Literature Review on Helping People Reduce Their Plastic Consumption

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1 Paper 1: The challenges of measuring plastic pollution

Journal/Conference Rank: Q3
Publication Year: 2019
Reference: []

1.1 Summary

This paper discusses the sources from which plastics, both macroplastics and microplastics, get released into the environment as pollution, the health effects it can have on human and other animal populations and the environmental effects as well. It delineates between two kinds of microplastics, primary microplastics are released into the environment as small particles as part of products such as shower gels or through the wear and tear of solid products such as synthetic textiles while secondary microplastics are formed from the breakage of larger items into smaller fragments. It estimates that 3 percent of the plastic produced worldwide leaks into the ocean but admits that sources disagree heavily due to the difficulty of accurately measuring the outflow of plastic waste, as the systems and pipelines are complex and the pollution difficult to model. It mentions how coastal communities are affected by the buildup of trash and the high cost required for cleanup, along with the potential adverse health effects of microplastics which are yet to be fully understood. In the conclusion, the paper emphasizes the importance of common-sense approaches such a reduction of littering over the highest efficiency.

1.1.1 Paper Link

Access the full paper at https://journals.openedition.org/factsreports/5319.

2 Paper 2: Plastic pollution and infectious diseases

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: []

2.1 Summary

This paper focuses directly on the effects that plastic pollution has on health and on ecosystems. It states that plastic can affect water-borne life by blocking light and oxygen from the water's surface into the deeper environment below. It can also cover sensitive coral reefs, cause internal issues when ingested by animals or trap them. It further states that in human, microplastic ingestion can lead to potential endocrine system disruption. In terms of disease spreading, the paper states that plastics can trap stagnant water, creating pools that are suited to microbial growth and to the reproduction of virus vectors such as mosquitos. This can lead to an increase in the spread of certain diseases in urban areas especially.

2.1.1 Paper Link

Access the full paper at https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(22)00198-X/fulltext.

3 Paper 3: Evaluating scenarios toward zero plastic pollution

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: []

3.1 Summary

This paper focuses on modeling the plastic pollution issue and evaluating the effects of various methods to combat it up to 2040. It uses a multifaceted approach to modeling both the pollution itself and the potential solutions, considering a multitude of factors from geographical area (economic prosperity and degree of urbanization) to the specific sources (tires, cosmetics, etc.) to the difference between waste management pathways for the pollution. For the potential solutions, it considers a no change scenario alongside various interventions both pre- and post-consumption. As expected, the no change scenario shows a sizable increase in pollution by 2040, but even the possible best-case scenario (which reduces annual pollution by 78 percent) would still leave a lot behind due to the sheer scale of numbers. It concludes that the global infrastructure surrounding plastic has much left to improve on, and that there is no silver bullet solution to this issue.

3.1.1 Paper Link

Access the full paper at https://www.science.org/doi/full/10.1126/science.aba9475.

4 Paper 4: Plastic Recycling Practices in Vietnam and Related Hazards for Health and the Environment

Journal/Conference Rank: Q2
Publication Year: 2021
Reference: []

4.1 Summary

This paper focuses on the plastic waste/recycling situation in Vietnam, a low income country with increasing consumption but lacking in the proper management infrastructure that richer countries have. It discusses the geopolitical aspects of China's recent regulations surrounding imported waste plastic (used for recycling). It states that due to higher standards of quality for that plastic, much of the output has been redirected towards South-East Asian countries such as Vietnam and others such as Turkey. It addresses how the lack of infrastructure means that recycling that occurs within the country happens informally. The lack of proper safety regulations in this informal type of recycling poses potential safety risks when the details of the recycling processes with different kinds of plastics are taken into account. It recommends being more selective in regards to which materials recycling plants will intake alongside better wastewater treatment and better organization in regards to waste disposal.

4.1.1 Paper Link

Access the full paper at https://www.mdpi.com/1660-4601/18/8/4203.

5 Paper 5: Plastic waste and its management strategies for environmental sustainability

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: []

5.1 Summary

This paper goes into detail about the chemical make up of various kinds of plastics throughout the history of the technology, plastic processing methods, and takes a holistic view of its effects on various aspects of the environment and the natural world. It details the effects of land and water pollution that plastic waste causes, its contributions to climate change, and to the spread of disease and illness. It also details management strategies such as, recycling, incineration, landfills, and chemical methods such as pyrolysis and bioremediation

5.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2666016421000645.

6 Paper 1: Incentives for Plastic Recycling: How to Engage Citizens in Active Collection. Empirical Evidence from Spain

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: []

6.1 Summary

The recycling target for plastics in Europe is set to increase from 22.52025, reflecting the growing environmental concern over plastic waste. In response to this challenge, a pilot project was conducted to encourage recycling among families in the county of Pla de l'Estany, Catalonia, Spain. The project introduced a virtual reward token called RECICLOS to incentivize recycling behaviour, utilizing a web app prototype to track recycled plastic. After a 6-week pilot, 1053 families, representing 10target population, participated in the scheme. Notable features of the project included the introduction of a token, gamification through raffles and lotteries, direct communication with citizens via a web app, and feedback on recycled materials. This innovative approach recognized the multidimensional aspects of recycling, its connection to human behaviour, and the demand for communication and interaction, demonstrating the potential of mobile technologies in promoting recycling. The results indicate that people's recycling habits can be influenced and improved through effective and innovative incentive schemes.

6.2 Software Architecture

The literature explains the structure and methods used in the RECICLOS project, which is aimed at encouraging recycling among families through virtual reward tokens, incentives, and lotteries. The project also emphasizes the importance of transparency and traceability in the reward program, utilizing Distributed Ledger Technologies (DLTs), specifically blockchain technology.

6.3 Data Parameters

User Data: Registration data for participating families. Unique QR codes are associated with each user and recycling bag. User preferences for reward options (e.g., tax discounts, donations, raffles). Blockchain Data: Data related to blockchain transactions for recording recycling activities and rewards. Smart contracts for managing lotteries and reward distribution. Transparency and traceability data are recorded on the blockchain. Reward Data: Information about rewards offered to users, such as discounts on local waste taxes, donations to NGOs, and lottery prizes. Data on the distribution of rewards to users based on their recycling behaviour. Web App Data: User interactions and activities on the web app, including participation in lotteries and checking reward status. Population Data:

Figure 1: Figure 1: Mechanics and cycle of use in RECICLOS

Demographic data related to the selected area for the pilot project, including the number of inhabitants and households. Proof of Work Data: Data related to the scanning of QR codes by users as part of the Proof of Work process. RECICLOS virtual currency units are generated as rewards for users. QR Code Data: Data associated with the generation and encryption of unique QR codes for recycling bags.

6.4 Datasets Used

N/A.

6.4.1 Paper Link

Access the full paper at https://www.mdpi.com/2313-4321/6/2/29.

7 Paper 2: GLOVE: The Global Plastic Ingestion Initiative for a cleaner world

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: []

7.1 Summary

Plastics are extensively used globally, but their indiscriminate use and improper disposal have led to severe environmental impacts, particularly in terms of plastic ingestion by wildlife. This issue has drawn worldwide attention, but many scientific studies on plastic ingestion are often inaccessible due to scientific jargon and paywalls. To address this

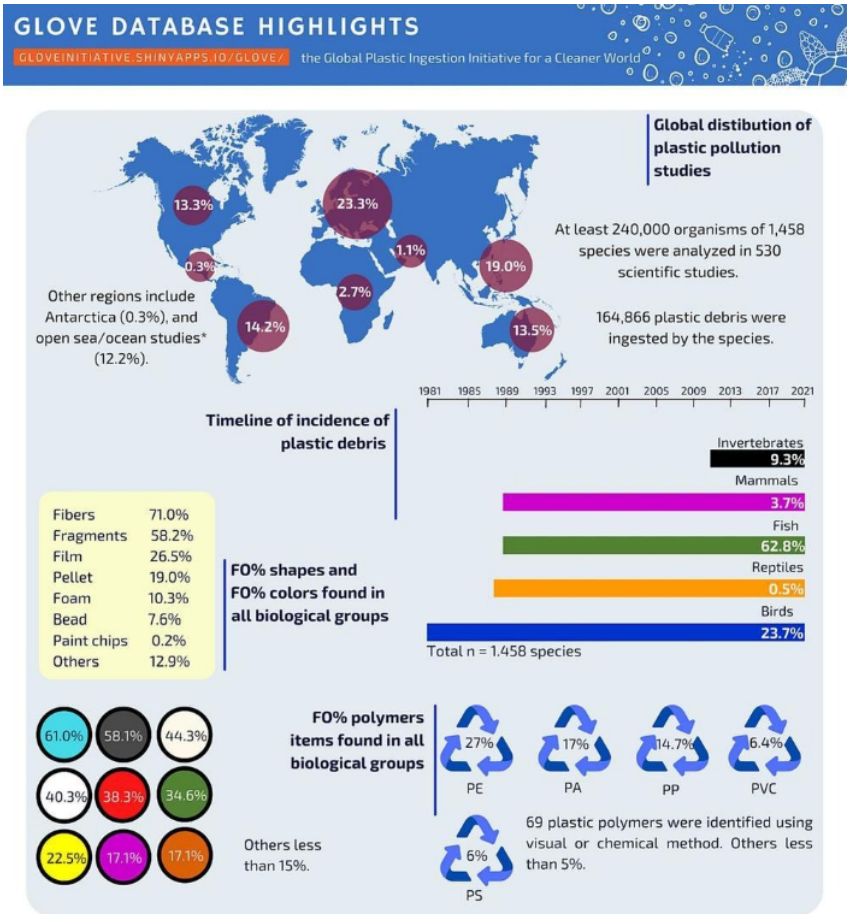


Figure 2: Graphical abstract

challenge, the GLOVE initiative has created an open-access dashboard database available at gloveinitiative.shinyapps.io/Glove/. This online platform is designed to assist scientists, decision-makers, and society in accessing information gathered from plastic ingestion studies. The GLOVE platform, developed using the R environment and Shiny web interface, offers comprehensive data from 530 studies. These studies cover all biological groups and include 245,366 individual records of 1458 species found in marine, freshwater, and terrestrial ecosystems. The primary aim of the GLOVE database is to enhance data accessibility, serving as a valuable tool for designing effective strategies and initiatives amidst the growing global and local efforts to combat plastic pollution.

7.2 Software Architecture

N/A.

7.3 Data Parameters

N/A.

7.4 Datasets Used

GLOVE is an online and open-accessdashboard database available at
gloveinitiative.shinyapps.io/Glove/
to support scientists, decision-makers, and society with information collected from plastic ingestion studies..

7.4.1 Paper Link

Access the full paper at
https://www.sciencedirect.com/science/article/abs/pii/S0025326X22009262.

8 Paper 3: The plastic waste problem in Malaysia: management, recycling and disposal of local and global plastic waste

Journal/Conference Rank: A*
Publication Year: 2021
Reference: []

8.1 Summary

In summary, the text provides insights into the global and Malaysia-specific challenges regarding plastic waste management. Here are the main points:

- Plastic waste is a significant global issue, ranking as the third-highest source of waste. This problem is exacerbated by the growing global population and increased individual plastic consumption.

- Malaysia has been significantly impacted by global trends in plastic waste generation and usage. Since 2017, it has become the world's largest importer of plastic waste, leading to substantial challenges for its waste management system.

- Malaysia utilizes various methods to manage plastic waste, including landfill disposal, recycling, and incineration.

- The text emphasizes the extent of the plastic waste problem in Malaysia and the associated risks, such as the presence of microplastics, issues related to landfills, and concerns regarding incineration.

- The text explores policy initiatives in Malaysia, including the investigation of alternatives like biodegradable plastics.

- Challenges in effectively managing plastic waste in Malaysia are attributed to inconsistent policy implementation by state governments and a lack of public awareness and enthusiasm for household recycling.

- Proposed models for managing plastic waste in the country include a circular economy approach and the use of a solid waste management hierarchy.

- The text concludes by highlighting the necessity of sustained efforts at various levels to address the complex challenges posed by plastic waste in Malaysia.

8.2 Software Architecture

N/A.

8.3 Data Parameters

- Recycling Rates: Data on the rates of recycling for different types of plastics and the effectiveness of current recycling methods.

