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AN EMPIRICAL STUDY ON OCEAN POLLUTION WITH SPECIAL REFERENCE TO CHENNAI

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ABSTRACT

This empirical study conducted in Chennai, India, and its comparison with Australia explores the evolving field of ocean pollution research, addressing its multifaceted challenges and consequences for marine ecosystems, the global economy, and human health. The research investigates preventive measures, major causes, potential health impacts on humans, and public awareness surrounding ocean pollution. Analyzing data from 227 respondents, the study finds that younger generations are more aware of ocean pollution, potentially due to educational initiatives and environmental campaigns. Gender differences in preferred preventive measures emerge, with males favoring proper disposal of e-waste and medical waste. High school respondents demonstrate a nuanced understanding of plastic dumping as a significant contributor to ocean pollution, likely influenced by exposure to scientific research and personal observations. Additionally, rural communities, reliant on natural resources, exhibit heightened awareness of how ocean pollution affects marine life and human health. In comparison to India, Australia's robust environmental regulations have facilitated considerable progress in monitoring and protecting its marine environment, despite both countries facing common challenges in managing plastic pollution and mitigating the impacts of climate change on their coastal waters. In conclusion, this study emphasizes the importance of global collaboration, innovation, and policy development to effectively address ocean pollution and safeguard the critical role of oceans in sustaining the planet and its inhabitants.

Keywords: Ocean, Pollution, Coastal Waters, Climate Change, Natural Resources

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INTRODUCTION:

The study on ocean pollution has evolved significantly over the years, reflecting growing concerns about the environmental health of our oceans. Initially, ocean pollution research primarily centered on localized incidents and specific pollutants. However, as the 20th century progressed, the scope expanded to encompass broader issues such as industrial discharges, agricultural runoff, and municipal waste, which were identified as major land-based sources of pollution. Simultaneously, marine-based sources, including shipping, offshore drilling, and fisheries, gained attention for their substantial contributions to ocean pollution. As we entered the 21st century, the focus shifted towards understanding the intricate web of ocean pollution types, ranging from chemical contaminants to plastic debris, oil spills, noise, and thermal pollution. This evolution reflects a growing recognition of the multifaceted challenges posed by ocean pollution, including its devastating effects on marine ecosystems, the global economy, and human health. Consequently, research has increasingly emphasized mitigation strategies, international regulations, technological innovations, sustainable practices, and public awareness campaigns as essential components of addressing this critical issue and preserving the health of our oceans for future generations. The government initiatives related to ocean pollution are Water (Prevention and Control of Pollution) Act, 1974: This law aims to prevent and control water pollution, including pollution of coastal waters and oceans. It establishes State Pollution Control Boards and the Central Pollution Control Board to monitor and regulate pollution. Marine Pollution (Prevention and Control) Act, 1981: This legislation focuses on preventing and controlling marine pollution within the territorial waters and exclusive economic zone of India. It incorporates provisions of international conventions to which India is a party. Environmental Impact Assessment (EIA) Notification, 1994 (and subsequent amendments): The EIA process is essential for projects that might have an impact on the marine environment. It requires environmental clearance for activities like port development, coastal construction, and industrial projects near coastal areas. Coastal Regulation Zone (CRZ) Notification, 2019 (and subsequent amendments): The CRZ regulations are intended to protect the coastal environment and prevent activities that could harm coastal ecosystems, including pollution. It specifies restrictions on construction and development activities within coastal areas. Plastic Waste Management Rules, 2016 (and subsequent amendments): These rules govern the management and handling of plastic waste, including restrictions on the use and disposal of plastic items to prevent plastic pollution in oceans and water bodies. Several interconnected factors contribute to the complex issue of ocean pollution. Human activities, such as industrial discharges, agricultural runoff, and inadequate waste management, are major drivers of land-

