiatives and changes following employee feedback was analysed. Respondents rank on a scale of 1 to 100 the likely hood of this to improve environmental behaviour. On average this ranked at 86 out of 100, refer to figure 25.

Company driven engagement, a top down approach, was repeatedly observed throughout the findings and analysis section of this study. Question 22 has consolidated this point.

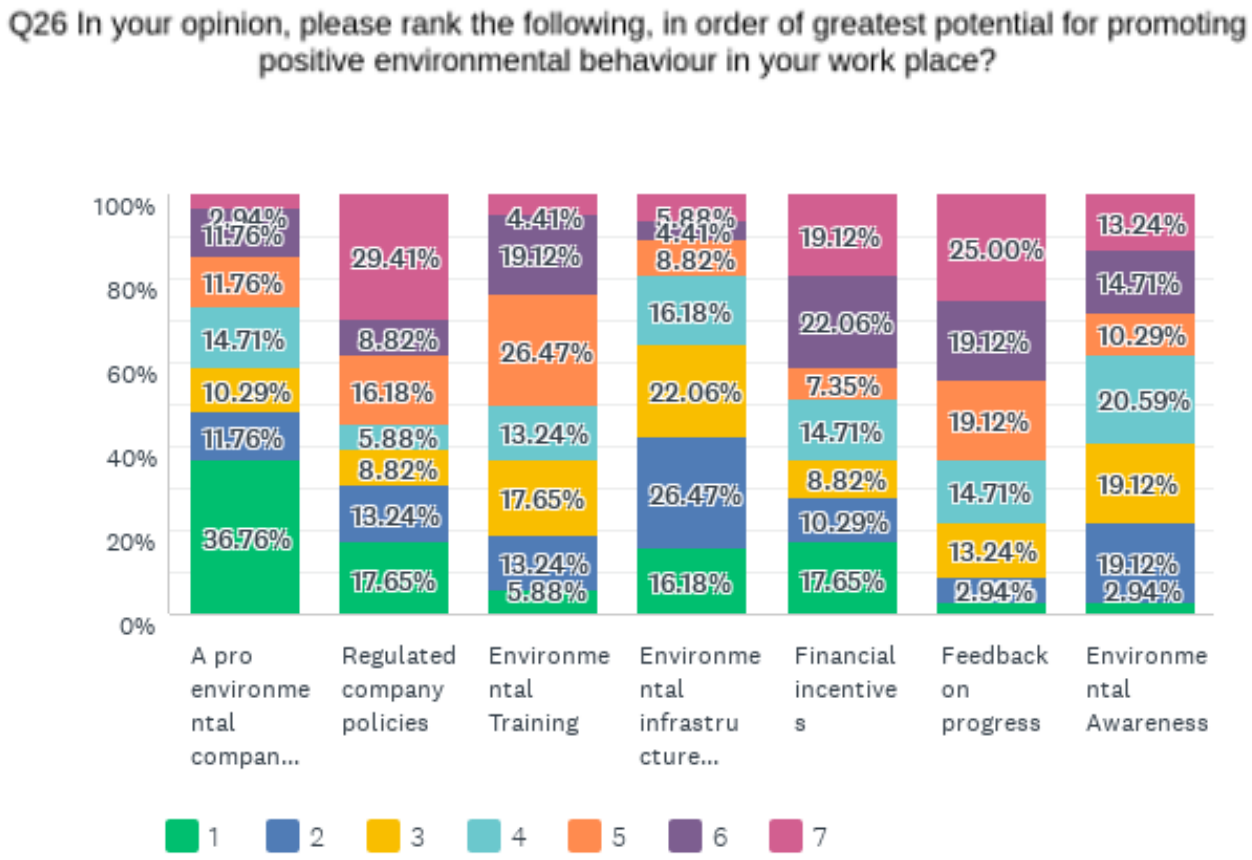
FIGURE 26 QUESTION 23 CHART DATA



In terms of feedback, as a result of changes made, employees prefer highly visual poster displays as a form of communication over any other. A report was rank least helpful from all options and is represented as light blue in figure 26.

