

MARKET RESEARCH ON FEASIBILITY OF ZERO WASTE LIFESTYLE IN KERALA

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Abstract: - Compacting global warming requires reducing the amount of waste disposal and incineration. Global carbon emissions could be cut down by at-least 20 % if cities begin to recycle and compost waste instead of dumping it into landfills or burning it. This research study, propose to pledge the cities in Kerala to cut down waste in the next 15 years in an effort to control global warming and become zero waste cities in the long run thereby lay the groundwork for a zero-waste future. The study aims to encourage Kerala to put an end to production of waste and the common practice of burning of waste by trying to break the inhibition of the Kerala populatation towards waste management. The study also aims to recommend alternate waste management practices encouraging minimal waste generation, recycling and reusing materials. This study cite the examples of zero-waste cities around the world to encourage Kerala to do the same. Data required for the study was collected using survey method through structured online questionnaire. Equal number of responses from each of the 14 districts of Kerala were gathered and analyzed using simple percentage analysis. The study conducted, revealed that the people of Kerala are ready to adopt a zero-waste lifestyle if provided with necessary support though majority of them were not fully aware of zero-waste strategy.

KEYWORD: - Global warming, compost, landfills, zero-waste, minimal waste generation.

I. INTRODUCTION

The Zero Waste International Alliance'19 defines zero-waste as, “ the conservation of all resources by means of responsible production, consumption, reuse and recovery of products, packaging and materials without burning, and with no discharges to land, water or air that threaten the environment or human health”. “Zero Waste” approach is an essential environment-friendly ideology that aims to promote resource efficiency by minimizing the resource consumption to the utmost level and taking advantage of the execution of alternate strategies, resources and innovative tools to eliminate waste to the fullest. Zero Waste is a combination of concepts carefully designed to motivate the remodeling of resource life cycles by avoiding waste generation thus all products are used again and again. The aim of zero waste lifestyle is to ensure that no waste material is sent to landfills, incinerators, or the water bodies like ocean, rivers and so on. It is primarily the concept of living entirely waste-free inspired from the `natural ecosystems where the waste or by product of one process is used as an input into another process. It is an attempt to move towards a closed loop system where all materials can be put fully back into the system. Zero waste is a strategy wherein waste is viewed as a resource and used as an input to other processes. It is an ethically and economically efficient practice leading to a sustainable lifestyle.

The strategies in zero-waste approach can be well described through the 5 R's namely refuse, reduce, reuse, repurpose and recycle. These 5 R's helps move from a linear cycle to a cyclical system wherein no waste is generated. Output from one becomes the input to another. It aims to minimize the influence of consumerism. Zero-waste is all about redefining the traditional waste management system. The ultimate purpose of zero waste is to make a transition from linear economy to a circular economy where minimal or no waste is generated. Zero waste approach contributes to a healthy community by reducing air, water, and soil pollution by keeping landfills and incinerators free from toxins and waste. Zero waste comes with significant environmental, social and economic benefits. It is a cost effective climate action strategy focusing on reducing the greenhouse gas emissions and reducing the impact on environment.

Zero waste movement is all about adopting a sustainable lifestyle free from plastic by buying, making and using sustainable/green products that do not have negative impact on the environment. Zero waste is naturally beyond all the eco-friendly efforts that only aims to reduce, reuse and recycle as it includes refuse as the starting point and rot as the ending. Thus it is an ethical, economical, efficient, socially and environmentally responsible approach to reduce the trash sent to landfills and incinerators. The study also intends to propose Kerala to pledge zero-waste and suggest zero waste practices for the practical integration of zero-

waste approach to the traditional waste management system of Kerala. The main aim of this project is to provide safe and healthy living environment for families and communities across Kerala while reducing resource consumption thereby maximizing the utility of all available resources at the minimum possible level. The geographical scope of the study is limited to the landscapes of Kerala. For sustaining life on earth, there is a great need to change from a linear economy to a circular recycling based economy. Zero-Waste lifestyle plays a significant role in improving the cities and the environment by reducing the resource consumption and the pollution of environment by minimizing the waste that goes to landfills to a great extent and thus providing a cost effective solution to all the waste related issues facing the society and the planet. Recycling based economy in a closed loop system preserves the value added in products. The research study under “Market research on the feasibility of zero waste lifestyle in Kerala” aims to explore the benefits of transforming every city in Kerala into zero-waste cities. Sustainable lifestyle free from waste especially plastic can be aimed to be achieved throughout Kerala. The study aims to implement the incorporation of 5 R’s into the waste management practices of Kerala by encouraging the people to resort to appropriate alternate waste management practices currently viable in Kerala for the effective development of zero-waste strategy. Key highlight of zero waste lifestyle is that it is ethical, economical, efficient, socially and environmentally responsible. We look forward to replace the traditional waste management practices with more sustainable alternatives.

A. IMPORTANCE OF ZERO-WASTE ECONOMY IN KERALA

With the world population ever increasing, management of waste especially solid waste is a significant challenge. Municipal solid waste generation levels are 1.3 billion tonnes per year approx. India alone generates 31.5 million tons per year. Waste management in India is becoming more and more of an issue. Improper management of waste in India causes both health problems as well as environmental hazards.

Garbage disposal and management of waste remains one of the grave concerns in Kerala. Poor waste management practices like open dumping, burning, etc. leads to pollution of air, water and soil. Landfills occupy natural spaces wasting and trapping recyclable resources. It is also a source of

greenhouse gases that are far more dangerous than carbon dioxide gas. The problem of waste management can be resolved if each individual is aware about the segregation of waste and its management. 90% of the waste can be dealt at home. Kerala is in great need of sustainable waste management. Zero-waste lifestyle is one effective and efficient way to combat these problems as it protects the environment and benefits the communities by supporting a strong local economy.