- Waste Separation Data: Information on how effectively households separate waste at the source and the extent to which this is enforced and regulated.

- Microplastics Data: Information on the presence and impact of microbeads and microplastics in different products and the environment.

- Recycling Supply Chain Data: Data on the effectiveness and challenges of the recycling supply chain, including collection, distribution, and production of recycled plastics.

- Biodegradable Alternatives Data: Information on the production and use of biodegradable alternatives to petroleum-based plastics.

- Circular Economy Data: Data related to the implementation of a circular economy, including changes in product design, distribution, and refurbishment efforts.

- Incineration Data: Data on the feasibility and impact of incineration as a waste management solution for different types of plastics.

8.4 Datasets Used

N/A.

8.4.1 Paper Link

Access the full paper at https://link.springer.com/article/10.1007/s42452-021-04234-y.

9 Paper 4: Emotional responses to plastic waste: Matching image and message framing in encouraging consumers to reduce plastic consumption

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: []

9.1 Summary

This study delves into the impact of emotions and message framing on the reduction of plastic consumption, utilizing three experimental studies focused on consumer intentions, participation, and product choices. The research reveals that the choice of imagery in communication, whether it portrays plastic waste or its victims, can evoke varying emotions, specifically disgust and sadness. Depending on these emotional reactions, different approaches to framing messages prove more effective in motivating consumers to cut down on their plastic use.

Key Points:

- Background: Plastic pollution, especially in marine environments, poses a global issue with diverse detrimental effects on the environment, human well-being, and wildlife. Effectively addressing this concern is vital, as conventional methods such as taxes and levies may not consistently drive the desired changes in behavior.

- Research Gap: The study seeks to bridge a gap in the existing literature by shifting the focus towards reducing plastic consumption at its source, emphasizing consumer engagement and awareness, instead of relying solely on regulatory measures or taxation.

- Emotions and Message Framing: The research investigates how different types of visual representations related to plastic waste can elicit distinct negative emotional responses, specifically, feelings of disgust and sadness. These emotional responses are then aligned with specific message-framing strategies.

- Theoretical Framework: The study draws upon the construal level theory to propose that disgust, prompted by images depicting plastic waste, aligns effectively with a "why" message (i.e., reasons to reduce plastic consumption). Conversely, sadness, triggered by images portraying victims of plastic waste, aligns effectively with a "how" message (i.e., practical steps to reduce plastic consumption).

Research Studies: The hypotheses are rigorously tested across three experimental studies encompassing consumer intentions, participation levels, and product choices. The research findings underline the significance of comprehending how diverse emotional reactions impact consumer decision-making. This understanding can aid in the development of more efficient advertising and messaging strategies for curbing plastic consumption.

9.2 Software Architecture

N/A.

9.3 Data Parameters

N/A.

9.4 Datasets Used

N/A.

9.4.1 Paper Link

Access the full paper at https://doi.org/10.1016/j.ausmj.2019.09.002.

10 Paper 5: Plastic Waste Management: Global Facts, Challenges and Solutions

Journal/Conference Rank: A
Publication Year: 2021
Reference: []

10.1 Summary

This research paper delves into the urgent issue of plastic waste, which has evolved into a worldwide problem due to its continually rising production and consumption. The paper underscores a troubling prediction: by 2050, it's possible that there will be more plastic in the world's oceans than there are fish. This presents significant dangers to the environment, the economy, and human well-being. Key Points:

- Widespread Plastic Utilization: Plastic is omnipresent in our everyday lives, fulfilling various roles in furniture, electronics, packaging, and industry due to its cost-effectiveness, lightweight attributes, and robustness.

- Escalating Crisis: The upsurge in the global population has led to a substantial increase in plastic production and utilization. Projections indicate a distressing twelve billion tons of plastic waste by 2025. This upswing places both the environment and the global economy in jeopardy, resulting in substantial annual costs estimated at roughly 139 billion US dollars.

- Negative Consequences: The adverse effects of plastic waste extend to the environment, human health, and wildlife, disrupting food chains and ecosystems. Plastic includes harmful additives that pose hazards to public health.

- Deterioration and Microplastics: Plastic materials degrade at an exceptionally sluggish rate, taking over a century to fragment into smaller particles known as microplastics. These microplastics can be ingested by marine life and subsequently enter the human food chain, raising concerns about potential health effects.

- Stunning Data: Plastic's annual production reached a staggering 8.3 billion tons by 2015, with approximately 4.98 billion tons of plastic waste accumulating in landfills and natural environments.

- Approaches to Waste Management: Globally, plastic waste is predominantly handled through incineration or recycling. Notably, 58and landfills. However, challenges persist in effectively implementing sustainable recycling methods, necessitating the exploration of alternatives and improved waste management.

- Challenges and Hurdles: Tackling the plastic waste crisis involves numerous challenges, spanning human behaviour, the proliferation of single-use plastics, technical limitations, disjointed awareness campaigns, the absence of standardized metrics, inadequate

policies, and deficiencies in regional infrastructure. The primary aim of this comprehensive review is to highlight the global challenges linked to plastic waste management and present potential solutions for governments worldwide. The ultimate objective is to alleviate the severe environmental and health repercussions associated with plastic waste.

- Discussion and Future Planning: Successful management of plastic waste necessitates a collective global commitment, with governments implementing regulations and individuals taking action to decrease plastic usage and encourage recycling. It is crucial to thoroughly evaluate biodegradable plastics. Providing standardized labelling can guide consumers. Strict enforcement of regulations is essential. There is a need for research on how microplastics affect human health and marine ecosystems. Developing well-designed landfills and conducting further studies on emissions resulting from open burning in low-income nations are highly advisable.

10.2 Software Architecture

N/A.

10.3 Data Parameters

N/A.

10.4 Datasets Used

N/A.

10.4.1 Paper Link

Access the full paper at https://doi.org/10.1109/IEEECONF51154.2020.9319989.

11 Paper 1: Solutions and Integrated Strategies for the Control and Mitigation of Plastic and Microplastic Pollution

Journal/Conference Rank: Q2
Publication Year: 2019
Reference: []

11.1 Summary

This paper, titled "Solutions and Integrated Strategies for the Control and Mitigation of Plastic and Microplastic Pollution", provides a comprehensive review of current practices and recommendations aimed at mitigating the negative effects of plastic pollution on both the environment and human health. The article emphasizes that plastic pollution is a global crisis resulting from the unsustainable use and improper disposal of plastic products. These plastics have a limited capacity to degrade, leading to their accumulation in various ecosystems, especially in marine environments. Such pollution poses threats to the economy, biodiversity, ecosystem services, and human health, as plastics

can carry toxic substances, pathogens, invasive species, and microorganisms. The paper suggests a need to revise existing cleanup methods, such as beach clean-ups and waste collection, to address the increasing volume of plastic waste entering the environment. It underscores the urgency of reducing plastic inputs into the environment through a multidisciplinary global approach. The primary source of plastic pollution is poorly managed waste, and the paper advocates for an Integrated Waste Management System (IWMS) that encompasses various practices and technologies to minimize waste generation, maximize resource recovery, and ensure proper waste disposal. Examples of such practices include production and consumption regulations, eco-design, recycling, waste-to-energy, feedstock utilization, bioplastics, and biodegradation. The authors further offer ten recommendations for stakeholders to combat plastic pollution, such as promoting the use of recycled plastics, reducing plastic usage, adopting renewable energy for recycling, expanding producer responsibility for waste, prioritizing recycling, employing bio- based and biodegradable plastics, and enhancing the recyclability of electronic waste.

11.1.1 Paper Link

Access the full paper at https://www.mdpi.com/1660-4601/16/13/2411.

12 Paper 2: Innovative Use of Plastic for a Clean and Sustainable Environmental Management: Learning Cases from Ghana, Africa

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: []

12.1 Summary

Titled "Innovative Use of Plastic for a Clean and Sustainable Environmental Management: Learning Cases from Ghana, Africa", this article discusses the conversion of plastic waste into valuable products in Ghana and its contribution to environmental sustainability and community benefits. The paper highlights that plastic pollution is a global concern stemming from the unsustainable use and disposal of plastics, particularly due to their poor degradation rates. Plastics tend to accumulate in ecosystems, posing threats to the environment, economy, biodiversity, and human health. The paper underscores the necessity of revising current cleanup approaches to manage the increasing volume of plastic waste. It emphasizes the importance of adopting innovative solutions to reduce plastic inputs into the environment. In Ghana, one of the main sources of plastic pollution is mismanaged waste, and the paper presents two Ghanaian companies, Trashy Bags, and Nelplast Ghana Limited, as exemplars of innovative approaches to addressing this issue. These companies creatively transform plastic waste into artifacts and pavement blocks. Such initiatives not only diminish plastic waste volumes but also contribute to environmental sustainability in Africa. The article also underscores the community benefits derived from these eco-friendly activities, offering them as models that can be emulated worldwide, especially in Africa.

12.1.1 Paper Link

Access the full paper at https://www.mdpi.com/2413-8851/5/1/12.

13 Paper 3: A review of the cost and effectiveness of solutions to address plastic pollution

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: []

13.1 Summary

This paper, titled "A Review of the Cost and Effectiveness of Solutions to Address Plastic Pollution", provides an overview of current practices and recommendations for addressing the detrimental effects of plastic pollution on both the environment and human health. It summarizes key solutions to combat plastic and microplastic contamination, covering technologies designed to control plastics in solid waste and water systems. Additionally, it explores policy measures intended to decrease plastic usage and enhance recycling. The article delves into the cost-effectiveness of different technologies, capital expenditure, operation and maintenance costs, the expense of implementing policy measures, and the suitability of each solution under varying conditions. The paper aims to guide policymakers and practitioners in selecting appropriate solutions for managing plastic pollution based on their specific local contexts.

13.1.1 Paper Link

Access the full paper at https://link.springer.com/article/10.1007/s11356-021-18038-5.

14 Paper 4: Consumer-based actions to reduce plastic pollution in rivers: A multi-criteria decision analysis approach

Journal/Conference Rank: Q1
Publication Year: 2020
Reference: []

14.1 Summary

Titled "Consumer-based Actions to Reduce Plastic Pollution in Rivers: A multi-criteria decision analysis approach", this paper examines consumer-driven measures to mitigate plastic pollution's negative impacts on the environment and human health. The paper reiterates that plastic pollution is a global issue resulting from unsustainable plastic product use and disposal. These plastics have low degradation rates, causing them to accumulate in various ecosystems. Such pollution endangers the marine environment,

economy, biodiversity, and human health due to the plastics' ability to carry toxic substances, pathogens, invasive species, and microorganisms. The paper stresses that existing cleanup strategies, including beach clean-ups and waste collection, are inadequate to manage the growing volume of plastic waste. It advocates for the reduction of plastic inputs into the environment through a comprehensive, multidisciplinary approach. The primary source of plastic pollution in Europe is mismanaged waste. The paper suggests improving the life cycle of plastics, especially during production, consumption, and disposal, via an Integrated Waste Management System (IWMS). The IWMS encompasses a range of practices and technologies designed to minimize waste generation, maximize resource recovery, and ensure proper waste disposal. These practices include production and consumption regulations, eco-design, recycling, waste-to-energy, feedstock usage, bioplastics, and biodegradation. The authors offer ten recommendations for consumers to reduce their plastic footprint. These recommendations include using wooden or reusable cutlery, adopting reusable water bottles, using wooden or reusable stirrers, utilizing plastic-free cotton buds, and opting for refilled detergent and shampoo bottles.

14.1.1 Paper Link

Access the full paper at https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0236410.