4.7 Additional Questions

FIGURE 27 QUESTION 26 DATA CHART



Respondents were asked to rank the following in order of greatest potential for promoting positive behaviour in the workplace:

- A pro-environmental company culture e.g. management support
- Regulated company policies
- Environmental Training
- Environmental infrastructure e.g. segregated bins, signage etc.
- Financial incentives
- Feedback on progress

- Environmental Awareness

The following is illustrated through chart data in figure 27. A pro-environmental company received the most votes at number 1. Following inclusion of 2nd ranked choices a pro environmental company culture still remained in top place followed by infrastructure and regulated company policies. Combining 1st, 2nd and 3rd votes the top three are, in order, a pro-environmental company culture, environmental infrastructure and environmental awareness. Although combining top 3 votes places environmental awareness in 3rd place this tied with feedback on progress and received the lowest of number 1 votes.

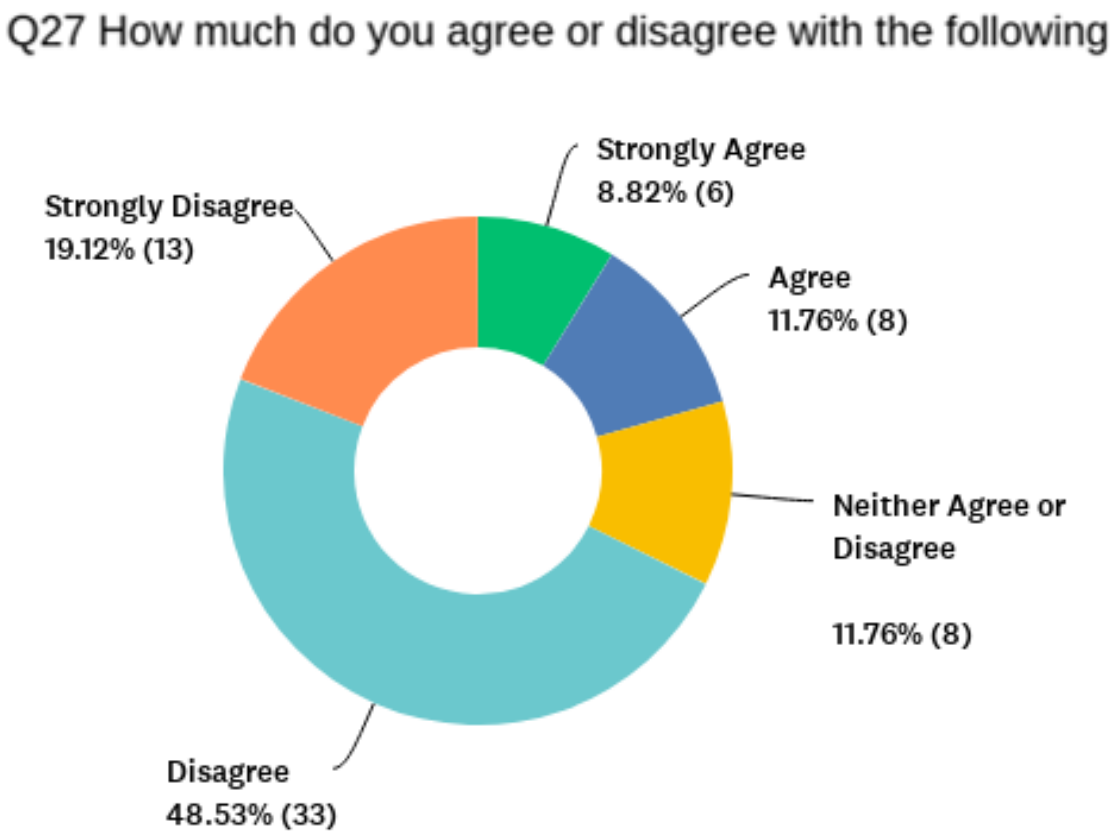
Regulated company policies followed by feedback on progress were most commonly placed at number 7. Overall a pro-environmental culture e.g. management support and environmental infrastructure top the list. Feedback on progress ranked the lowest. Environmental awareness was low in number one votes but overall did place quite highlight upon accumulation of top 3 votes. This could indicate the importance of awareness among respondents however awareness alone will not achieve the desired outcome when it comes to environmental goals.

Respondents were given the opportunity to provide their own answers through text box response as to what factors impact them most greatly. The question asked was “What factor, if any, most positively impacts your environmental behaviour at work?”. The most common responses centred around the following. Infrastructure: building in success to make pro-environmental actions easy. The highest volume of answers related to communication with approximately half of these pointing to signage. Employees believe clear signed guidelines would strongly promote positive choices. Other popular answers

included feedback, awareness of the current situation e.g. current waste levels on site, company lead initiatives and management involvement to lead by example and implement change and self. Participants noted self often as in it is their own personal beliefs/habits and want to care for the environment which was developed outside of work which most impacts what they do in their companies.