Landfills are moving closer to urban areas and are put closer to poor and disadvantaged communities. A number of resources that are dumped in landfills contain harmful materials which are able to leak into the soil and groundwater triggering environmental hazards that have long term impacts. Also majority of the materials sent to landfills are recoverable or recyclable. Moreover, landfills are one of the main climate criminals. Therefore a significant reduction in greenhouse gas emissions can be attained by cutting down the amount of trash sent to landfills by diverting organic materials to composting facilities. Reusing and recycling strategies help keep the resources in use for a longer period reducing the need to extract more natural resources which consumes more energy. A circular 5 R based Zero-waste economy is the sustainable way to approach the future.

Kerala is facing huge issues with respect to waste management as its cities are drowning in garbage. In majority of the cities in Kerala, there are no formal mechanisms for processing and disposing waste. Trash is being dumped anywhere and everywhere. Accumulation of waste at places, across both sides of national highways and public places with garbage litters, polluted water bodies, stagnant contaminants, eutrophication of lakes etc. adversely affects the natural beauty and hygienic environment. Lack of an efficient waste management system in Kerala is causing havoc to normal public life. With a strong emphasis on waste prevention and socially and environmentally responsible waste management system, zero-waste is a great strategy to rebuild the economy of the State of Kerala to support public health, sustainable development, and justice.

Zero-Waste Lifestyle in Kerala is beneficial for people, animals, plants and the planet. Individuals and organizations around Kerala can together work to minimize the negative impact of waste disposal on the environment, human beings and the animals. Zero-Waste lifestyle is appealing because of its significant benefits in relation with health, time and money. It is a new approach to consumerism and conscious lifestyle. With a greater emphasis on sustainable living and

reduction of plastic waste, zero-waste approach to life can be a wonderful way to encourage sustainable waste management practices as far as possible for the safety of mankind, animals, plants and the survival of the planet. Contribution to waste can be dealt by reducing personal waste which in turn helps reduce air, water and soil pollution caused by waste and traditional waste management practices like open burning, dumping etc. There is little or no additional cost involved in this. It supports ecological prosperity and can improve the present condition prevailing in the cities of Kerala to a great extent. Successful implementation of zero waste will eliminate all harmful discharges to land, water or air which impose threat to our mother earth, humans, animals, plants and all other beings.

B. BENEFITS OF ZERO-WASTE' WASTE MANAGEMENT

Zero waste approach is highly beneficial for our economy as it encourages it to be regenerative by viewing waste as a resource. By resorting to a waste free lifestyle, one is participating in protecting our environment. It protects the health of the people by minimizing air, water and soil pollution by diverting waste from landfills. It not only supports a circular economy but also creates green jobs.

Zero waste strategy is a climate solution. Zero waste is the right way to deal with the problem of climate change. It is the simplest climate action strategy promising fast results in the reduction of green house gas. Resource conservation is another benefit of zero waste approach. Waste is viewed as a resource. It conserves natural resources by reducing resource consumption thereby maximizing the utility of all available resources at the minimum possible level. Social equity can be attained by implementing zero waste as it helps community groups to address social inequities by donating unused items of good condition to those in need or refugees. Zero waste lifestyle leads to community development by building community capacity, protecting public health and supporting marginalized communities. Implementing zero waste concept in waste management not only cuts down waste but also saves money by reducing meaningless purchases thus making it a cost-effective climate solution. Switching to sustainable organic and plastic free products is a healthy alternative. It leads to a toxic free lifestyle providing safe and healthy living environment for families and communities. Pollution of air, water and soil can be reduced to a great extent by following a zero waste lifestyle. Plastic pollution can also be considerably reduced. Green jobs are created in composting, recycling, reducing, reusing and diversion programmes such

as collection and handling of recyclable materials, compost facilities, waste depots, processing, reusing, rental businesses etc. Apart from the economic, environmental and personal and community benefits, zero waste helps the local economy to grow by unleashing the economic potential created by new business opportunities of recovering and reselling valuable materials. Hence, zero waste lifestyle is an effective and efficient sustainable lifestyle choice.

C. ZERO WASTE COUNTRY - SWEDEN

Sweden is setting an example for other countries. The country has a revolutionary system of waste collection with recycling stations established at less than 300 metre from residential areas. In order to vacuum the waste sent by households to the station, pipelines are constructed under the roads. Communities across Sweden are well informed concerning sorting the waste materials for recycling. The government has powerful strategies for the collection of these waste and its reuse to provide energy. This "recycling revolution" has helped Sweden meet the 'zero waste' levels. The country recycles almost 99 percent of locally-produced waste. As far as recycling and reusing of waste is concerned, Sweden is by far the best country in the world. Today, almost all of the wastes are recycled by households with only one percent of the total waste produced being land-filled. As a result of its zero waste policy, Sweden is paid for importing waste from UK, Norway, Ireland and other countries without making any payments to them, as the country faces shortage of anymore rubbish.

Waste producers are made responsible for handling all costs associated with the collection, recycling, or disposal of waste. Household waste produced in the country is used for biological recycling, material recycling and energy recovery. The recycled waste is used as a resource and turned into district heating, electricity, biogas and bio-fertilizers. Sweden's waste-to-energy programme is responsible for supplying heat to more than one million houses in the country from effectively burning waste in low-carbon incineration plants. Swedish model of waste disposal is not 100 percent eco-friendly, however its waste management system is a global leader recovering more energy from every tonne of waste than any other country.

D. ZERO WASTE CITIES AROUND THE WORLD

Zero Waste Cities is an ongoing effort to deal with waste by creating and implementing sustainable waste management systems to mitigate waste

generation. Implementation of zero waste strategies can lead to a substantial decrease in waste generation and increase in reusing and recycling which accelerates the transition of cities towards zero waste cities.