15 Paper 5: A Review of Technological Solutions to Prevent or Reduce Marine Plastic Litter in Developing Countries

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: []

15.1 Summary

Titled "A Review of Technological Solutions to Prevent or Reduce Marine Plastic Litter in Developing Countries", this paper discusses current practices and recommendations for reducing the adverse effects of plastic pollution on the environment and human health. The article emphasizes that plastic pollution is a global crisis resulting from the unsustainable use and disposal of plastic products, leading to their accumulation in various ecosystems, particularly marine environments. This pollution negatively impacts the economy, biodiversity, ecosystem services, and human health due to plastics' capacity to carry toxic substances, pathogens, invasive species, and microorganisms. The paper reiterates the inadequacy of existing cleanup strategies for addressing the growing plastic waste issue. It underscores the importance of reducing plastic inputs into the environment through a global multidisciplinary approach. The primary source of plastic pollution in developing countries is mismanaged waste, and the paper suggests innovative methods for converting plastic waste into useful products, such as artifacts and pavement blocks. The paper showcases how two companies in Ghana, Trashy Bags and Nelplast Ghana Limited, have effectively employed these innovative ideas, thereby reducing plastic waste volumes and enhancing environmental sustainability in Africa. The paper also highlights

the community benefits of these eco-friendly activities and presents them as valuable case studies for dissemination worldwide, especially across Africa.

15.1.1 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/13/9/4894.

16 Paper 1: A Review of Technological Solutions to Prevent or Reduce Marine Plastic Litter in Developing Countries

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: []

16.1 Summary

Abstract Summary: Plastic pollution poses a global environmental crisis impacting marine, freshwater, and terrestrial ecosystems. Half of plastic production consists of single-use plastics (SUP). Game-based approaches are emerging to drive behavior change and tackle plastic pollution. This systematic review examines existing evidence on the use of game-based interventions to promote sustainable behaviors related to plastic consumption, avoidance, waste management, and pollution. The review includes 22 studies published between 2015 and 2021. Results reveal limited research on game-based solutions for plastic issues. Most studies aim to raise awareness and modify behaviors among the public. While games show promise in engagement and knowledge enhancement, there's insufficient evidence of long-term, real-world behavior change.

Introduction Summary: Plastic pollution is a global environmental concern affecting various ecosystems. It poses a threat to marine, freshwater, and terrestrial life, including potential health risks for humans through the food chain. Single-use plastics (SUPs) are a major source of this pollution. Strategies to combat this crisis include international agreements, awareness campaigns, documentaries, educational programs, and nudges. This review focuses on the innovative use of game-based interventions to address sustainability-related behaviors, especially in the context of plastic pollution. It aims to investigate the types and effectiveness of game-based interventions in addressing plastic-related issues, encompassing awareness, behaviors, and usability.

16.1.1 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/13/9/4894.

17 Paper 2: Reducing plastic waste: A meta-analysis of influences on behaviour and interventions

Journal/Conference Rank: Q1
Publication Year: 2022

Reference: []

17.1 Summary

Abstract Summary: This review focuses on the pivotal role of behavior change in reducing plastic waste. It employs several frameworks and models, including AACTT (Action-Actor-Context-Target-Time), COM-B (Capability-Opportunity-Motivation-Behavior), the Behavior Change Wheel, and the Behavior Change Techniques Taxonomy. A systematic literature search reveals 60 studies related to plastic waste behavior, primarily concerning the general public, recycling, shopping, and specific plastic waste items. Capability, opportunity, and motivation factors show medium-strength associations with behavior. The most effective intervention types for behavior change are 'persuasion,' 'enablement,' and 'environmental restructuring.' Strong behavior changes relate to policy options like 'communications and marketing,' 'environmental and social planning,' and 'service provision.' Interventions targeting 'physical opportunity' and 'reflective motivation' have the strongest positive effects. Behavior change techniques consistently influence behavior changes. These findings provide essential directions for future research and plastic waste reduction efforts.

Introduction Summary: The escalating issue of plastic waste poses a significant threat to the environment and public health. Over the past six decades, approximately 8,300 million metric tons of plastic have been produced, with ineffective waste management leading to extensive pollution. Plastic waste has become a primary source of floating litter and poses well-documented risks to wildlife. Additionally, microplastic particles have been found in everyday items, with potential but not conclusively determined human health risks. If current trends persist, an additional 12,000 million metric tons of plastic waste will be added to landfills or littered by 2050, further degrading the environment. Eliminating plastic waste is a global imperative. This necessitates substantial systemic changes, transitioning from a linear to a circular plastics economy that promotes reusing, repurposing, recycling, and recovery. Achieving this shift relies significantly on changing the behavior of various actors within the plastics system, including the public, producers, suppliers, and waste managers. Widescale behavioral changes depend on technological innovations and infrastructure developments. Yet, technology and infrastructure alone cannot solve the plastic waste problem; individuals must interact appropriately with these systems for environmental benefits to occur. Understanding human behavior and the factors influencing behavior change are vital components of any plastic waste reduction solution. However, the field faces challenges due to a lack of theory- and evidence-driven behavioral research, hindering the design of effective interventions to reduce waste.

17.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S095965262204433X.

18 Paper 3: Plastic Waste: Challenges and Opportunities to Mitigate Pollution and Effective Management

Journal/Conference Rank: Q2
Publication Year: 2023
Reference: []

18.1 Summary

The article discusses the problem of plastic waste management and its impact on the environment and human health. It reviews the sources and types of plastic waste, the existing technologies for recycling, recovery, and conversion, and the challenges and opportunities for sustainable solutions. It also highlights the role of plastic waste in meeting the UN Sustainable Development Goals. The article aims to provide a comprehensive analysis of plastic waste generation and mitigation strategies, as well as to identify the gaps and future directions for research and policy. The introduction provides some background information on the history and properties of plastic, as well as its widespread use in various sectors and applications. It also presents some statistics on the global production and consumption of plastic, as well as its distribution and accumulation in landfills, oceans, and other ecosystems. It then outlines the main environmental and health hazards of plastic pollution, such as greenhouse gas emissions, toxicity, bioaccumulation, and microplastics. It also mentions some of the social and economic impacts of plastic waste, such as loss of biodiversity, aesthetic degradation, and reduced tourism. The introduction ends with a brief overview of the structure and objectives of the article.

18.1.1 Paper Link

Access the full paper at https://link.springer.com/article/10.1007/s41742-023-00507-z.

19 Paper 4: Exploring the psychological antecedents of private and public sphere behaviours to reduce household plastic consumption

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: []

19.1 Summary

The article investigates the psychological factors that determine people's intentions and behaviours to reduce their plastic consumption in both private and public spheres. The article examines three types of plastic reduction activities: purchasing less plastic, engaging in activism, and supporting policies. The article uses two well-known psychological models to explain how people's personal norms, sufficiency orientation, perceived behavioural control, and collective efficacy affect their plastic reduction intentions. The

article also reports the results of an online survey that tested the proposed models and measured people's actual behaviour. The article concludes that rational and moral considerations are both important drivers of plastic reduction, and suggests some implications for promoting plastic-free consumption. The aims and background section provides some context and motivation for the study. It describes the problem of plastic pollution and its negative impacts on the environment and human health. It also reviews some of the existing literature on pro-environmental behaviour and plastic consumption, and identifies some gaps and limitations in the current research. It then states the main research questions and hypotheses of the study, which are based on the theory of planned behaviour (TPB) and the norm activation model (NAM). It also explains some of the key concepts and variables used in the study, such as sufficiency orientation, collective efficacy, and personal norms.

19.1.1 Paper Link

Access the full paper at https://doi.org/10.1007/s10668-022-02186-w.

20 Paper 5: Attitudes towards Plastic Pollution: A Review and Mitigations beyond Circular Economy

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: []

20.1 Summary

This article discusses the persistent problem of plastic pollution despite increased global attention and calls for control. It reviews recent literature on people's attitudes and behaviors related to plastic pollution, consumption, and management. The review finds that most participants in the studies have negative attitudes toward plastic pollution and are willing to support initiatives to combat it, such as environmental campaigns and government policies. However, the convenience of plastic items and established habits are significant barriers to behavioral change. The article emphasizes the need for governments to leverage these attitudes to intensify efforts to control plastic pollution through measures like promoting environmentally friendly alternatives and advancing circular plastic economy practices. It suggests that gradually capping conventional plastic production and consumption, along with public education and awareness campaigns, can complement governmental actions. The article also discusses the increase in plastic production and highlights the challenge of weaning society off petroleum-based plastics. It underscores the importance of understanding public perceptions and responses to the plastic pollution issue and suggests that a systemic approach like the circular economy could positively influence people's behavior. The review focuses on attitudes and behaviors rather than just perceptions, as attitudes play a crucial role in determining actions. It aims to identify general patterns in societal attitudes and barriers to addressing plastic pollution at the individual level, with the hope of bridging the gap between attitude and behavior to bring about positive changes. The review includes scholarly papers published in the

past 10 years and uses keywords related to attitudes, behaviors, plastics, microplastics, and plastic pollution. The selected papers provide insights into the complex relationship between people's attitudes and behaviors regarding plastic pollution.

20.1.1 Paper Link

Access the full paper at https://www.researchgate.net/publication/371575063.

21 Paper 1: Reducing single-use plastic on college campuses: Theory of planned behavior-based brief interventions

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [?]

21.1 Summary

This study focuses on the urgent issue of plastic pollution and aims to test the impact of two different interventions on reducing plastic consumption among college students. The study also explores the role of various psychological factors in mediating the effects of these interventions. Here's a summary of the study:

1. Introduction **1.1. Problem of Plastic Pollution**: The study addresses the environmental impact of single-use plastic and the need for effective interventions to reduce plastic consumption.

1.2. Theory of Planned Behavior (TPB): The TPB is introduced as a widely used theory for predicting pro-environmental behavior. It highlights the roles of attitudes, subjective norms, and perceived behavioral control in shaping behavioral intentions and actions.

- **1.3. Expanded TPB**: The study suggests expanding the TPB model by including additional factors such as personal norms, descriptive norms, and self-identity, which have been shown to influence pro-environmental behavior.

1.4. Expanded TPB and Plastic Consumption: Previous research related to plastic consumption and the TPB is briefly reviewed. The study emphasizes the need to incorporate personal norms, descriptive norms, and self-identity into the TPB model when predicting single-use plastic consumption.

1.5. TPB and Experimental Interventions: The TPB is discussed as a framework for designing interventions. It mentions the effectiveness of interventions based on TPB constructs and the potential impact of brief interventions, pledges, and mobile app interventions.

1.6. Present Study: The study's objectives and design are outlined. It aims to address gaps in the literature by focusing exclusively on single-use plastic consumption, exploring extensions to the TPB, comparing different interventions, and investigating the mediating role of TPB constructs in behavior change.

2. Method **Participants**: The study involved 375 undergraduate students from two colleges in the southeastern US.

Interventions: Participants were randomly assigned to one of three groups: control, app intervention (using a mobile app to track plastic consumption), or pledge intervention (making an online pledge to reduce plastic consumption). Both intervention groups received daily TPB-based messages.

Data Collection: Baseline and post-intervention surveys were conducted to measure changes in plastic consumption and TPB constructs.

3. Results - The extended TPB model, along with the intervention condition, significantly predicted changes in plastic consumption over the week.

- Mediation analysis revealed that the pledge group showed a significant decrease in plastic consumption, mediated by changes in attitudes, perceived behavioral control, and descriptive norms.

- The app group had a smaller decrease in plastic consumption and no significant changes in the extended TPB constructs.

4. Hypotheses **H1**: Changes in extended TPB constructs explain significant variance in changes in plastic consumption.

H2: The intervention conditions (app and pledge) directly decrease plastic consumption compared to the control condition.

H3: The interventions indirectly decrease plastic consumption through changes in the extended TPB constructs.

In summary, this study addresses the critical issue of plastic pollution and explores the effectiveness of different interventions in reducing plastic consumption among college students. It also highlights the importance of considering various psychological factors when designing interventions based on the Theory of Planned Behavior.

21.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2666622723000114.

22 Paper 2: Curbing plastic consumption: A review of single-use plastic behaviour change interventions

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [?]

22.1 Summary

This document discusses the global issue of plastic waste and its environmental impact, particularly focusing on single-use plastics. It highlights the need for transformative change to address this problem. Various solutions have been proposed, including extended producer responsibility, consumer behavior change, and regulatory measures. The document stresses the importance of considering the larger ecosystem of stakeholders, including governments and businesses, in addressing plastic waste.

The introduction outlines the severity of the plastic waste problem, emphasizing the challenges posed by single-use plastics. It mentions their contribution to litter, environmental harm, and the difficulty in recycling them.

The document reviews existing research and insights on strategies to reduce individual consumption of single-use plastics. It acknowledges the importance of consumer behavior change and how it can be influenced through various interventions. The authors emphasize the need to consider the specific conditions and context of developed economies, like Australia.