In question 25 participants were asked to detail any other pro environmental factors currently in placed within their company that were not already mentioned throughout previous questions of the survey. The large majority noted no other factors. Those that did included; Electric car charging points, ban on disposable cups, bike to work scheme, carpooling parking spots, annual collection of waste and electrical and electronic equipment (WEEE) products for recycling, “greenovation innovation” (a green innovative incentive) and plans to remove plastic drink bottles onsite.

FIGURE 28 QUESTION 27 CHART DATA



Finally, respondents were asked to what extent do they agree or disagree with a statement surrounding their actions should further measures be introduced to improve environmental behaviours by their companies. That statement posed was; if these were introduced employees would adhere to new efforts because they have to and not because of their concern for the environment. The majority disagreed or strongly disagreed displaying personal concern for the environment.

Chapter Five: Conclusion

The purpose of this section is to refer back to the original research question/statement and objectives and provide a report on the findings of both primary and secondary research utilised, in the aim to satisfy the objectives of this study. It is the intention that the information gathered, as a result of this research, will provide biopharmaceutical and similar companies with knowledge and insight that can be utilised to both assess their current environmental position and to improve their environmental impact.

The research statement is “An Analysis of Factors Influencing Environmental Behaviours in Ireland’s Biopharmaceutical Industry Employees”. Objectives are as follows:

1. Identify factors that have the potential to positively impact environmental behaviours.
2. Identify factors that have the greatest potential to positively impact environmental behaviours of employees within the Irish biopharmaceutical industry.
3. Analyse current efforts to implement these factors within the Irish biopharmaceutical industry.

In chapter 2 secondary research was conducted in the form of a literature review. Here, an analysis of the current state of Ireland’s environment, environmental laws for pharmaceutical manufacture and pharmaceutical manufacturing concern, previous research in the field of factors influencing environmental behaviours was performed. Ireland’s environment, manufacturing laws and pharmaceutical concern were included to show the relevancy of this study and give the foundations as to why there is a need to improve our environmental impact. Ireland’s environmental choices are crucial at this time to protect our future, in terms of natural amenities and health of our people. With Irelands location on the Atlantic coast our small Island has added cause for concern when it comes to environmental changes, which brings about rising sea levels. Compared to other countries the state of our environment is “good”, but we have a long way to

go and localised issues tend to get hidden in overall country reporting. Ireland's target emissions for 2020 reporting are unlikely to meet our goals and ongoing issues with our water cleanliness continue. Global events such as the Australian bush fires of 2020 continue to spark environmental change and the need to protect our planet. Environmental laws and licences control the actions of pharmaceutical companies when it comes to environmental actions and ongoing unannounced inspections by the EPA serve to ensure companies remain in compliance. Particularly for the biopharmaceutical industry, biohazardous waste management is an area where we need to rely on other countries to treat this waste appropriately. The industry must follow these laws and policies in place but also have an ethical responsibility to cause the least amount of damage as possible to Ireland's and the world's environment. Concern for the environment within the biopharmaceutical industry can be seen through the formation of groups such as the Pharmaceutical Round table composed of several leading pharmaceutical companies, the American Chemical Society and the Green Chemistry Institute.

Previous research in to factors impacting environmental behaviours (Barr, 2007) looked at factors influencing the actions of reducing, reusing and recycling showed that knowledge, awareness of issues and good environmental values combined resulted in greatest reducing of waste. Convenience was the biggest factor that resulted in reuse of items. Additionally, those who belonged to a group/ society were more likely to reuse. Finally, the strongest factor for recycling was peer influence, as it was seen as the normal thing to do. Other studies carried out by (Boiral, 2005) and (Davis et al., 2011) highlighted that employee participation in the establishment of strategies is needed to achieve higher levels of success. (Young et al., 2015) expanded on work carried out by (Tudor et al., 2007) to create a framework of factors influencing behaviour. From this it is understood that a variety of factors, at varying levels of importance, are needed for optimum impact. These factors were organised into categories: individual factors, group factors,

organisational factors and external factors. This can be seen in Figure 5of Chapter Two which outlines the factors noted from each category.