1. San Francisco

San Francisco is one among the 23 cities that pledged zero waste. This city diverts about 80 percent of its waste from landfills which is more than any other major U.S. city. San Francisco adopts recycling, composting, reusing and reducing consumption as to send nothing to either the landfill or incineration in order to achieve its zero waste goal. The city has made recycling and composting a mandatory requirement for all businesses and residences and has also banned environmentally hazardous products like checkout bags and Styrofoam.

In order to promote the behaviour change, the rates of waste collection was set much higher compared to that of recycling and composting rates in the initial stages. Also, businesses were charged on the basis of the volume of waste produced and were penalized for the presence of recyclable or compostable materials in the trash. San Francisco is making zero waste a reality in exclusive partnership with the waste management company, Recology.

2. Copenhagen

Copenhagen, one of the greenest cities on the planet, aims to become a sustainable and liveable city of the future by fully supporting the zero waste declaration and is committed to become greener in order to attain the goal of becoming the world's first carbon neutral city by 2025. Circular economy and sustainability are the key focus areas of this Danish city. The city has adopted an integrated solution including strategies, policies and investments to ensure high rate of recycling and waste to energy programme. This holistic waste management model is helping the city reach its goal of creating a sustainable community and green economy. Copenhagen mainly focuses on recycling and reusing of materials. Businesses in the city are obliged to comply with the municipal waste management system to manage the waste they generate. Denmark has made it illegal to send waste to landfill if it can be incinerated. Thus waste incineration becomes an essential part of the system and the city of Copenhagen uses the world's most energy efficient incinerator. Segregation of waste at source at all households is another important aspect of the city's waste management

system. Today, Copenhagen sends less than 2 percent of the waste to landfill. Major portion of the waste is recycled and used to generate heat for the city's district heating network.

3. Sydney

For achieving the goals of responsible consumption and production, Sydney adopts the 4 R's reduce, reuse, repurpose and recycle of resources. This Australian city is committed to environmental leadership including zero waste to landfill. An integrated sustainable resource management is set out to achieve this waste strategy. Over 69% of residential waste is diverted from landfill. The City of Sydney is among its first in Australia to send waste to resource recovery facilities, from where, food waste is separated in order to produce compost for mine and landfill remediation. Sydney plans to create a digital platform within the organization to collect, store, convert and report waste and recycling data. The city collects and manages waste from households, city-managed assets, parks and public places whereas businesses are responsible for collecting their own commercial and industrial waste. The city influences the recycling of businesses and institutional wastes through various sustainability programmes. Sydney intends to divert 90 percent of its waste from landfill by 2030.

E. ZERO WASTE COMPANIES IN INDIA

Some of the popular companies in India practicing zero-waste concept are as follows:

1. Zero waste Indian Kerala

ZEROWASTE is an ISO Certified Hindustan Trading Company established in 2014 in the Malappuram District of Kerala. They are involved in the manufacturing of environment friendly incinerator(solid waste dispenser). This incinerator is a zero waste- zero fuel equipment which relies on Oxygen Controlled Technology that uses oxygen from the atmosphere as the fuel. The zero waste zero fuel incinerator is designed in such a way that it can burn all kinds of waste (except iron, treated cement and glass pieces) ranging from municipal solid waste to domestic waste within minutes in a cost effective way as it requires no maintenance. This equipment is not only easy to operate but also very easy to install as it can be installed even on rooftops as sufficient air supply availability is its only requirement. The byproducts can be used as fertilizers as it does not contain any harmful toxins since it ensures complete breakdown of any toxic substances. The incinerator is designed in such a way that it emits only the least minimum carbon dioxide emission and is

available in three different models. This company is also an expert in rain water harvesting.

2. Bare Necessities Zero Waste India

Bare Necessities is a zero waste start-up founded by Sahar Mansoor, a zero waste activist who lives in Bangalore, India. Bare Necessities is Bengaluru based social business that choose to offer sustainable and eco-friendly alternative products to the consumers in India. Customers can shop for personal care, home care, lifestyle and gift items from their online website. Bare Necessities products are available in stores across India. All its products are zero waste and ethically sourced which are best for both the people and the planet. All products are handmade, completely bare and comes in recyclable packages. The company plays a big part in helping the society to transition to a sustainable, zero waste and earth friendly lifestyle.

3. Saahas Zero Waste

Saahas Zero Waste is a non-profit organization involved in sustainable waste management established in 2001 under the Societies Act . They are waste recyclers that offer limitless waste management solutions to large-scale waste generators. It was founded by Wilma Rodrigues and is headquartered in Bangalore with branches in Surat, Gurugram, Ballari, Hubballi and Chennai. The company emphasizes on the principles of segregation of waste at source and decentralized waste management. Their products involve recyclable zero waste notebooks, chip boards and recyclable roofing sheets that are blot proof and long lasting. They are involved in innovation, incubation and propagation of programs such as sustainable waste management, sensitization and behavioural change, consultancy and research and building reverse logistics networks.

4. Waste Ventures India

Waste Ventures India is a Hyderabad based social enterprise engaged in financially and environmentally sustainable waste management. They offer expertise waste collection and processing services to households, business clients and waste pickers. Since 2013, Waste Ventures have averted more than 4,000 tons of waste, 11,000 tons of carbon dioxide and have served more than 25,000 households. They are one- stop recycling shop that are driven by technology. They ensure green guarantee by sending all recyclables to certified recyclers.

5. SWaCH Pune

SWaCH is India's first fully owned cooperative of waste pickers engaged in door-to-door waste and recyclable collection. It is a social enterprise of waste pickers that focus on solid waste management of the City of Pune. The SWaCH model of waste management is sustainable, cost effective and efficient. They are service providers including waste collection, recycling, red dot awareness, composting services, waste collection at events , e-collect, MLP collection and Nirmalaya collection. SWaCH reduces the amount of waste sent to landfill by way of recycling which leads to reduction in green house gas emission responsible for global warming. They provide waste management services at lower costs.