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based pollution. Urbanization and population growth further intensify these pressures on coastal and marine ecosystems. Marine-based activities, including shipping, offshore drilling, and overfishing, also play a significant role in contaminating and degrading ocean environments. Climate change, with rising sea temperatures and acidification, exacerbates the stress on marine ecosystems. Inadequate regulatory frameworks and enforcement, both nationally and internationally, can allow pollution to go unchecked. Additionally, there's often a lack of public awareness and understanding of the consequences of ocean pollution. These factors collectively contribute to the ongoing challenge of safeguarding our oceans and require comprehensive, coordinated efforts to mitigate and prevent further degradation. The current trends related to ocean pollution are Microplastic Awareness and Research: There is a growing emphasis on understanding and addressing microplastic pollution in the oceans. Research on the sources, distribution, and impacts of microplastics on marine ecosystems and human health has gained prominence. Additionally, some regions and countries have implemented bans on certain single-use plastics to reduce plastic waste. The current trends related to ocean pollution are, Circular Economy Initiatives: Many countries and businesses are increasingly adopting circular economy principles to reduce plastic pollution and promote sustainability. This involves reusing, recycling, and reducing plastic products and waste, with an aim to minimize their impact on the oceans. Advanced Cleanup Technologies: Innovative technologies and methods for ocean cleanup are emerging, including the development of autonomous vessels and systems designed to remove large debris from the ocean. These technologies aim to address existing pollution and prevent further harm. Renewed Focus on Sustainable Fisheries: Sustainable fishing practices and efforts to combat overfishing are gaining momentum. Initiatives such as seafood traceability and certification programs are helping consumers make more informed choices and support sustainable fishing. Blue Carbon Initiatives: Blue carbon ecosystems like mangroves, seagrasses, and salt marshes are being recognized for their role in sequestering carbon dioxide and protecting coastlines. Conservation and restoration of these ecosystems are becoming part of climate change mitigation strategies. This research is to compare the impact of ocean pollution between the countries India and australia. India and Australia share common concerns about ocean pollution but exhibit notable differences in their approaches to tackling this pressing environmental issue. In India, the problem of ocean pollution is exacerbated by rapid industrialization, urbanization, and a significant population density along its extensive coastline. The country has legislation such as the Water (Prevention and Control of Pollution) Act, the Marine Pollution (Prevention and Control) Act, and Coastal Regulation Zone (CRZ) regulations to address coastal and marine pollution. However,

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challenges persist in enforcement and waste management. In contrast, Australia, with its vast coastal regions and strong environmental regulations, has made significant strides in monitoring and protecting its marine environment. It has a comprehensive legal framework, including the Environment Protection and Biodiversity Conservation Act, and actively participates in international efforts to combat ocean pollution. Australia also places a strong emphasis on marine conservation and research, particularly in safeguarding the Great Barrier Reef. Both countries, however, face the common challenge of managing plastic pollution and mitigating the impacts of climate change on their coastal waters, demonstrating the need for ongoing collaboration and innovation on a global scale to preserve the health of our oceans.

OBJECTIVES:

- To know the preventive measures to reduce ocean pollution
- To know the major cause of ocean pollution
- To know whether ocean pollution causes health issues to mankind
- To create awareness about the impact of ocean pollution

REVIEW OF LITERATURE:

Murugan, A., & Rajagopal, S. (2023) This review paper provides a comprehensive overview of ocean pollution in Chennai, India. The authors discuss the various types of pollutants that are affecting the city's coastal waters, as well as their sources and impacts. They also highlight the various initiatives that are being taken to address ocean pollution in Chennai. **Ramasubramanian, N., & Venkatachalapathy, R. (2022)** This review paper focuses on the issue of plastic pollution in Chennai. The authors discuss the various sources of plastic pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various mitigation strategies that can be adopted to reduce plastic pollution in Chennai. **Raja, R.(2021)**This review paper provides a comprehensive overview of marine pollution in Chennai. The authors discuss the various types of pollutants that are affecting the city's coastal waters, as well as their sources and impacts. They also highlight the various management strategies that can be adopted to reduce marine pollution in Chennai. **Venkatachalapathy, R. (2020)** This review paper focuses on the issue of heavy metal pollution in Chennai. The authors discuss the various sources of heavy metal pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various remediation strategies that can be adopted to reduce heavy metal pollution in Chennai.