Objective 2, “Identify factors that have the greatest potential to positively impact environmental behaviours of employees within the Irish biopharmaceutical industry” was satisfied through primary research. Similar to secondary research findings, a number of factors were identified to that impact environmental behaviours. The level of impact of these factors varied. The following factors were identified:

- A pro-environmental company culture
- Regulated company policies
- Environmental Training
- Environmental infrastructure
- Financial incentives
- Feedback on progress
- Environmental Awareness
- Communication

On an individual level, employees are willing to make the changes needed to improve and a top down management approach is recognised as a requirement for success. Factors with the greatest power to positively impact the environment were found to be company culture, infrastructure built in from the design phase or throughout to make positive environmental behaviours easy, and regulated policies. This is in agreement with research of Williamson in which the business profitability driven by free market economy thinking is the key cultural driver (Williamson et al., 2006). Voluntary action as a result is often seen as tedious and an unnecessary expense. It is the profitability culture that trumps an environmentally sustainable culture. This

highlights the true power of culture as a foundation for a sustainable business. Changing culture is not a short-term fix but something that requires great effort in the long term and poses a paradox of sustainability versus profitability for companies to resolve. But this is not a law or a requirement and for this reason culture is seen as the number one factor with the potential to impact environmental behaviour but it is not the most feasible in the current business environment to produce real results in the near or medium future. Regulations, again in agreement with Williamson (Williamson et al., 2006) in addition to infrastructure follow similar thought processes. The serve to leave no option but to follow guidelines in order to remain in compliance, this is driven by the culture of the free market once more, if a company is not in compliance this will affect their supply and profitability. But it is through these regulations that environmental action can be driven as it is in the company's interest to ensure these are followed. The regulations are put in place and employees are required to meet these. Similarly, infrastructure, can make the environmentally correct decision easy for employees by creating the path of least resistance to positive environmental behaviour, although it does not remove 100% of choice when it comes to environmental behaviours. A factor repetitively noted by employees was signage which can be considered infrastructure or communication. This coupled with the following factors, which were the next highest ranking as determined through primary research, work together to strengthen the desire to enact positive environmental behaviour These factors were awareness and knowledge as well as feedback from the company/ company leaders on incentives.

Objective 3, “Analyse current efforts to implement these factors within the Irish biopharmaceutical industry”, was also satisfied through primary research. It was established that employees within the Irish biopharmaceutical industry are concerned about the environment and have moderate awareness/knowledge of the topic within Ireland and the biopharmaceutical industry. The large majority of employees are willing to make changes even when this can cost more time or money but many find themselves at a juxtaposition when it comes to hitting deadlines. Only 16.21%

confirmed the presence of record keeping of environmental saves achieved by teams. A mere 24.32% strongly agree that the companies culture promotes positive environmental behaviours. 27.03% strongly agreed that environmental policies are in place. Only 14.86% strongly agreed that management support and training is in place to promote positive environmental behaviours and 16.22% strongly agreed that there is pro-environmental infrastructure on site. The aforementioned statements did rank much higher in the “agree” category but for environmental impact to be taken seriously and for it to be regarded as a key initiative it is expected that these percentages would be much higher. These should rank as strongly agree for company culture, management support, policies and infrastructure to heighten positive environmental impact. Canteen areas and recycling rank highly in areas promoting positive environmental behaviour whilst water usage, PPE usage and paper free factors are at the lower end of the spectrum. Although recycling efforts are seen to be of good standard it is evident that reduction of waste is not. It may appear as a win that recycling is being highly utilised however there is clear evidence that the amount of waste created can and should be reduced. According to employees, further awareness and communication is needed, things must be easy to do/follow and initiatives must be driven from the top down. Currently, in the biopharmaceutical industry there are opportunities for improvement particularly in paper free practices, waste management of water, energy and hazardous waste disposal. Companies can also improve this through increased visible awareness across site and encouraging employees to work from home. Across various departments potential for waste reduction has been identified, from paper use, to raw materials and PPE, opportunities to reduce prior to any relevant treatment or disposal are evident. There is some evidence that positive environmental behaviours are in place, this would be considered a moderate attempt, many improvements are possible.

It is accepted that primary research conducted was performed at a point in time and therefore is subject to change. Qualitative research methods were employed utilising employees of the Irish

biopharmaceutical industry from a range of companies, locations, departments and of different job roll levels and ages. The use of a wide range of respondents served to increase accuracy across research questions posed and to produce accurate results of the Irish biopharmaceutical industry as a whole. It is the hope that the given information can be utilised in efforts to identify opportunities for environmental improvement and to improve positive environmental behaviours in order to increase positive environmental output from the industry which will serve to enhance Irelands environmental state.