F. INDIAN ZERO WASTERS

Many people from different parts of India have adopted a waste free living. Most of them are inspired by zero waste pioneers like Bea Johnson and Lauren Singer. They are not living a completely zero waste life but are doing their bit in reducing the waste by cutting down their own personal waste generation. Here are some of the popular zero wasters in India:

1] Shibu K Nair

Shibu K Nair is a zero waste fellow living in Thiruvananthapuram. He is an environmentalist and a volunteer of a non-governmental organization, Thanal. He is the India Coordinator for GAIA. He is a consultant who designs, develops and implements and monitors zero waste systems for communities, non-profit organizations and government. He is into zero-waste campaigns and projects since 2000. He adapts simple methods such as composting, vermi composting, installation of biogas plants to manage bio-degradable waste.

2] Durgesh Nandini

Durgesh is a homemaker with a two toddlers. Since 2015, her whole family is zero-waste. Before adopting the zero waste lifestyle she had been exploring alternative sustainable lifestyle options and was also experimenting with minimalism. Zero waste lifestyle was just an extension of these sustainable life practices. She was inspired by Bea Johnson's book and Lauren Singer's blog also by many Indian zero wasters on Instagram.

Durgesh started off with the zero waste life by segregating her waste at home and tracking the waste materials. She further practiced zero waste by using cotton bags for groceries, steel vessels for liquids. She even replaced her personal hygiene and cleaning products with kitchen staples.

She carries her own reusable container for takeaways. She believes minimalism is the route to achieve the goal of zero waste. Her family collectively generates only about half a kilogram of non-recyclable waste each year. Durgesh admits she is not one hundred percent zero waste as it is very hard in metro cities though she has started out experimenting with environmentalism as it has brought her family both health and financial benefits. She also stresses that through proper planning and organizing one can easily overcome the challenges of being a zero waster.

3] Sahar Mansoor

Sahar is an environmentalist who runs a zero waste start-up, "Bare Necessities" in Bengaluru. She came across the concept of zero waste when she was doing an undergraduate course in a university in Los Angeles back in 2012. Like Durgesh Nandini, Sahar was also inspired by a video of Bea Johnson displayed in her class. In 2014, she adopted zero waste lifestyle after being inspired by Lauren Singer's blog on zero waste. Sahar believes that waste is directly linked to all the environmental crisis happening in the world and hence wanted to stop contributing to it by addressing the waste she generated through a lifestyle that best reflects her values.

Both Durgesh and Sahar took advice from their grandmother to transition into this lifestyle. She strongly believes the the Indian traditions are mostly zero waste practices. Sahar replaced single use items with steel or bamboo alternatives and makes her own personal care products like shampoo, soap, body oils etc. Sahar also admits that she is not fully zero waste but she does everything she possibly and practically can to produce the least possible waste. Sahar points out that she has saved money, is more healthy and happy because of her lifestyle.

3] T Lalita

Lalita is a 23 year old women living in Mumbai and is working as a consultant at Stree Mukti Sanghatana, an NGO that deals with the rights of women waste pickers. She believes waste reduction at source is the responsibility of every citizen. After realizing the problems of waste pickers, she decided to adopt plastic free lifestyle. She stopped using non-biodegradable items such as straws, polythene, bottles, etc and always carries her own reusable water bottle and cloth bag. She also stopped ordering food from outside to eliminate plastic packaging.

4] Shubhashree Sangameswaran

Shubhashree from Hyderabad continues to live a plastic free life by embracing the three principles of waste management, the 3 R's i.e. reuse, reduce, and recycle. Her regular and traditional habits is what helps her produce the least amount of waste possible and follow a sustainable lifestyle. Just like Durgesh and Sahar, her inspiration comes from Lauren Singer and Bea Johnson. Her book, 'Let's talk trash' is a compilation of simple ways to cut down personal waste generation. She also haven't completely adopted a zero waste lifestyle but is cutting down her personal waste generation by carrying her own cloth bag and bottle, composting wet garbage at home and so on.

G. REVIEW OF LITERATURE

The researchers have reviewed various articles revolving around the concept of zero waste, published by authors around the world with the objective of gaining deep insights into the subject of research here.

Research article by **Smitha Chandran, Anju Bist and Peter Ash (2013)** is a case study on the Amrita Institute of Medical Sciences, Kochi. It focuses on the 'zero-waste' waste management aspect of the system. This study highlights the methods used to achieve the goal of zero-waste in Kerala. It was found that proper solid waste management, thermophilic composting, vermicomposting are some of the methods that helped the organization achieve its zero-waste goal. The study concludes by outlining the successful implementation of sustainable waste management system in Amritapuri and Coimbatore campus and suggests academic partnership with other universities for further research and development for technologies for better zero-waste plans.

The study by **Dr Alka Bharat and Arti Jaiswal (2013)** presents an approach discussing the various issues related to solid waste. Through this article, the authors develop the idea of zero waste for the City of Bhopal in India. The main focus of the study is the increasing problems of solid waste in the cities of India which is determined by reviewing literature. The paper attempts to transform Bhopal into a zero waste city by developing appropriate strategies. The study concludes by suggesting 3R as a solution to different waste types. The research paper by **Steffen Lehman and Atiq Uz Zaman** discusses the various obstacles and prospects in transforming a city into a zero waste city. According to the study, the transformation journey of over consuming cities towards a zero waste city is full of challenges. However, implementing the zero waste concept in a city comes with endless opportunity for development. Case-based and evidence based methodology was employed by the researchers to determine