The document also discusses the initiatives taken by governments and businesses to tackle single-use plastics, using the example of Victoria, Australia's intention to ban certain single-use plastics by 2023. It highlights the need for a comprehensive approach to encourage plastic minimization and avoidance behaviors.

The primary research aim is to understand the types and effectiveness of behavioral interventions targeting individual plastic consumption, with a focus on countries similar to Australia. The specific plastic items of interest are listed, and these were chosen because they are avoidable, commonly littered, and pose contamination risks to recycling efforts.

In summary, this document addresses the global problem of plastic waste, emphasizes the importance of changing individual behavior, and provides insights into interventions to reduce single-use plastic consumption, with a focus on the Australian context.

22.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S0959652622007107.

23 Paper 3: Drivers of public plastic (mis)use — New insights from changes in single-use plastic usage during the Covid-19 pandemic

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [?]

23.1 Summary

This text discusses the impact of the COVID-19 pandemic on people's behavior regarding plastic use, focusing on single-use plastics when on-the-go. The study used data from an online plastic footprint calculator to explore how people's plastic consumption changed during lockdowns. The researchers hypothesized that plastic use on-the-go would change due to the pandemic, with a decrease in single-use plastics during lockdowns. The results showed that during lockdowns, people actually used more single-use plastic items, such as food wrappers, takeaway containers, and bottles. This increase in plastic use was attributed to hygiene concerns and limited alternatives. The text also highlights the broader environmental implications of increased plastic use during the pandemic and discusses the challenges in reducing plastic consumption, including government policies and changing consumer perceptions. The study suggests the need for effective strategies to reduce plastic waste and emphasizes the importance of collecting data on plastic use to inform such efforts.

23.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S0048969722047702.

24 Paper 4: Sustainability of biodegradable plastics: New problem or solution to solve the global plastic pollution?

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [?]

24.1 Summary

This text discusses the growing environmental issue of plastic pollution and the increasing interest in biodegradable plastics as a more sustainable alternative. It highlights the need for comprehensive life cycle assessments of biodegradable plastics and their potential to reduce environmental impact. The study also emphasizes the importance of considering economic, social, and environmental factors in the sustainability of biodegradable plastics. The introduction provides background on the environmental concerns associated with traditional plastics and the efforts to promote biodegradable plastics as a solution. It distinguishes between bio-based and biodegradable plastics, with a focus on the latter's ability to decompose relatively quickly, reducing their environmental footprint. The text points out that the success of biodegradable plastics depends on factors like materials production, waste management, and government policies. It also discusses the potential for using sustainable materials to strengthen bioplastics and the need for fiscal policies to incentivize their adoption. Finally, the text notes the importance of strategic planning for businesses in navigating the uncertainties surrounding the long-term viability of biodegradable plastics in the global sustainability context.

24.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/pii/S2666086522000157.

25 Paper 5: Using behavioral interventions to reduce single-use produce bags

Journal/Conference Rank: Q1
Publication Year: 2023
Reference: [?]

25.1 Summary

Plastic pollution is a significant environmental problem, with a focus on plastic bags but less attention given to single-use produce bags commonly used in grocery stores. This study aimed to test 12 different behavioral interventions to reduce the use of produce bags

during grocery shopping in a simulated online task. The study found that various interventions were effective, with reductions in produce bag usage ranging from 9.2 percentage to 48.7 percenatge compared to the control condition. The most effective interventions included indirect incentives or punishments (such as donations to environmental organizations), reminding people of the positive consequences of not using produce bags, using normative messaging, drawing attention to the option of not using produce bags, and reminding or visualizing the negative consequences of using them. Importantly, these interventions had different effects on individuals with varying political orientations, with liberals responding more positively.

The introduction explains the context of plastic pollution and the neglect of produce bags as a source of plastic waste. It highlights the need for effective interventions and considers the heterogeneous effects of these interventions on different groups. The study tested interventions targeting various cognitive processes, including attention, perception, memory, effort, intrinsic motivation, and extrinsic motivation, based on a cognitive framework. It also distinguished between nudge (reducing decision friction) and sludge (increasing decision friction) interventions, resulting in 12 categories of interventions.

Overall, this research aimed to identify the most effective interventions for reducing produce bag use, taking into account cognitive factors and their varying impact on different populations, such as liberals, conservatives, and independents. It also sought to determine whether nudge or sludge interventions were more effective in reducing plastic waste.

25.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S0921344923000794.

26 Paper 1: A Collaborative Application for Assisting the Management of Household Plastic Waste through Smart Bins: A Case of Study in the Philippines

Journal/Conference Rank: Q1
Publication Year: 2021
Reference: [?]

26.1 Summary

This paper addresses the issue of managing household plastic waste, particularly for elderly and impaired individuals who may struggle with waste disposal. It proposes a collaborative infrastructure consisting of smart bins with weight sensors and a mobile application to forecast plastic waste generation. The application uses an algorithm to plan efficient routes for waste-pickers to collect the plastic waste.

The global rise in plastic waste, along with the United Nations recognizing plastic pollution as a crisis, has led to efforts to reduce plastic usage and improve waste management. Many countries have banned single-use plastics, and manufacturers are making

changes to reduce plastic production. However, traditional waste collection methods with fixed schedules still dominate many waste management systems.

This paper aims to create an intelligent system to predict the state of household plastic bins, specifically targeting communities with special needs, including the elderly, people with reduced mobility, and those affected by COVID-19 restrictions.

The contributions of the paper include the development of smart bins with weight sensors, a collaborative application for managing plastic waste collection, and an algorithm to optimize waste collection routes. The paper discusses current waste management approaches, details the proposed framework, presents results from a simulation scenario in the Philippines, and addresses the findings and limitations of the work.

In conclusion, this paper offers a solution to address the challenge of managing household plastic waste, especially for vulnerable communities, through smart technology and route optimization.

26.1.1 Paper Link

Access the full paper at https://www.mdpi.com/1424-8220/21/13/4534.

27 Paper 2: Reducing single use packaging and moving up the waste hierarchy

Journal/Conference Rank: Q2
Publication Year: 2022
Reference: [?]

27.1 Summary

This article discusses the growing interest in the circular economy and its connection to environmental concerns, particularly the problem of plastic waste. Single-use plastic packaging, which constitutes a significant portion of the global plastics market, is highlighted as a major challenge due to its short life cycle and environmental impact. The article emphasizes that addressing single-use plastics requires more than individual behavior change and should involve broader societal shifts.

The authors use social practice theory and two case studies from New Zealand to illustrate how the transition away from single-use plastics in food retail involves understanding the functions and meanings of packaging materials. This transition also requires coordination of materials, skills, and meanings to replace the functions performed by single-use packaging throughout the supply chain. The article underscores the need for collaboration and investment in circular practices, particularly at the top of the waste hierarchy, to reduce reliance on single-use plastics.

In summary, the article explores the challenges of transitioning away from single-use plastics in the context of the circular economy and presents case studies to demonstrate how shifts in practices and meanings are necessary for such a transition. It concludes by suggesting that investment in circular practices can help reduce plastic waste and promote a more sustainable approach to materials and waste management.

27.1.1 Paper Link

Access the full paper at
https://drive.google.com/file/d/1_Xzqk29ADAM5VvFt9jVNbirRcApfMJ3j/view?usp=sharing.

28 Paper 3: Plastic Waste Management Strategies and Their Environmental Aspects: A Scientometric Analysis and Comprehensive Review

Journal/Conference Rank: Q2
Publication Year: 2022
Reference: [?]

28.1 Summary

This article addresses the growing problem of plastic waste due to increased global plastic consumption. It highlights that traditional plastic waste management methods, such as landfilling, are unsustainable and environmentally harmful. The article discusses various strategies for managing plastic waste, including recycling, pyrolysis, liquefaction, and using plastic waste in construction applications.

The study uses a scientometric approach to analyze a large volume of bibliographic data on plastic waste management up to 2021. It examines the most frequently used keywords, highly cited papers and authors, active countries in research, and sources of publications in the field. Additionally, the article assesses the environmental benefits of different plastic waste management strategies and concludes that construction applications and the production of tar and concrete are the most effective methods due to their ease of localization, reduced greenhouse gas emissions, and increased durability of materials.

The article also emphasizes the environmental challenges posed by plastic waste, especially nonbiodegradable plastics, and the need for sustainable waste management solutions. It discusses the negative environmental impacts of incineration and landfilling and highlights the importance of exploring innovative plastic waste management approaches.

In summary, the article provides insights into the challenges of managing plastic waste and the need for more sustainable and environmentally friendly strategies. It employs scientometric analysis to examine the existing literature on the topic and suggests that construction applications are among the most promising methods for plastic waste management.

28.1.1 Paper Link

Access the full paper at https://www.mdpi.com/1660-4601/19/8/4556.

29 Paper 4: The Green Frontier of Mobile Applications in Improving Recycling Consumers' Behavior

Journal/Conference Rank: Q2
Publication Year: 2022
Reference: [?]

29.1 Summary

This article explores the use of a mobile recycling application in Italy and its impact on users' engagement with environmental issues, specifically recycling behavior. The research was conducted during the COVID-19 pandemic, a period when users became more environmentally conscious and concerned about plastic pollution, leading to an increase in mobile application usage.

The study examines the relationship between media richness (MR) in mobile applications and user engagement and recycling behavior. It finds that there is a positive correlation between media richness, user engagement, and recycling behavior. This suggests that mobile applications can effectively engage users and influence them to adopt more sustainable and eco-friendly practices.

The article emphasizes the role of technology, particularly mobile applications, in promoting responsible consumption and sustainability. It suggests that mobile engagement can increase users' awareness of environmental concerns and build social bonds with companies that promote green innovations. This research provides practical insights for companies on how to engage with consumers to encourage more sustainable behavior.

In summary, the article highlights the role of mobile applications in influencing user behavior towards sustainability and offers valuable insights into the use of technology to address environmental concerns.

29.1.1 Paper Link

Access the full paper at
https://drive.google.com/file/d/1TOr6ZYHz7B70lOkW0xQ-C0DIiBSklnY1/view?usp=drive_link.

30 Paper 5: INVESTIGATION OF SECURE VEKIT WEB INTERFACE FOR PREVENTING ENVIRONMENT POLLUTION

Journal/Conference Rank: Q2
Publication Year: 2020
Reference: [?]

30.1 Summary

AODV – ad-hoc on-demand distance vector; AU – application unit; CIDR – central identities repistory; DSR – dynamic source routing; DSRC – dedicated short-range com-

munications; DU – detection unit; EDGE – enhanced data rates for global evalution; GPRS – general packet radio service; GSM – global system for mobile communication; LPG – liquefied petroleum gas; MAC – medium access control; MU – monitoring unit; OBU – on-board unit; PAN – personal area network; PB – plastic bags; PCB – plastic carry bags; PDR – packet delivery ratio; RFID – radio-frequency identification; RSU – road-side unit; RU – receiver unit; RX – receiver; SU – sensing unit; SUMO – simulation of urban mobility; TU – trigger unit; TX – transmitter; UIDAI – unique identification authority of India; V2RSU – vehicle-to-RSU; V2V – vehicle-to-vehicle; VANET – vehicular ad-hoc network; VEKIT – vehicle kit; Wi-Fi – wireless fidelity; WLAN – wireless local area network.

This paper introduces a new system called Vehicle Kit (VEKIT), which employs a secure web-based interface for authenticating and monitoring Vehicular Ad-Hoc Network (VANET) infrastructure and for combating environmental pollution. The paper highlights the environmental hazards associated with the use of plastic bags and proposes VEKIT's design, which can be installed in vehicles to reduce the use of such plastic bags by up to 75

VEKIT not only helps reduce plastic bag usage but also enhances future VANET projects by assisting countries in pollution prevention. The paper describes the web interface of VEKIT, which can be used to monitor vehicle authenticity. It also outlines a secure architecture for utilizing VANET in transport-related projects, involving a network of vehicles communicating with each other and with Roadside Units (RSUs).

The primary goal of VEKIT is to reduce the usage of single-use plastic carry bags, particularly those made of polymers less than 30 µm, which are a significant environmental problem. VEKIT is designed to be implemented in vehicles and can effectively reduce plastic bag usage by up to 75

30.1.1 Paper Link

Access the full paper at https://journals.vilniustech.lt/index.php/Transport/article/view/13038/10033.