As stated in chapter three qualitative research methods were utilised in this research study. Further research is suggested through quantitative methods in order to capture outputs of changes made in line with those identified under this study.

To conclude, factors that positively impact environmental behaviours were found to be Individual Factors (financial incentives, environmental awareness, feedback and personal beliefs and attitudes), Group Factors (financial incentives and feedback), Organisational factors (culture, infrastructure, management support and attention to training and policies) and finally External factors (environmental behaviours at home, access to resources, , regulated company policies and training, environmental infrastructure, financial incentives, feedback on progress, environmental awareness/knowledge and communication). Of these factors, in addition to communication and in particular signage in the work place, it was found that those with the greatest potential to positively impact environmental behaviours of employees in the Irish biopharmaceutical industry are company culture, infrastructure- particularly signage and regulated policies followed by knowledge/awareness and feedback. This research suggests company culture is the strongest factor that influences employee behaviour but one that requires extensive work in order to bring about results. To do so requires changes to profitability driven frameworks and is seen as a long-term task to reap the environmental rewards. For the short to medium term regulations and infrastructure are recommended to propel positive employee

environmental behaviours. The factors identified here portray a symbiotic relationship in which a combination of factors serve to provide optimum results. Current efforts to implement these factors within the Irish biopharmaceutical industry are moderate and must be improved on in order to reduce negative environmental impact and to play their part in ensuring Ireland moves efficiently in the right direction for our environment, to safeguard our natural resources and preserve our environment and therefore our health as a nation.

In Ireland's current situation, following covid-19 government led quarantine a new normal was created with increased working from home to prevent spread of this virus. A positive from this is the opportunity to capitalise on this new way of work reduces commuting to site thus reducing emissions and also reduces paper usage as it forces employees to utilise electronic avenues over paper with lack of printing facilities in the home.

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Appendix 1 Survey

Welcome to My Survey

Thank you for participating in my survey. Your feedback is important.

The purpose of this survey is to determine the factors influencing environmental attitudes/ behaviours in Irish biopharmaceutical employees.

All personal information is confidential e.g. company name and survey taker details.

This survey will take you approximately 15 minutes. Please do your best to answer truthfully.

* 1. What is your company name?

Please note this information is **confidential**, will not be named in reporting. This serves to allow comparisons of companies.

Company

City/Town

* 2. Select Age category

- Under 18
- 18-24
- 25-34
- 35-44
- 45-54
- 55-64
- 65+

* 3. Please select the most suitable regarding your job role/position.

- I am a team lead
- I am a manager
- I do not manage anybody (staff)
- I do not manage anybody (senior staff)
- I am a supervisor
- I am a director
- I am an associate director
- Other (please specify)

* 4. Please select the most suitable in regards to your job role

- Operator/ Manufacturing Technician
- Laboratory Work
- Office/Desk work
- Mix of desk work and manufacturing floor work
- Mix of Desk work and Lab work
- Other (please specify)

* 5. How concerned about the environment are you; generally speaking?

No Concern	Slight Concern	Moderate Concern	Significant Concern	Extreme Concern
○	○	○	○	○

* 6. Which of the following do you believe is the biggest problem for Ireland as a whole?

- [ ] Water Pollution
- [ ] Waste Disposal
- [ ] Climate Change
- [ ] Air pollution
- [ ] Over consumption of natural resources
- [ ] Chemical Waste
- [ ] I don't know
- [ ] Other (please specify)

* 7. Which of the following do you believe is the biggest concern for Irish pharmaceutical companies?

- [ ] Water Pollution
- [ ] Waste Disposal
- [ ] Climate Change
- [ ] Air pollution
- [ ] Over consumption of natural resources
- [ ] Chemical Waste

- [ ] I don't know
- [ ] Other (please specify)

* 8. How much knowledge/ environmental awareness do you believe you have, generally speaking?

- ◯ A great deal
- ◯ A lot
- ◯ A moderate amount
- ◯ A little
- ◯ None at all

* 9. Test your knowledge: In 2016 Ireland generated the equivalent of how many tonnes of waste per person?

- ◯ 8.4 tonnes
- ◯ 3.2 tonnes
- ◯ 500kg
- ◯ 100kg

* 10. Test your knowledge: Over the last century global temperature has increased by almost...

- ◯ 10°C
- ◯ 5°C
- ◯ 1°C
- ◯ 0.5°C

 0.1°C

Environmental Attitudes in the Pharmaceutical Industry (Ireland)

* 11. How much knowledge do you believe you have of environmental concerns within the pharmaceutical industry?

e.g. air pollution, waste disposal, waste pollution, chemical usage, chemical disposal, climate change, over consumption of natural resources.