the challenges and opportunities for a zero waste city. The study highlights the integrated principles of zero waste city and highlights the need for further study. In this study, the researchers propose five important principles for the successful implementation of zero waste transformation of over-consuming cities. **Pannipha Dokmaingam, Pattayaporn Unroj, Mongkonkorn Srivichai and Panate Manomaivibool** conducted a study focusing on the sustainability of 'zero-waste' waste management system. The study suggests 3 R's as an effective strategy to avoid waste disposal. Case study approach was adopted by the researcher to identify the strategies to achieve the zero waste goal. Case study on Chiang Rai was conducted for this purpose. The study spotlights the success of Chiang Rai to encourage communities to manage waste at source. The research study by **E Munawar, E Munir, M Nizar and Irvan** aims to determine the extent of application of the zero-waste management practices in the City of Banda Aceh. It discusses the development of zero waste concept, municipal solid waste, zero waste initiatives in the world and waste management in Indonesia. The study focuses on the practice of zero waste in the city of Banda Aceh by highlighting the waste avoidance strategy, extended producer responsibility, retribution, community waste management and incentives and disincentives. The study concludes with the need for improvement in the implementation of zero waste. The researchers suggest the immediate application of zero-waste concept in the management of waste. **Atiq Uz Zaman** in his study "A Comprehensive review of the development of zero waste management: lessons learned and guidelines" aims to contemplate the concept of zero waste on the basis of a critical review of earlier academic journal publications relating to zero-waste. The study shows that there is wide scope for the studies concerning zero-waste. It also reveals that the concept of zero-waste is developing perpetually with the execution of various policies, plans, programmes and so on. This is a review of the most significant studies revolving around the concept of zero-waste. Research methodology used to analyze the earlier studies on zero waste was quantitative methods. It also employed a three-tiered methodological approach. The findings of this research study indicate that the zero waste programmes implemented in many countries lack holistic approach. The review study concludes that the concept of zero waste is widely implemented in various phases of production, distribution and waste management systems. The study is useful in establishing zero waste principles effective enough to identify the most critical areas of zero waste strategy and to develop zero waste guidelines for the country. Another

research article by **Atiq Uz Zaman and Johnathon Hannon** attempts to explore the zero waste evolution, particularly the way successful implementation of the concept of a zero waste can boost the social participation and accelerate the planning, organising and controlling of circular urban metabolism and hence, more resource efficient future cities. The study also explores the phenomenon of zero waste evolution in New Zealand using a case study model. The article concludes by underlining the interdisciplinary phenomenon of zero waste using the polarized zero waste experience of New Zealand. The study by **Xianlai Zeng, Qingbin Song and Jinhui Li** highlights the role of zero waste strategy in minimizing the increasing solid waste. The researchers discuss the various problems of solid waste including industrial waste generation, environmental concerns, e-waste generation, food waste generation and packaging waste generation. This article also presents case studies on various key zero waste cities and zero waste companies all over the world. The study primarily focuses on the application of zero-waste concept on solid waste management. The researchers further discuss zero waste strategy as an effective business instrument and conclude by summarizing the zero waste practices and strategies. Another research article by **Atiq Uz Zaman** points out the main principles necessary for the successful development of a survey-based strategic zero waste framework. The research tool used here is an online questionnaire survey. The study found that the simultaneous implementation of three essential well-developed action plans is necessary for attaining the goal of zero waste societies. The study discusses the problems and elements of waste management system including source reduction and waste minimization, waste disposal and treatment. It also discusses the major challenges for zero waste strategy and develops a strategic zero waste framework and elaborates its applications and limitations. The study concludes by acknowledging that all the planned elements may not be practical in all countries. **William Hogland, Marika Hogland, Amit Bhatnagar, Fabio Kaezala and Yahya John** in their study raises concerns and awareness about the importance of establishing a new model of waste management schemes. One of the main focus in this paper is to raise awareness regarding metals extraction from fine-grained fractions. The study discusses the throw-away mentality in Sweden during 1960s and 1970s. It further discusses the plastic pollution. The study concludes that zero waste and beyond zero waste concept must be developed and improved so more people can get a high material standard. The research article by **Jaques Snyman and Kobus Vorster** addresses the challenges of municipal solid waste

management in the city of Tshwane. The study identifies and evaluates the various tools and techniques commonly used in developed countries for processing the different components of municipal solid waste suitable for domestic environment as a sustainable alternative to land-filling. The study is focused on Tshwane, nevertheless, the findings of the study is applicable to any municipality of South Africa as well as other developing countries. The researchers discuss the current waste management model implemented in Tshwane and proposes a new zero waste model of waste management for the city. The conclusion of the study states that it is techno-economically viable to establish a zero waste model for Tshwane. **Usha Karunakaran and Nivya Noonhiyl Kaithery** has conducted a study on the perception of household waste management in a rural area of Northern Kerala. The study identifies and evaluates the attitude among the households of Cheruthazhan Panchayat in Northern Kerala with regard to both liquid and solid waste management. Community based cross-sectional study design was used by the researchers. Direct interview using a pretested semi-structured questionnaire was used for data collection. The data was then analyzed using SPSS software. The study found out that the participants were ready to adopt the practice of composting, segregation and recycling of waste. The study concluded that awareness programmes on sustainable waste management have to be conducted on a continuous basis and efforts must be taken to encourage the administration of household waste management. **Prathibha Ganesan** has studied two municipal corporations in Kerala to address the problems concerning the centralized system of waste management and how the urban local bodies refuse to give in to the resistance against centralized waste management in certain localities while yielding to the insurmountable resistance of people in other localities. A sample survey of 175 households located in the landfill sites and city limits of Thrissur and Kochi form the basis of this study. The findings of this study reveals that potency of the people's obstruction affects the decision making ability of the urban local governments. A combination of survey and case study methods were used to understand the complex dynamic of solid waste management. The study discusses the involvement of the citizen in the waste management system in Thrissur and Kochi, waste storage and removal by households, waste collection and transport, waste treatment and disposal. The study concludes that land-filling of solid waste is not suitable for Kerala and that centralized waste management practices can be detrimental to environment and public health of people in Kerala. A study conducted by **Abraham P George** analyses the various urban facets of

solid waste management and factors influenced it in the city of Thiruvananthapuram. This exploratory, descriptive study employed in-depth interviews, focus group discussion and non-participant observations to collect data needed for the research. The researchers found that main problem are large volume of waste generated, limited number of staff and functioning waste disposal equipment and vehicles, the lack of a proper waste processing plant and acute land shortages, ineffective and inefficient legislation on solid waste disposal, budgetary constraints, insufficient supervision of work, poor health status and low motivation of municipal workers and lack of citizen involvement. The study concludes by stressing the need to address the key issues concerning the solid waste management.