31 Paper 1: Improving plastic management by means of people awareness

Journal/Conference Rank: Q4
Publication Year: 2019
Reference: [?]

31.1 Summary

The abstract introduces the issue of plastic usage, its impact on the environment, and the need for a solution. It emphasizes that plastic is widely used in various industries, contributing to the global economy, but its improper disposal and lack of recycling pose environmental challenges. The European Parliament has taken steps to ban single-use plastic products. Plastic recycling is crucial in addressing these challenges, following the principles of the circular economy.

The study aims to propose a solution to tackle plastic waste as both a social-economic and environmental problem. It considers various strategies, including chemical-mechanical

technologies for recycling, making plastic edible, reusing plastic for art, and promoting a plastic-free lifestyle app. The most suitable and effective solution identified is the adoption of a plastic-free lifestyle. This solution is innovative in that it combines social, technical, economic, and environmental perspectives to promote a more sustainable relationship between humans and nature.

31.1.1 Paper Link

Access the full paper at https://e-publishing.cern.ch/index.php/CIJ/article/view/882/711.

32 Paper 2: Evaluation of Legal Strategies for the Reduction of Plastic Bag Consumption

Journal/Conference Rank:
Publication Year: 2018
Reference: [?]

32.1 Summary

The abstract introduces the topic of lightweight plastic shopping bags and their significant environmental impact. It highlights the excessive use of these bags, the resulting environmental issues, and the global efforts to reduce their consumption through policies and regulations. The thesis aims to identify effective measures for reducing plastic bag usage, examining over 450 initiatives worldwide.

The research identifies five main strategies for reducing plastic bag use: bans, levies, voluntary actions, recycling programs, and bans combined with a levy. These strategies are implemented at various government levels, and the effectiveness of each is assessed based on reductions achieved. While bans are common, they are not always the most effective approach.

The thesis proposes a model for effective reduction, involving national directives, regional levies, and local bans. This model is applied to Canada, demonstrating that adopting it could lead to an 80

Overall, the thesis aims to provide a framework for informed decision-making on plastic bag management and hopes to guide countries in implementing effective strategies to address this environmental concern.

32.1.1 Paper Link

Access the full paper at https://www.proquest.com/openview/a537b5a156a844f93bfc4bcfd807d5e5/1?pq-origsite=gscholarcbl=18750diss=y.

33 Paper 3: An Empirical Investigation on Plastic Waste Issues and Plastic Disposal Strategies to Protect the Environment: A UAE Perspective

Journal/Conference Rank:
Publication Year: 2022
Reference: [?]

33.1 Summary

The abstract discusses the environmental challenges posed by the growing use of plastic water bottles in the United Arab Emirates (UAE) and the need for effective waste management strategies. The research aims to address the surge in plastic waste and its impact on the environment in the UAE.

The introduction highlights the increasing generation of municipal solid waste (MSW) in the UAE due to factors like population growth and changing consumption patterns. Plastic usage, especially in the form of water bottles, has added to the problem. Despite the negative environmental effects of plastics, they are widely used due to their cost-effectiveness and versatility. The UAE's heavy reliance on plastic has led to substantial waste generation, which is difficult to manage safely.

The government and various organizations have initiated measures to tackle the plastic waste issue, including awareness campaigns and public-private partnerships. However, there is a need for more comprehensive solutions, particularly in the context of water bottle usage, which is influenced by cultural factors.

The research seeks to address this gap in the literature and focuses on:

1. Investigating environmental concerns related to plastic water bottles. 2. Examining consumer behavior regarding efforts to mitigate the environmental impact of plastic water bottles. 3. Assessing the feasibility of implementing a closed-loop recycling system for water bottles to protect the environment.

The study aims to offer insights into the environmental challenges associated with plastic waste and the potential for a recycling system to mitigate these issues in the UAE.

33.1.1 Paper Link

Access the full paper at https://www.mdpi.com/2071-1050/14/24/16719.

34 Paper 4: Unlocking digital technologies for waste recycling in Industry 4.0 era: A transformation towards a digitalization-based circular economy in Indonesia

Journal/Conference Rank: Q1
Publication Year: 2022
Reference: [?]

34.1 Summary

The abstract introduces the issue of overgeneration of non-biodegradable waste in Indonesia and the resulting challenges in waste disposal. It highlights the need for more sustainable waste management practices in the context of cleaner production (CP) and a circular economy (CE). The abstract also emphasizes the role of digitalization in transforming the waste recycling industry.

Key points from the introduction:

1. The global focus on Cleaner Production and Circular Economy as solutions to minimize waste production and reduce environmental impact.

2. The importance of digitalization in modernizing the waste sector and promoting a sustainable economy.

3. The impact of the COVID-19 pandemic on the waste recycling industry, emphasizing the need for digital solutions.

4. The need to shift from the conventional 'end-of-pipe' waste management approach to a more sustainable and efficient model.

5. The concept of a digital platform to enhance waste collection, sorting, and economic incentives for communities.

6. The aim of the study to explore how digital technology can add economic value to recycled waste and encourage waste reduction.

7. The anticipated benefits of the research, including making waste recycling industries more efficient and raising public awareness about climate change and sustainable waste management.

Overall, the research investigates the integration of digital technology into waste management to promote a circular economy, reduce waste generation, and create economic opportunities for communities, with a focus on Yogyakarta, Indonesia.

34.1.1 Paper Link

Access the full paper at https://www.sciencedirect.com/science/article/abs/pii/S0959652622015219.

35 Paper 5: Review of natural fiber-reinforced engineering plastic composites, their applications in the transportation sector and processing techniques

Journal/Conference Rank: Q2
Publication Year: 2019
Reference: [?]

35.1 Summary

The abstract highlights the growing interest in natural fiber-reinforced polymer (NFRP) composites in the transportation sector as an alternative to metals and synthetic fiber composites. It emphasizes the need for lightweight and fuel-efficient vehicles to reduce CO2 emissions, and how the transportation industry is shifting toward materials with a

smaller carbon footprint. Engineering plastics, which are high-performance thermoplastics, are considered for their potential in NFRP composites.

Key points from the introduction:

1. The transportation sector heavily relies on non-renewable resources, and reducing vehicle weight is essential to improve fuel efficiency and reduce CO2 emissions.

2. The global shift towards fiber-reinforced polymer (FRP) composites, with the prediction that a significant portion of future vehicles will be made from polymer composites.

3. The environmental impact of synthetic fibers, leading to the exploration of natural fibers like flax, hemp, jute, and sisal as reinforcement materials.

4. The benefits of natural fibers, including low cost, renewability, recyclability, and biodegradability.

5. The classification of polymer matrices in NFRP composites into thermoplastic and thermoset, with a focus on thermoplastic engineering plastics.

6. The importance of considering the use of recycled plastics in NFRP composites to address environmental concerns.

7. The objective of the review article, which is to explore the current status of engineering plastics reinforced with natural fibers and their applications in the transportation industry.

The review aims to provide insights into the potential of NFRP composites with engineering plastics for various transportation applications.

35.1.1 Paper Link

Access the full paper at https://sci-hub.se/https://journals.sagepub.com/doi/abs/10.1177/0892705719

36 Summary and common ideas from all the papers

1. *Plastic Pollution Impact:* All papers discuss the negative impacts of plastic pollution on the environment, human health, and ecosystems.

2. *Microplastics:* Microplastics are highlighted across multiple papers, discussing their sources, health effects, and environmental consequences.

3. *Global Nature of the Issue:* The global nature of plastic pollution is emphasized, with papers discussing its impact in various countries and regions.

4. *Health Implications:* Several papers delve into the health implications of plastic pollution, both for animals and humans, including potential endocrine disruption and disease spread.

5. *Recycling Challenges:* The challenges and inadequacies of plastic recycling, especially in developing countries, are a recurring theme.

6. *Innovative Solutions:* Innovative solutions to address plastic pollution, such as technological interventions, behavioral incentives, and creative recycling practices, are discussed in multiple papers.

7. *Policy and Regulation:* The importance of policy and regulation in managing plastic waste is a common thread, with papers discussing the role of regulations, policy initiatives, and the need for consistent implementation.

Elaborate Summary:

The collective body of research underscores the pervasive and detrimental impact of plastic pollution on a global scale. It emphasizes the dual threat posed by both macroplastics and microplastics, detailing their sources, environmental release, and adverse effects on human and animal populations. The difficulty in accurately measuring plastic outflow into the oceans is acknowledged across papers, reflecting the complexity of systems and the challenges in modeling such pollution.

The health implications of plastic pollution, particularly the ingestion of microplastics and their potential to disrupt the endocrine system, are highlighted. Disease spread, especially in urban areas, is noted as a consequence of plastics creating stagnant water pools conducive to microbial growth.

Several papers address the critical issue of plastic recycling, with a focus on developing countries like Vietnam and Malaysia facing challenges due to inadequate infrastructure. The geopolitical aspects, such as China's regulations redirecting plastic waste to Southeast Asian countries, are discussed. Safety risks associated with informal recycling processes and the need for better waste management practices are emphasized.

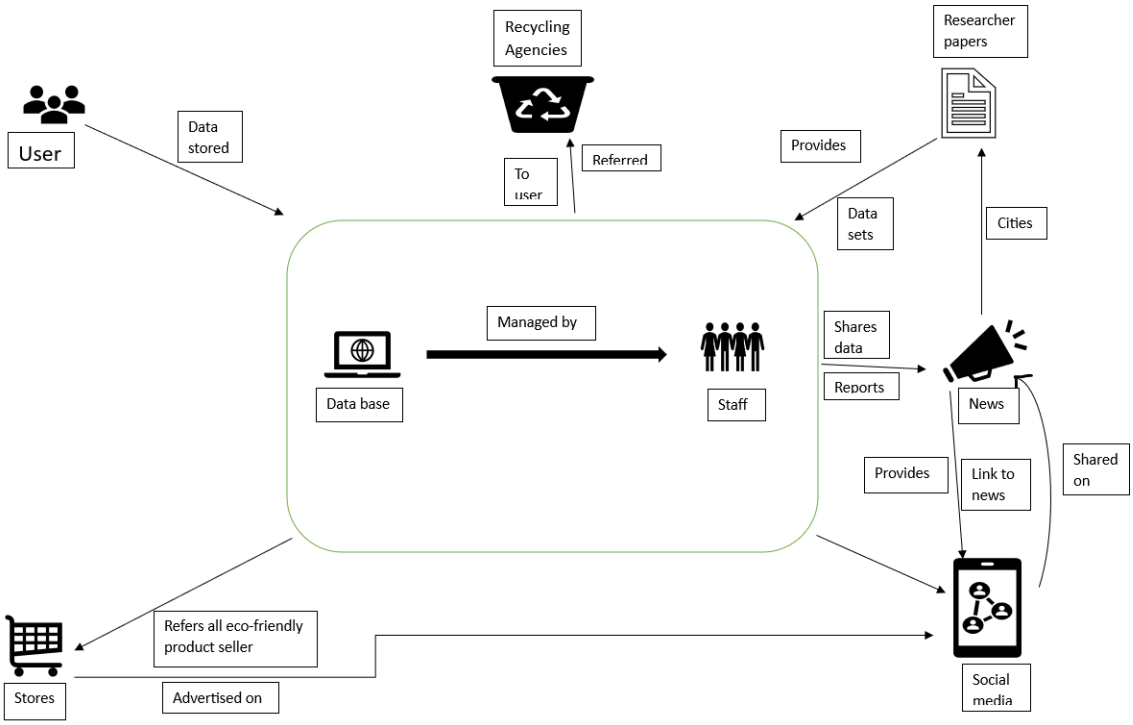
Innovative solutions are explored, ranging from modeling scenarios to combat plastic pollution to incentive-based approaches, as seen in the RECICLOS project in Spain. The use of technology, such as the GLOVE initiative's open-access database, is presented as a valuable tool for researchers and decision-makers.

The global crisis of plastic pollution is further addressed in papers advocating for integrated strategies, including a shift towards a circular economy, revising cleanup methods, and adopting a multidisciplinary approach. Recommendations span from promoting recycled plastics to adopting renewable energy for recycling.