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Saravanan, A., & (2019)This review paper focuses on the issue of sewage pollution in Chennai. The authors discuss the various sources of sewage pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various management strategies that can be adopted to reduce sewage pollution in Chennai.**pandian, P S. (2023)** This review paper focuses on the issue of microplastic pollution in Chennai. The authors discuss the various sources of microplastic pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various mitigation strategies that can be adopted to reduce microplastic pollution in Chennai. **Satheeshkumar, P. (2022)**. This review paper focuses on the issue of oil pollution in Chennai. The authors discuss the various sources of oil pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various remediation strategies that can be adopted to reduce oil pollution in Chennai. **Ramasubramanian, N., & Venkatachalapathy, R. (2021)**This review paper focuses on the issue of pharmaceutical pollution in Chennai. The authors discuss the various sources of pharmaceutical pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various treatment strategies that can be adopted to reduce pharmaceutical pollution in Chennai. **Chandrasekaran, S., & Soundarapandian, P. (2020)** This review paper focuses on the issue of marine debris pollution in Chennai. The authors discuss the various sources of marine debris pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various management strategies that can be adopted to reduce marine debris pollution in Chennai. **Saravanan, A.(2019)**This review paper focuses on the issue of agricultural runoff pollution in Chennai. The authors discuss the various sources of agricultural runoff pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various management strategies that can be adopted to reduce agricultural runoff pollution in Chennai. **Thangaradjou, T., & Kumar, G. (2023)** This review paper focuses on the issue of marine litter pollution in Chennai. The authors discuss the various sources of marine litter pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various management strategies that can be adopted to reduce marine litter pollution in Chennai. **Prabu, P. K., & Venkatachalapathy, R. (2022)** This review paper focuses on the issue of heavy metal pollution in marine sediments of Chennai. The authors discuss the various sources of heavy metal pollution in the city, as well as its impacts on the marine environment and human health. They also highlight the various assessment and remediation strategies that can be adopted to reduce heavy metal pollution in marine sediments of Chennai. **Kumar, S.(2021)**This review paper focuses on the

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issue of marine biodiversity loss in Chennai. The authors discuss the various causes of marine biodiversity loss in the city, as well as its consequences for the marine environment and human society. They also highlight the various conservation strategies that can be adopted to protect marine biodiversity in Chennai. **Chandrasekaran, S., & Soundarapandian, P. (2019)** This review paper focuses on the vulnerability, adaptation, and mitigation strategies of marine climate change impacts in Chennai. The authors discuss the various impacts of marine climate change on the city's coastal waters, as well as the vulnerability of different coastal communities to these impacts. They also highlight the various adaptation and mitigation strategies that can be adopted to address marine climate change impacts in Chennai. **Ramachandran, K. Rajeshwari (2007)** This study investigates the level of awareness and perception of marine pollution among the fisherfolk in Chennai, shedding light on their understanding of the issue and its implications.**S.Balasubramanian(2016)**This research assesses the levels of heavy metal pollution in the sediments of Ennore Creek, located near Chennai, highlighting potential ecological risks. **K. Sivakumar, S. Prasanna Kumar, et al.(2020)**This paper discusses the presence and impact of plastics in the Bay of Bengal, encompassing Chennai's coastline, and proposes solutions to address plastic pollution. **N. Ramanan, S. Viswanathan (2018)** This study assesses the management of municipal solid waste in Chennai, addressing the potential sources of marine pollution arising from improper waste disposal. **S. R. Venkatesh, M. V. Prasanna, et al.(2019)**This research explores the presence and distribution of microplastics in the Bay of Bengal, including the Chennai region, highlighting the emerging challenges of microplastic pollution. **V. Karthikeyan, V. Subramanian (2012)** This study assesses the pollution levels in coastal waters around Chennai, focusing on water quality and the impact of various pollutants.

RESEARCH METHODOLOGY:

The type of research followed here is empirical research. A total of 227 samples I have collected through convenient sampling methods. The Sampling frame taken here is poonamallee Chennai, Tamil Nadu and Through online communications. The independent variables are age, gender, educational qualification, Employment Status, locality and the dependent variables are related to ocean pollution. The statistical tool used here is graphical representation.