II. METHODOLOGY

For the purpose of obtaining complete and accurate information for research, a descriptive survey design is used. Survey for research was conducted in the state of Kerala. Descriptive method of research was adopted here to carry out the study. Sampling methodology adopted was simple random sampling and sample size ranged to 420 samples taken from each of the 14 districts of Kerala. The research approach used in the study is survey method. Research approach includes survey through online interview using structured questionnaire containing 15 questions. The main instrument used for the research study is questionnaire. The questionnaire comprises of primarily closed ended questions along with a very few open ended questions. Altogether there were 15 questions.

Data for the conduction of this study was collected using both primary and secondary sources of data. Data required for the study was collected through survey using online questionnaire. Secondary data was collected from various sources such as journals, newspapers, websites, etc. In the study, the sample unit is the people from each of the 14 districts of Kerala. Sampling area is restricted to Kerala. Sample size for the study is 420 people. Simple random sampling is used for online survey using questionnaire. Sampling technique employed is survey method and the tool used is questionnaire.

Descriptive analysis were adopted in the study. Simple percentage was used as a tool for data analysis. The data and the results of the study were analyzed using percentage analysis.

III. RESULTS AND DISCUSSION

The section examines and analyzes the final results reached after descriptive analysis using simple percentage method highlighting the major analysis and findings relative to the objectives of the study.

1. Contentment with the current waste management system in Kerala

Waste management system in Kerala is inadequate. Disposal of garbage and management of waste especially solid waste is a serious issue in the state. The current system is not competent enough to cope with the large volume of waste produced by the Kerala population. People have expressed dissatisfaction with the current waste management system in the state. However, most of these waste can be deal with at home itself but the inhibition of the Kerala population is the main problem.

TABLE I. Table showing response on contentment with the current waste management system in Kerala

Data (tabulated using percentage analysis) Source: Survey

It is clearly evident from the table that majority I.e 66.43% of the respondents stated that they are not satisfied with the current waste management system in their locality while 33.57 % of them are satisfied with it.

2. Problems regarding waste management in Kerala

With an increase in population, changing lifestyles and consumer spending, the amount of waste generated is rising each day. Various problems including environmental

Sl.No	Option	Frequency	Percentage
1	Lack of required technical support	249	16.35
2	Limited resources	222	14.58
3	Lack of e-waste disposal plant	237	15.56
4	Inadequate waste collection	227	14.90
5	Lack of qualified engineers and environment professionals	184	12.08
6	Waste segregation at source	171	11.23
7	Large volume of waste generation	233	15.30
			100

problems and health issues are caused due to this. This is a serious threat to people, planet and economy. Hence there is a great need for sustainable waste management system in Kerala.

TABLE II. Table showing problems regarding waste management in Kerala

Sl.No	Option	Frequency	Percentage
1	Open dumping	279	17.01
2	Burning	262	15.98
3	Dump site fires	197	12.01
4	Open human and animal exposure to waste	211	12.87
5	Improper waste management	214	13.05
6	Pollution of air, water, soil	246	15
7	Dumping waste into water bodies	231	14.09
			100

Data (tabulated using percentage analysis) Source: Survey

Table 2 The above table clearly shows the various problems regarding waste management in the localities in Kerala. Open dumping (17%), burning (16%), pollution of air, water and soil (15%) and dumping waste into water bodies (14%) are stated as the most troubling problems by the respondents. It is also found that problems like improper waste management (13%),

Sl.No	Option	Frequency	Percentage
1	Yes	149	33.6
2	No	271	66.4
		420	100

dump site fires (12%)

and open human and animal exposure to waste (13%) are also prevalent in their locality.

3. Barriers towards the implementation of effective waste management system in Kerala

Effective management of waste is a major challenge in Kerala due to high population density. The existing inefficient waste management system has negative impact not only on health of the community but also on the environment and the economy. Proper disposal of waste will protect the health of the people and the environment. Waste collection, storage and disposal are some of the major challenges and is the responsibility of the concerned authority. However, waste management should be considered the responsibility of the waste generators.

TABLE III: Table showing barriers towards the implementation of effective waste management model in Kerala

Tabulated using percentage analysis Source: Survey Data

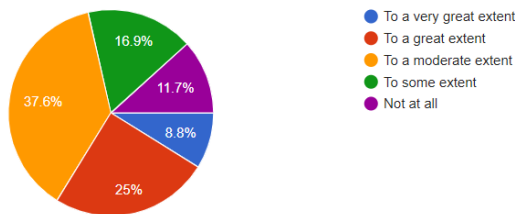
The above pie chart shows the barriers towards the implementation of effective waste management model in Kerala. It is clear that large volume of waste generation (

15.3%), lack of required technical support (16.4%) , lack of e-waste disposal plants (15.56%) , inadequate waste collection (14.9%) , and limited resources (14.58%) are some of the barriers the respondents find as strong challenges. Some of them also find that waste segregation at source and lack of qualified engineers and environment specialists are also other barriers.