Behavioral aspects are extensively studied, examining emotional responses to plastic waste and exploring interventions to encourage consumers to reduce plastic consumption. Game-based approaches and behavioral change models are analyzed, providing insights into effective strategies for reducing plastic waste at the individual level.

Ultimately, the papers collectively underscore the urgency of addressing plastic pol-

lution comprehensively, combining technological innovation, policy measures, and behavioral interventions to mitigate its far-reaching impacts on the environment, health, and communities worldwide.



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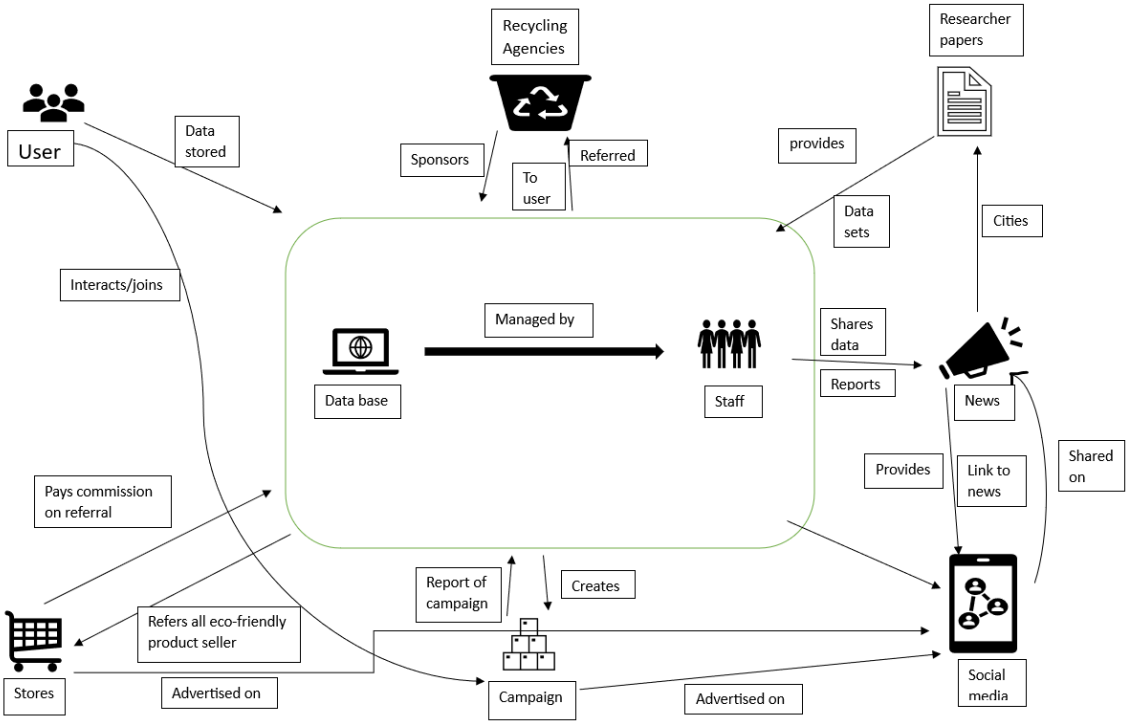

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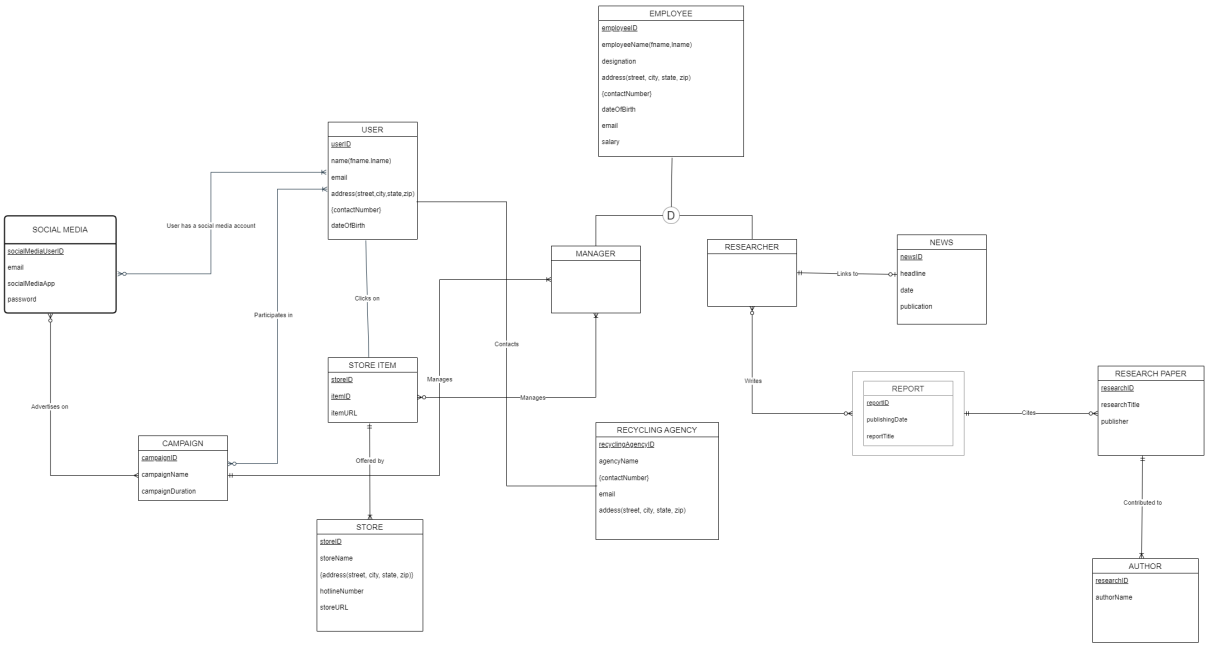
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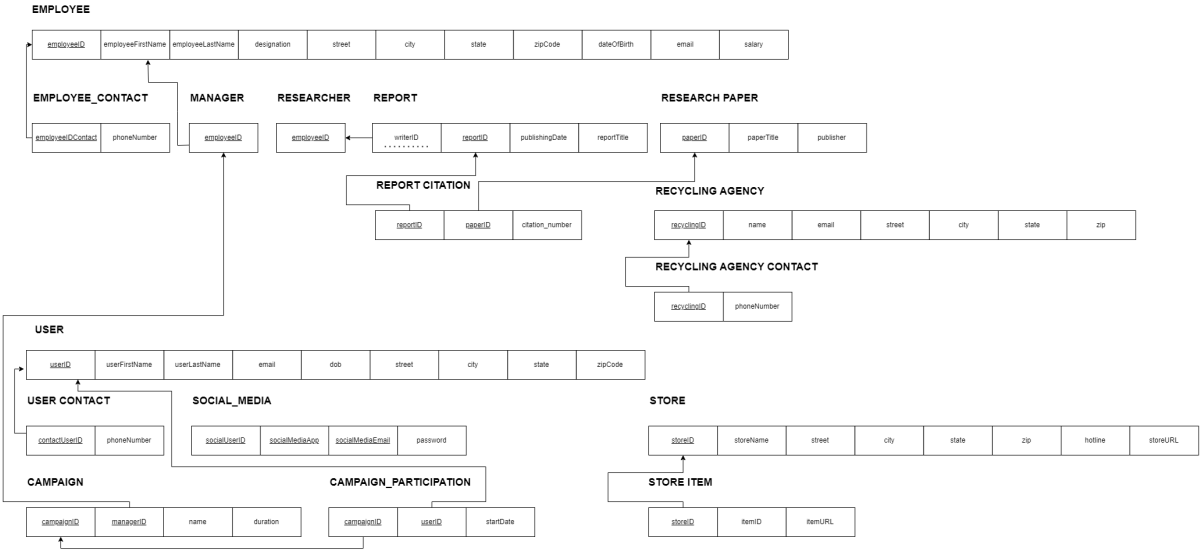
EER Diagram



Relationship Schema Diagram

Normalisation

E: EMPLOYEE, **EC**: EMPLOYEE_CONTACT, **M**:MANAGER, **R**: RESEARCHER, **RE**: REPORT,
RP: RESEARCH PAPER, **RC**: REPORT CITATION, **RA**: RECYCLING AGENCY,
RAC: RECYCLING AGENCY CONTACT, **U**: USER, **UC**: USER CONTACT, **S**: SOCIAL MEDIA,
ST: STORE, **C**: CAMPAIGN, **CP**: CAMPAIGN PARTICIPATION, **SI**: STORE ITEM

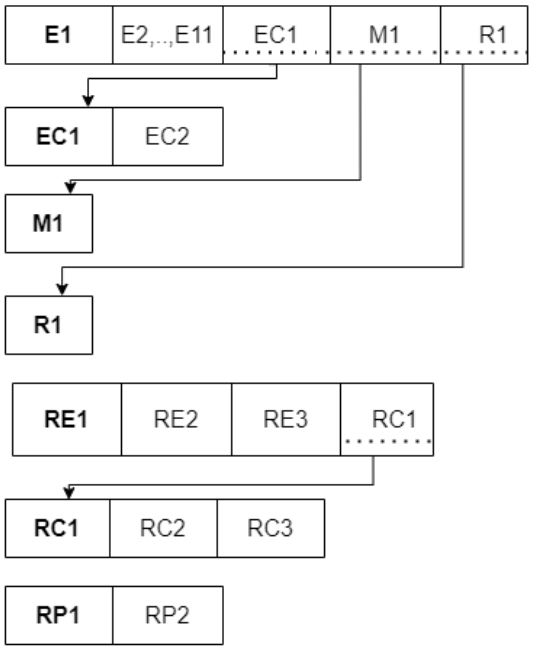
1NF

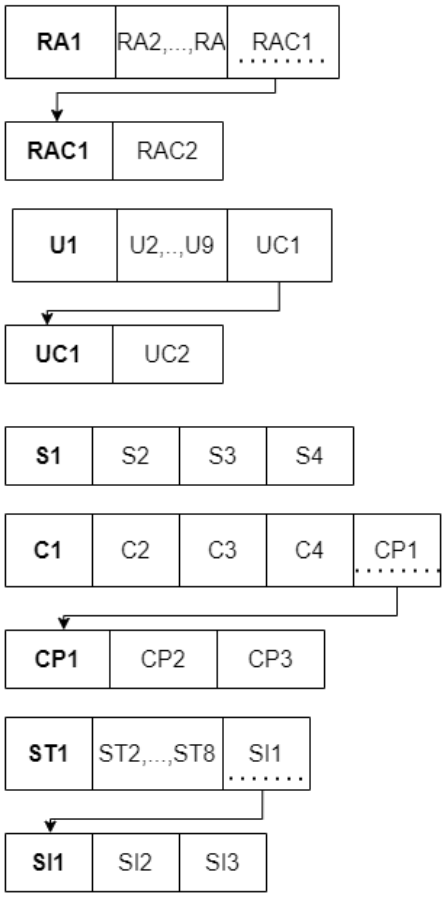
E1	E2,...E11	EC1	EC2	M1	R1	**RE1**	RE2	RE3	**RP1**	RP2	RC1
RC2	RC3	RC3	**RA1**	RA2,...RA7	RAC1	RAC2	**U1**	U2,...U9	UC1	UC2	**S1**
S2	S3	S4	**ST1**	ST2,...,ST8	**C1**	C2	C3	C4	CP1	CP3	SL1
SL2	SL3										

2NF

E1	E2,...,E11	EC1	EC2	M1	R1
RE1	RE2	RE3	RC1	RC2	RC3
RP1	RP2	RP2			
RA1	RA2...RA7	RAC1	RAC2		
U1	U2,...,U9	UC1	UC2		
S1	S2	S3	S4		
C1	C2	C3	C4	CP1	CP2	CP3
ST1	ST2,...,ST8	SI1	SI2	SI3	

3NF





BCNF

3NF already in BCNF

Data Table

tblemployee:

Name	Data Type	Size	Remark
employeeID	numeric	10	This is the primary key of this relation. This contains the ID of the Employee.
employeeFirstName	text	20	This contains the first name of the employee.
employeeLastName	text	20	This contains the last name of the employee.
designation	text	15	This contains the designation of the employee.
street	varchar	50	This contains the street name of the employee.
city	text	30	This contains the city name of the employee.
state	text	50	This contains the state name of the employee.
zipCode	numeric	10	This contains the zip code number of the employee.
dateOfBirth	datetime	dd/mm/yy	This contains the date of birth of the employee.
email	varchar	20	This contains the email of the employee.
salary	number	10	This contains the salary of the employee.

tblemployeecontact:

Name	Data Type	Size	Remark
employeeIDContact	numeric	20	This is the primary key of this relation. It contains the unique ID of the employee contact.
phoneNumber	numeric	10	This contains the phone number of the employee.

tblmanager:

Name	Data Type	Size	Remark
employeeID	numeric	10	This is the foreign key of this relation. It contains the employee ID of the manager.

tblresearcher:

Name	Data Type	Size	Remark
employeeID	numeric	10	This is the foreign key of this relation. It contains the employee ID of the researcher.

tblreport:

Name	Data Type	Size	Remark
writerID	numeric	10	This is the foreign key of this relation. This contains the ID of the Writer.
reportID	numeric	10	This is the primary key of this relation. It contains the report ID of the report.
publishingDate	datetime	dd/mm/yy	This contains the date of publishing of the report.
reportTitle	text	100	This contains the title of the report.

tblreportcitation:

Name	Data Type	Size	Remark
reportID	numeric	10	This is the foreign key of this relation. It contains the report ID of the report.
paperID	numeric	10	This is the foreign key of this relation. It contains the paper ID of the report.
citationnumber	numeric	10	This contains the citation number of the report.

tbluser:

Name	Data Type	Size	Remark
userID	numeric	10	This is the primary key of this relation. It contains the user ID of the user.
userFirstName	text	20	This contains the first name of the user.
userLastName	text	20	This contains the last name of the user.
email	varchar	30	This contains the email name of the user.
dob	datetime	dd/mm/yy	This contains the date of birth of the user.
street	varchar	50	This contains the street name of the user.
city	text	20	This contains the city name of the user.
state	text	20	This contains the state name of the user.
zipCode	numeric	10	This contains the zip code number of the user.

tblusercontact:

Name	Data Type	Size	Remark
contactUserID	numeric	10	This is the primary key of this relation. It contains the contact user ID of the user.
phoneNumber	numeric	10	This contains the contact number of the user.

tblsocialmedia:

Name	Data Type	Size	Remark
userID	numeric	10	This is the foreign key of this relation. It contains the user ID of the social media.
socialMediaApp			
socialMediaEmail	varchar	30	This contains the social media email of the social media.
password	varchar	20	This contains the password of the social media.

tblcampaign:

Name	Data Type	Size	Remark
campaignID	numeric	10	This is the primary key of this relation. It contains the campaign ID of the campaign.
employeeID	numeric	10	This is the foreign key of this relation. It contains the employee ID of the campaign.
name	varchar	30	This contains the name of the campaign.
duration	datetime	dd/mm/yy	This contains the duration of the social campaign.

tblcampaignparticipation:

Name	Data Type	Size	Remark
campaignID	numeric	10	This is the foreign key of this relation. It contains the campaign ID of the campaign participation.
userID	numeric	10	This is the foreign key of this relation. It contains the user ID of the campaign participation.
startDate	datetime	dd/mm/yy	This contains the start date of the campaign participation.

tblresearchpaper:

Name	Data Type	Size	Remark
paperID	numeric	10	This is the primary key of this relation. It contains the paper ID of the research paper.
papertitle	text	50	This contains the paper title of the research paper.
publisher	text	30	This contains the publisher of the research paper.

tblrecyclingagency:

Name	Data Type	Size	Remark
recyclingID	numeric	10	This is the primary key of this relation. It contains the recycling ID of the recycling agency.
name	text	20	This contains the name of the recycling agency.
email	varchar	20	This contains the email of the recycling agency.
street	varchar	30	This contains the street name of the recycling agency.
city	text	20	This contains the city name of the recycling agency.
state	text	20	This contains the state name of the recycling agency.
zip	number	10	This contains the zip number of the recycling agency.

tblrecyclingagencycontact:

Name	Data Type	Size	Remark
recyclingID	numeic	10	This is the foreign key of this relation. It contains the recycling ID of the recycling agency.
phoneNumber	numeric	20	This contains the phone number of the recycling agency.

tblstore:

Name	Data Type	Size	Remark
storeID	numeric	10	This is the primary key of this relation. It contains the store ID of the store.
storeName	text	30	This contains the store name of the store.
street	varchar	20	This contains the street name of the store.
city	text	10	This contains the city name of the store.
state	text	20	This contains the state name of the store.
zip	numeric	10	This contains the zip number of the store.
hotline	numeric	20	This contains the hotline number of the store.
storeURL	varchar	100	This contains the store URL of the store.

tblstoreitem:

Name	Data Type	Size	Remark
storeID	numeric	10	This is the foreign key of this relation. It contains the store ID of the store.
itemID	numeric	10	This is the primary key of this relation. It contains the item ID.
itemURL	varchar	100	This contains the item URL.

Frontend

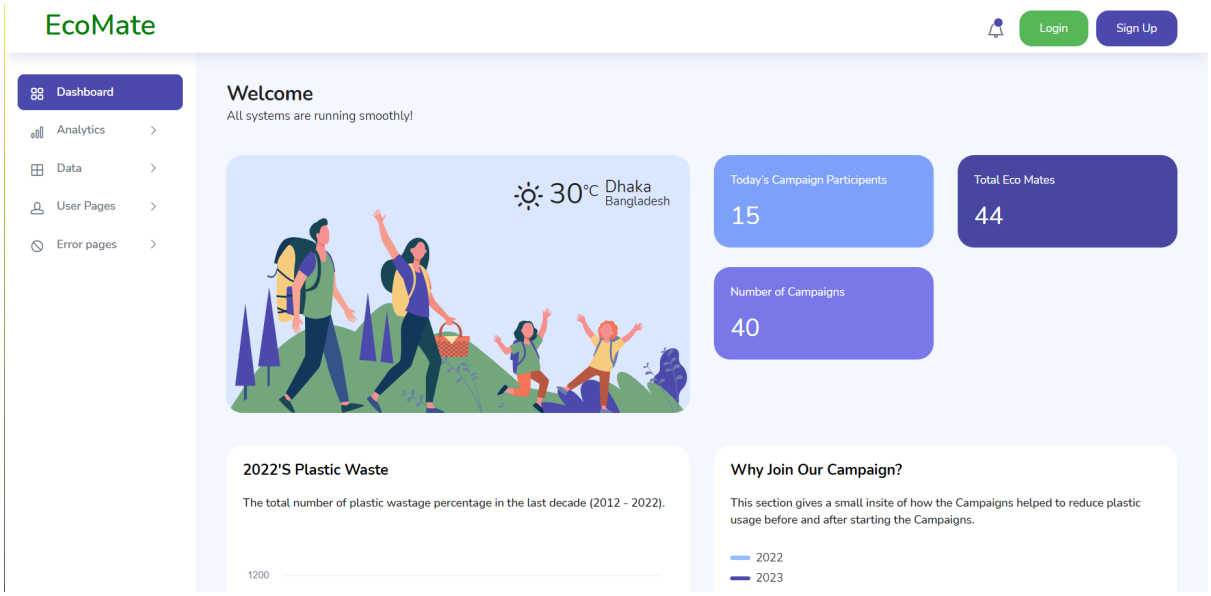


Figure 3: Dashboard Part 1 - Created using HTML, CSS, SASS, Javascript and the Bootstrap template SkyDash. this is a simple landing page with weather data on the user's location, along with basic analytics like user numbers.

Figure 4: Dashboard Part 2 - Charts made with charts.js, an open source library for creating charts and graphs. Pulls from sample data for a line graph and a bar graph. Final version will use proper data from a sourced dataset.

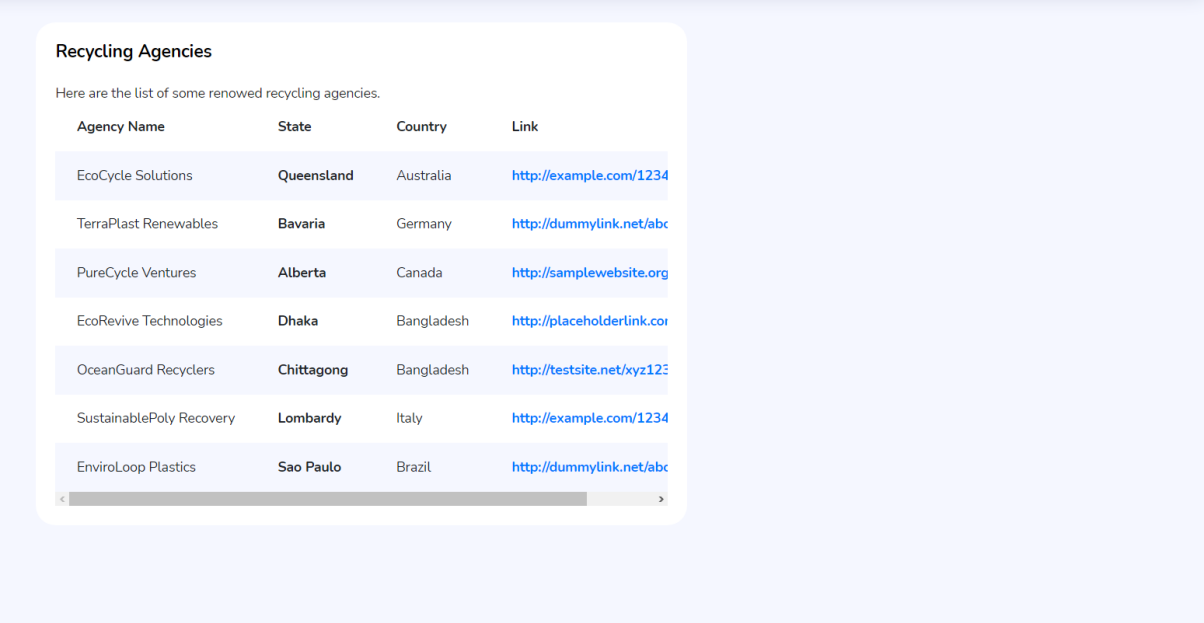


Figure 5: Dashboard Part 3 - Tables made using HTML Table tags but with SkyDash styling. Pulls from table of listed/partnered recycling agencies in the database.

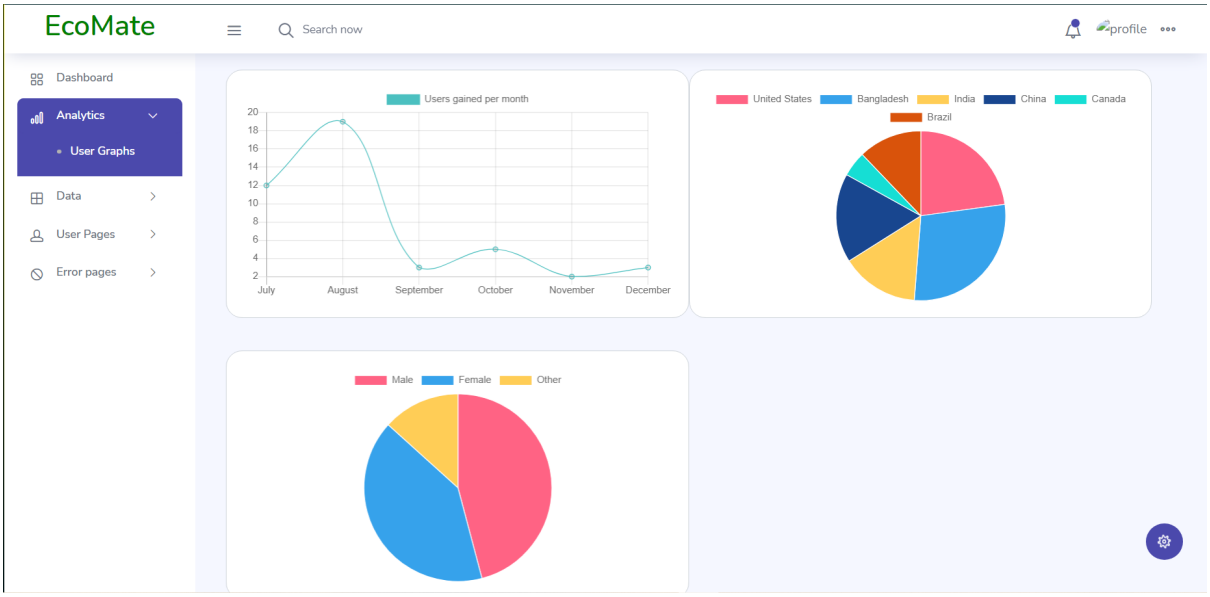


Figure 6: Analytics - Charts made using charts.js, basic user analytics for Admin use. Uses sample data temporarily, a line graph and two pie charts are used. Final version will use proper data from the User table in the database.