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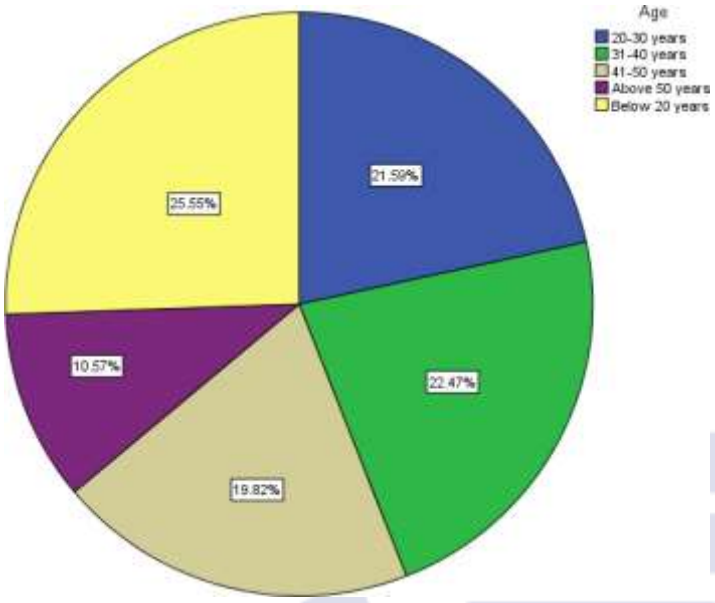
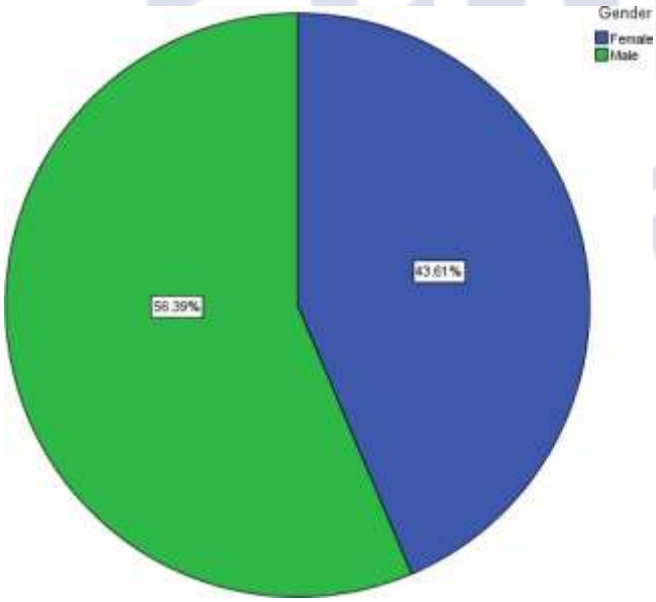
ANALYSIS:

Figure 1:



Legend: Figure 1 shows the age of the respondents

Figure 2:



Legend: Figure 2 shows the gender of the respondents.