4. Awareness about zero-waste lifestyle among people of Kerala

The growing population in the state is a major contributor to the increasing waste and limited environmental awareness together with low motivation inhibits the transformation of Kerala’s waste management system. There is an urgent need to break the inhibition of the people of Kerala towards the management of waste by encouraging the adoption of more sustainable trash-free practices and active involvement in the planning and management of the resource towards waste reduction through education and public awareness. Thus by resorting to sustainable and eco-friendly waste management practices, the negative impact of waste pollution on the people, planet and the economy can be reduced significantly. Awareness about the zero-waste concept would help change the perception of the public towards waste management and they would be motivated to take up the responsibility of their own personal waste.

FIGURE I: Figure showing awareness about zero-waste lifestyle among people of Kerala



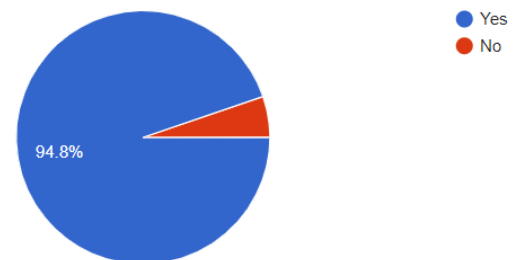
Data (tabulated using percentage analysis) Source: Survey

From the responses received it is evident that most of the respondents are aware of the zero waste concept to some extent but just 8.81% of them are aware about it to a great extent and only 11.67% of the respondents are not at all aware about concept.

5. Willingness of respondents to adopt zero-waste lifestyle

The concept of zero-waste lifestyle is entirely feasible provided one has the willingness to adopt it and resort to a minimalist lifestyle where no waste is created. People are ready to adopt a zero-waste lifestyle in the state of Kerala given they are provided with necessary training and education. Zero-waste movement could attract more recognition and participation if more awareness and education are provided to the people of Kerala. With the successful implementation of zero-waste concept in the current waste management system, the over-consuming cities of Kerala can be transformed into zero-waste cities.

FIGURE II: Figure showing willingness of respondents to adopt zero-waste lifestyle



Data (tabulated using percentage analysis) Source: Survey

As per the pie chart, we can see that, majority i.e 94.76% of the respondents are willing to change to the zero waste lifestyle if provided with adequate training/awareness campaign. Only a very few i.e 5.24 % of them are not willing to make the transition.

6. Contribution towards the implementation of ‘zero-waste’ waste management system in Kerala

Living a waste-free life requires a lot of effort and time to get used to it. Adoption of zero-waste lifestyle is a personal choice. One could practice simple sustainable alternative ways to contribute to the implementation of ‘zero-waste’ waste management system in Kerala. Simple habits to cut down waste can lead to big changes in saving the environment and protecting one’s health.

TABLE IV: Table showing contribution towards the implementation of ‘zero-waste’ waste management system in Kerala

Sl.No	Option	Frequency	Percentage
1	Ditch plastic /plastic packaging	207	8.87
2	Bring your own cloth bag	287	12.29
3	Waste prevention	250	10.71
4	Reduce, recycle and reuse of possibly everything	288	12.33
5	Waste diversion	154	6.60
6	Minimise food waste	234	10.02
7	Vermicomposting	161	6.90
8	Biofuel	151	6.47
9	Stop buying single serving	147	6.30
10	Use reusable containers	249	10.66
11	Use regular reusable dishes	207	8.87
			100

Data (tabulated using percentage analysis) Source: Survey

Table 4 shows that a good fraction of the respondents are ready to contribute towards the realization of ‘zero-waste’ waste management system in their locality by ditching plastic/ plastic packaging, carrying their own cloth bag, waste prevention, adopting 3 R principles, waste diversion, minimizing food waste, vermicomposting, bio-fuel, stop buying single serving, using reusable containers and use regular reusable dishes respectively.

IV. FINDINGS AND RECOMMENDATION.

Equal number of responses were collected from each of the 14 districts of Kerala i.e Thiruvananthapuram, Kollam, Alappuzha, Pathanamthitta, Kottayam, Idukki, Ernakulam, Thrissur, Palakkad, Malapuram, Kozhikode, Wayanad, Kannur, and Kasaragod respectively. In Kerala, majority of the people are aware about the existing waste management system to some extent and only a few are completely ignorant of it.

Waste collection and management in many parts of Kerala occur only sometimes and in few places it doesn’t happen at all. Irregularity and inefficiency in waste collection and management is observed in many localities. People of Kerala contribute to the waste management system by following the city’s waste management policies, efficient usage of resources, following the principles of waste reduction, recycling and reusing, proper disposal of hazardous waste, composting, landfills and segregation and proper disposal of waste at home. Fermentation and incineration are followed by only a few people in the state. More than half of the people of Kerala are not satisfied with the current waste management system in their locality. Most of the people consider the waste management system existing in their locality to be of average while a few consider it to be of poor.

Major population of the state reduce their plastic or other non-biodegradable waste material consumption. Only a very few of them never cared to reduce their personal waste generation. Likewise, majority of the people recycle plastic or other waste material whenever and wherever possible. Just a small fraction of them don’t recycle anything at all ever. Almost the entire population of Kerala reuse plastic or other waste material whenever and wherever possible. Overall, the people of Kerala follows the principles of 3R to manage their own waste. The common strategies and methods adopted by most of the people to manage their own personal waste includes avoidance strategy, waste minimization, source reduction and reuse, segregation and proper disposal of waste at home, recovery and recycling, composting, landfills, biogas units, incineration, waste to energy conversion and so on. The methods of vermiculture and plasma gasification are not popular among the people of Kerala. Open dumping, burning of waste, pollution of air, water and soil, dumping of waste into water bodies, improper waste management, dump site fires, open human and animal exposure to waste are some of the problems faced by people regarding waste management in their localities. Barriers towards the implementation of an effective waste management model in Kerala includes large volume of waste generation, lack of required technical support, lack of e-waste disposal plant, inadequate waste collection, limited resources, waste segregation at source and lack of qualified engineers and environmental specialists. People of Kerala are aware of the concept of zero-waste to some extent only and just a few are not at all aware about it. There is a need to educate people about the importance and ways to live a waste free life. Almost all of the people of Kerala are willing to make a transition towards the zero-waste lifestyle if provided with necessary training and awareness campaign. The community attitude towards the zero waste strategy in Kerala is positive. People are ready to contribute to the implementation of zero waste lifestyle by ditching plastic packaging, carrying their own cloth bag, waste prevention, adopting the 3 R principles, waste diversion, minimizing food waste, vermicomposting, bio-fuel, stop buying single serving, using reusable containers and regular reusable dishes.