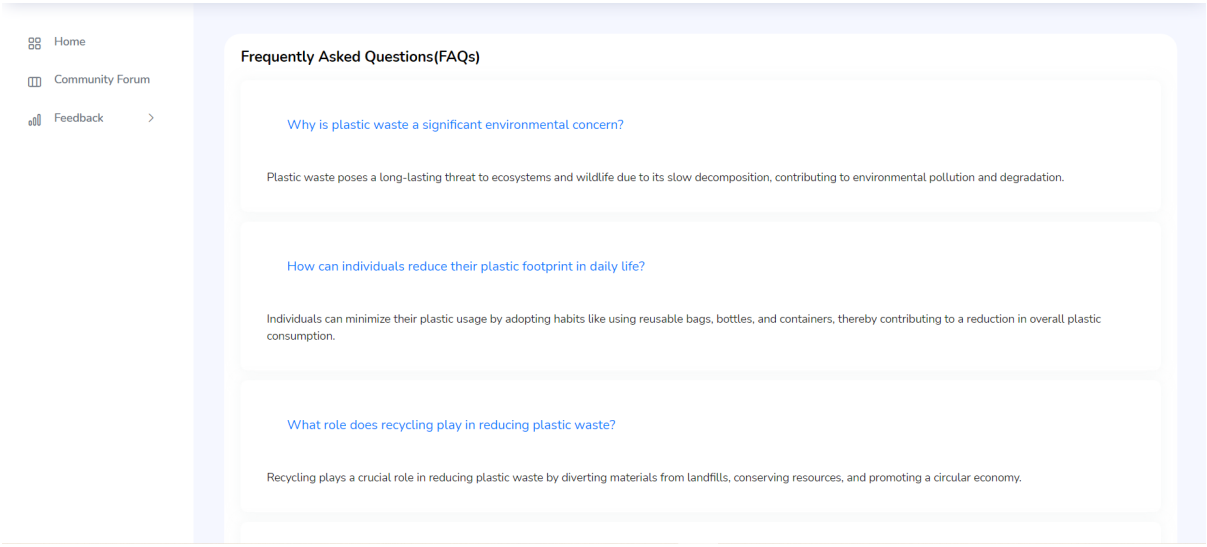


Figure 7: FAQ - Support page for Frequently Asked Questions, provides answers to common questions. Final version will provide useful links.

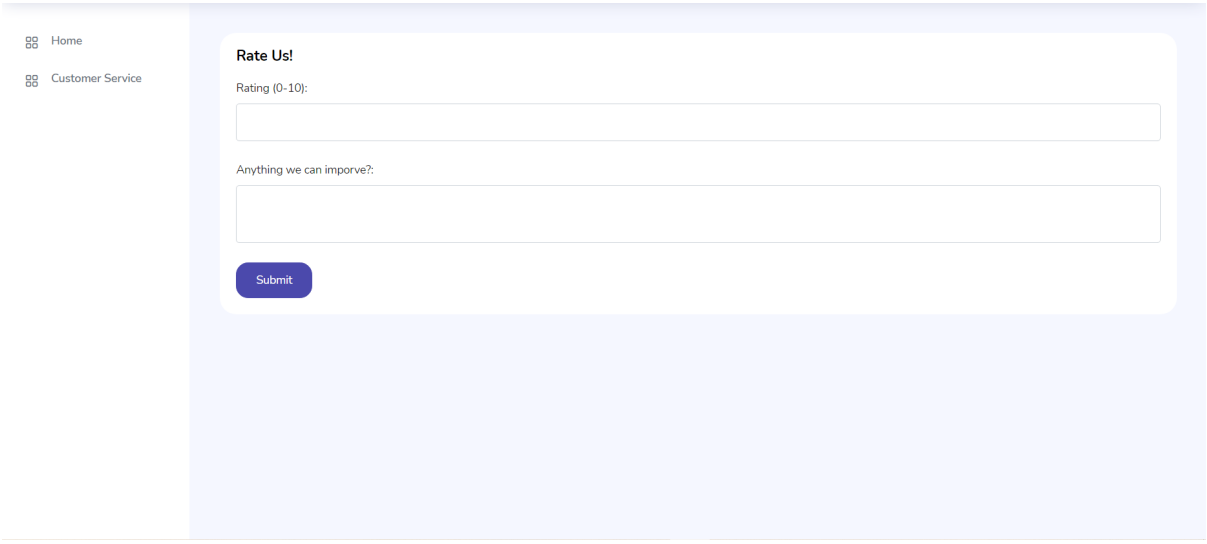


Figure 8: Feedback - Page for receiving feedback from users with a rating and an attached comment. Feedback will be saved to the backend and used to improve the experience.

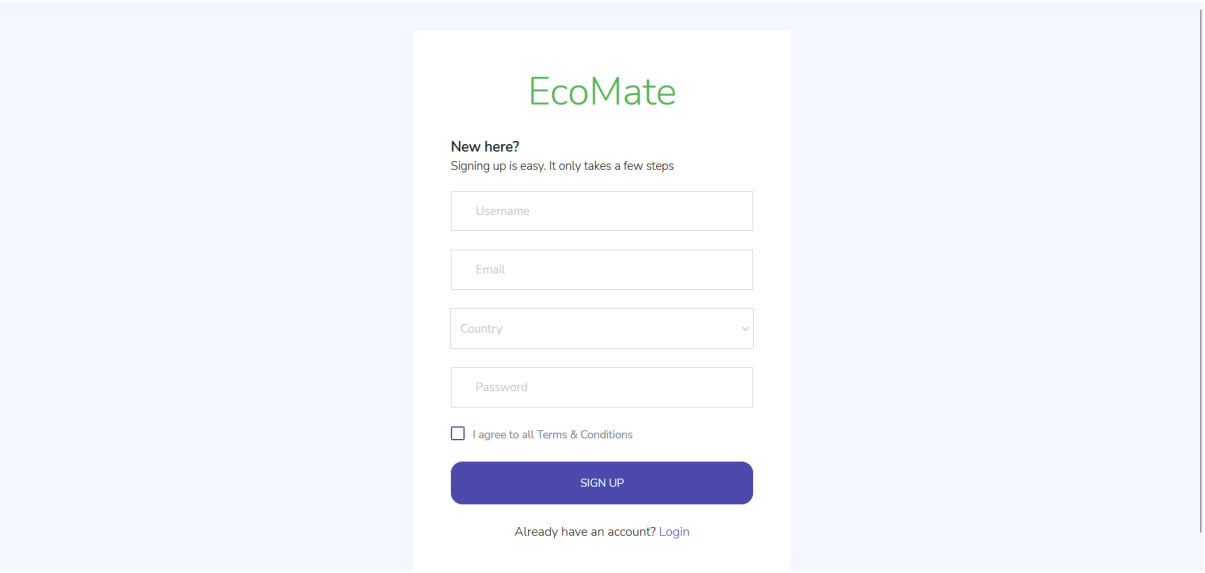


Figure 9: Sign Up - Basic Sign Up page.

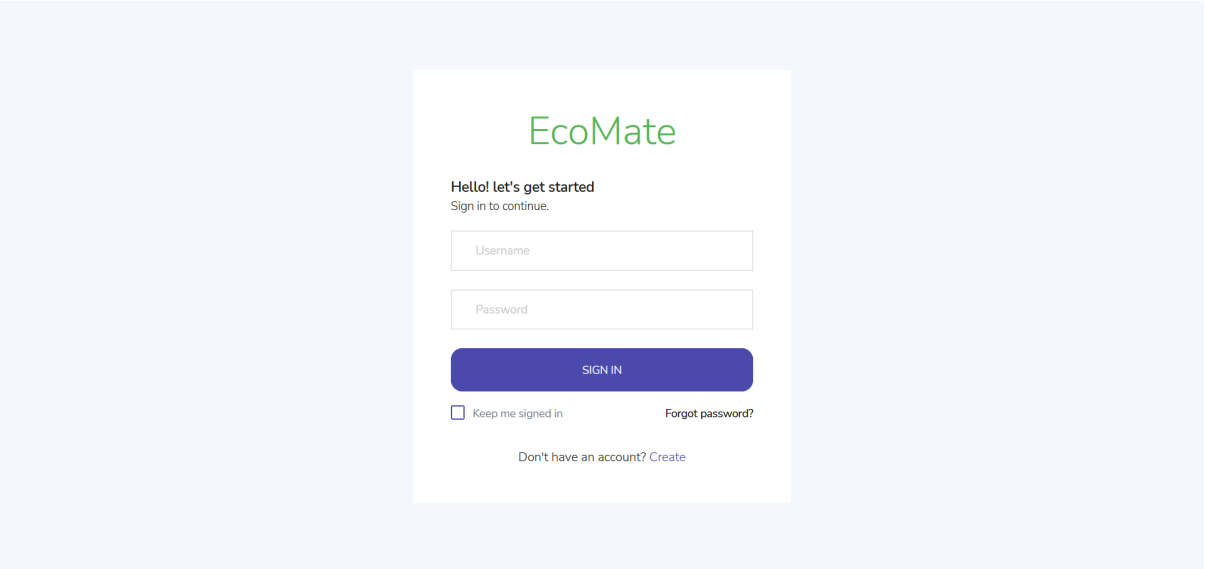


Figure 10: Log In - Basic Log In page.

Analysis

The following makes up the concluding segments of this paper.

Result Analysis

The rich picture diagram outlines a system of interactions among various entities, focusing on eco-friendly initiatives and data sharing. This is done by additionally outlining the interaction between users, stores, a data base managed by staff, campaigns, recycling agencies, and researchers.
- "Users" interact with "Campaigns".
- "Users" data is stored in a "Data Base" managed by "Staff".
- "Recycling agencies" sponsor the data base so that they are, in return, referred to "users".
- "Recycling agencies" sponsor the "Data Base" and are referred to "users".
- "Stores" receives referrals on all eco-friendly product sellers and advertises them on "Social Media".
- The "Staff" creates "Campaigns", and each "Campaign" sends a report back to the "Data Base" managed by "Staff".
- "Campaigns" created are advertised on "Social Media".
- "Social Media" shares the data and information they receive from "Stores", "Campaigns", and "Data Base" to the "News".
- Researchers create "Research Papers" and share the data sets with the "Data Base".
- "Data Base" shares the data received in the form of reports to "News", and "News" then cites the Researchers' "Research Papers".
- "News" also provides links to their news on "Social Media".
This diagram represents a collaborative network aimed at promoting environmental sustainability through data exchange and community involvement.

Problem Analysis

While the proposed project would function as a working plastic pollution self-management tool, it is limited primarily by the demand for such a system to begin with. Personal plastic management is a large undertaking for any individual and only those heavily invested in the issue would download the app. The proposed system would face issues in regards to its spread, the sponsorships and affiliations would likely not be viable to build up to. Due to the difficulty of widespread adoption with such a product, and with individual contributions to plastic pollution not making up the majority of the issue, it would require a highly notable innovation to push the product forward, which it does not offer.
This project remains incomplete due to extraneous circumstances reducing the time and manpower dedicated to it.

Conclusion

In conclusion, this project was created with the purpose of reducing plastic waste by allowing individuals to regulate their own PMI with the assistance of a management app. Studies support that such a prospect on a large scale could have a notable impact on the pollution situation, however it is limited by the difficulty of wide-scale adoption and of finding suitable sponsors and affiliates to keep it profitable.
This project is incomplete due to extraneous circumstances but could be completed and offer a decent alternative to its competitors with further afforded time.