- A great deal
- A lot
- A moderate amount
- A little
- None at all

* 12. How much Knowledge do you believe you have regarding solutions to these concerns within the pharmaceutical industry?

e.g. air pollution, waste disposal, waste pollution, chemical usage, chemical disposal, climate change, over consumption of natural resources.

- A great deal
- A lot
- A moderate amount
- A little
- None at all

* 13. How much do you agree or disagree with the following?

	Strongly Agree	Agree	Neither Agree /Disagree	Disagree	Strongly Disagree
We worry about the environment and its future too much	○	○	○	○	○
We must harm the environment to progress as humans	○	○	○	○	
There's no point in me doing something to help the environment	○	○	○	○	○
I would accept a decrease in my standard of living in order to protect the environment	○	○	○	○	○
I would make sacrifices in order to protect the environment	○	○	○	○	○

* 14. In regards to your workplace how much do you agree or disagree with the following?

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
I make no effort to be environmentally friendly at work	○	○	○	○	○
I make environmentally good choices when it's easy	○	○	○	○	
I make environmentally good choices even when it costs me more money/time	○	○	○	○	○
Hitting a deadline is more important than doing an environmentally friendly job	○	○	○	○	○
I rarely think of the environment in my work day	○	○	○	○	○

* 15. Organisational Factors: How much do you agree or disagree with the following Statements?

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
The companies culture promotes positive environmental behaviour	○	○	○	○	○
Environmental policies are in place	○	○	○	○	○
Management support and training is in place to promote positive environmental behaviour	○	○	○	○	○
The organisational structure addresses environmental factors	○	○	○	○	○
There is evidence of pro- environmental infrastructure on site	○	○	○	○	○

* 16. The promotion of positive environmental behaviour in the following areas is of what quality?

	Excellent	Good	Fair	Poor	Very poor
Canteen	○	○	○	○	○
Recycling	○	○	○	○	○
Water usage	○	○	○	○	○
PPE waste	○	○	○	○	○
Paper free practices	○	○	○	○	○
manufacturing material waste	○	○	○	○	○
hazardous waste	○	○	○	○	○

* 17. Do you see areas where your company can improve in environmental awareness? if so please give examples.

* 18. Group Factors: How much do you agree or disagree with the following

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
In my workplace environmental saves are tracked and compared to other teams					
Having my teams environmental behaviour compared to others motivate me to improve my environmental impact					
The introduction of financial incentives for groups would motivate teams to improve environmental impact					
Positive feedback from management would motivate teams to improve their environmental impact					

* 19. Do you see areas where <u>your department</u> can improve environmentally?

Hint: Try think of areas to: Reduce, reuse, recycle

Environmental Attitudes in the Pharmaceutical Industry (Ireland)

* 20. Individual Factors: How much do you Agree or Disagree with the following?

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
I am aware of my organisations waste management procedures	○	○	○	○	○
I am aware of waste management procedures at home	○	○	○	○	
My environmental behaviours at work are influenced by my personal behaviours	○	○	○	○	○
My environmental behaviour at work is influenced by site policies	○	○	○	○	

* 21. On an individual level if asked by your company for feedback on potential environmental saves at work what would your response be? what opportunities do you see for improvement?

* 22. The company listens to your suggestions, implements some changes/ initiatives and provides feedback on results. How likely is this to encourage you to improve your environmental behaviour?


definitely
No
definitely

* 23. What format of feedback would you find most beneficial?

- Highly visual poster display
- Presentations
- A video
- A report
- Email Communication
- Other (please specify)

* 24. What factor, if any, most positively impacts your environmental behaviour at work.

* 25. Is there anything in place in your work place not already mentioned that promotes positive environmental behaviour? What are they?

* 26. In your opinion, please rank the following, in order of greatest potential for promoting positive environmental behaviour in your work place?

A pro environmental company culture e.g. management support

Regulated company policies

Environmental Training

Environmental infrastructure e.g. segregated bins, signage etc.

Financial incentives

Feedback on progress

Environmental

* 27. How much do you agree or disagree with the following

	Strongly Agree	Agree	Neither Agree/ Disagree	Disagree	Strongly Disagree
If my company introduced measures to improve environmental behaviour I would comply because I have to not because of my concern for the environment	○	○	○	○	○