□□ Kerala has the potential to make the transition from over-consuming cities to zero waste cities through the successful implementation of the concept of zero waste in the waste management system. Successful realization of ‘zero-waste’ waste management model in Kerala offers numerous benefits to the people and planet. Zero-waste life would help reverse and reduce the environmental damage done and help people to stay healthy. Major environmental problems like climate

change, pollution etc. can be improved by the pledging all the cities in Kerala to be zero-waste cities. People of Kerala should be encouraged and motivated to live a waste free or minimalist life by promoting zero-waste lifestyle. Awareness about zero-waste lifestyle should be given to the people of Kerala by providing necessary training and organizing awareness campaigns. Zero-waste' waste management system can be promoted using various government strategies and policies. Adoption of 5 R principles (i.e reuse, reduce, recycle, refuse and rot) should be considered rather than the 3 R's for the effective management of waste. Zero-waste shops and companies should be given support and necessary steps should be taken to promote them. Discourage and thereby completely eliminate the throw-away culture in societies. Create consciousness in people especially youth with the help of social media or any other platform. Government of Kerala should take serious efforts to apply the zero-waste concept in the waste management system. Individuals, government, businesses and communities should work hand in hand for the effective achievement of the concept. Zero-waste management programmes and initiatives should be taken by private parties, communities and other NGO s. Regular collection of waste is recommended but it is not a solution to all the waste problems. Environmental education in schools should include zero-waste concept too. Waste generated should be managed at household itself using eco-friendly sustainable methods. Waste management should be the responsibility of the waste generators itself. Send only least possible waste to landfills. A ban should be imposed on incineration of waste. Illegal dumping of waste should be discouraged by imposing heavy fines. Encourage innovation in waste management. Educate the residents, tourists and also the business communities to refuse, reduce, recycle, reuse and recover waste.

Some simple ways to lead a zero-waste lifestyle include carrying own bags or containers to purchase products, going for organic products like steel straws, jute bags, bamboo or wood toothbrushes, non-plastic bottles, plates and other kitchen items et., avoiding unnecessary purchases, donating old clothes, shoes etc., reuse of everything that is possible, totally eliminating single use items in your daily life, avoiding buying food from outside or else carrying a steel mug or plate for takeaway, eliminating wastage of food, not throwing away food just because you can afford it but rather freezing the leftovers and using them again or giving it to someone who needs it, recycling everything whenever possible, going for locally sourced food, buying food from local suppliers, relying on digital sources than buying newspapers, books, etc., segregating own waste at home and

going for composting, purchasing from zero waste shops and online stores, adopting 5R's - refuse, reduce, recycle, reuse and recover, switching to green/earth friendly alternative options that are sustainable, using eco-friendly sanitary napkins or menstrual cups, donating unused items that are in good condition, using kitchen waste as manure for plants, using reusable kitchen rag., etc. Others include green celebrations (use banana leaves instead of plates, plant leaves and flowers for decorations), composting wet garbage at home, avoiding food that comes in plastic wrapping, and making your own personal care products like soap, shampoo, body oils, butter etc. Go for plastic packing free products while shopping and so on.

There is a huge gap yet to be filled and hence further study in this field is recommended.

V. CONCLUSION

This study celebrates and explores the benefits of implementing zero-waste lifestyle in the state of Kerala thereby enhancing the utility of the scarce resources with a strong emphasis on cost effective climate change solution. Zero waste is all about redefining the traditional waste management system. The ultimate purpose of zero-waste concept is to transform linear economy to a circular economy where minimal or no waste is generated. Zero waste approach contributes to a healthy community by reducing air, water, and soil pollution by keeping landfills and incinerators free from toxins and waste. Zero waste comes with significant environmental, social and economic benefits. It is a cost effective climate action strategy focusing on reducing the greenhouse gas emissions and reducing the impact on environment. Over-consuming cities of Kerala can be transformed into a sustainable zero-waste cities with the effective actualization of zero waste concept in the waste management system. This study was conducted in order to determine the community attitude towards zero-waste strategy and to encourage Kerala to adopt zero-waste management strategies to transform its cities into zero-waste cities by citing the examples of zero-waste cities around the world. The study also aims to suggest alternate zero-waste management practices encouraging minimal waste generation, recycling and reusing of materials. Zero-waste lifestyle is not a new concept but it is still a new trend in Kerala and people need more awareness about it and its numerous benefits. Barriers towards the implementation of an effective waste management model in Kerala includes large volume of waste generation, lack of required technical support, lack of e-waste disposal plant, inadequate waste

collection, limited resources, waste segregation at source and lack of qualified engineers and environmental specialists. Increased awareness and education is considered an effective way to put more attention on waste free living. This calls for organization of awareness campaign and waste management programmes for the people of Kerala for the purpose of giving a boost to our waste management system.

In Kerala, majority of people already follow the principle of 3Rs to manage their own personal waste apart from other sustainable options like composting etc. It is evident from the life of Indian zero wasters that a complete zero waste life would be extremely hard but one can practice the concept of zero waste to cut down the personal waste generation to a great extent. In conclusion, zero-waste concept could attract more recognition and participation if more awareness and education are provided to the people as well as more research on the topic.

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