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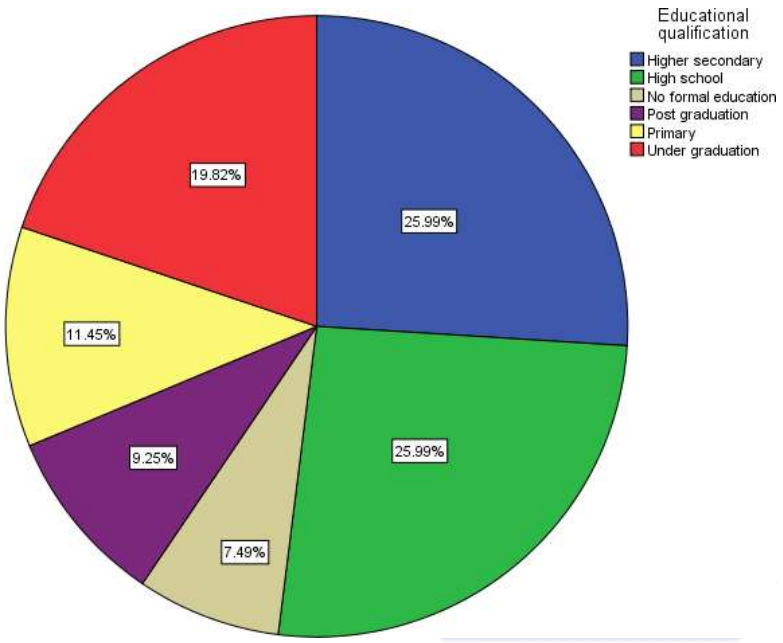
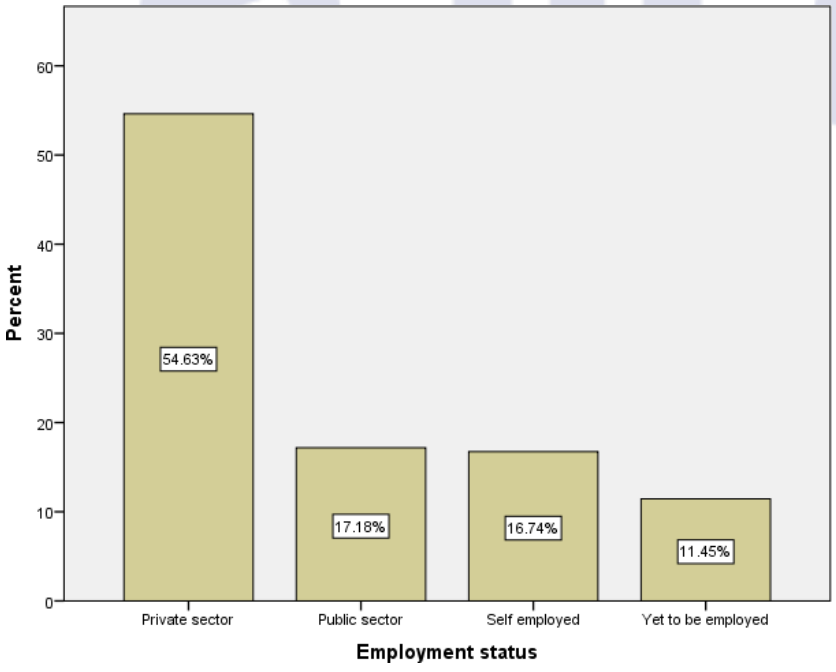
Figure 3:



Legend: Figure 3 shows the educational qualification of the respondents.

Figure 4:



Legend: Figure 4 shows the employment status of the respondents.

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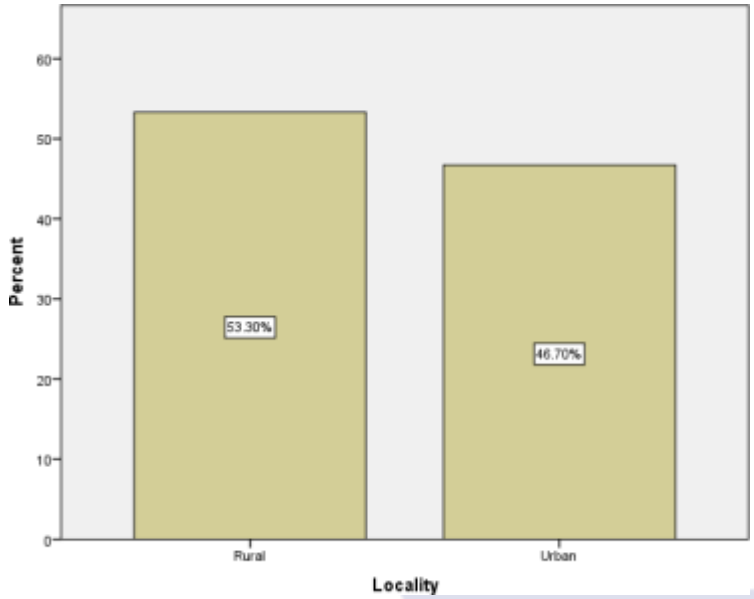
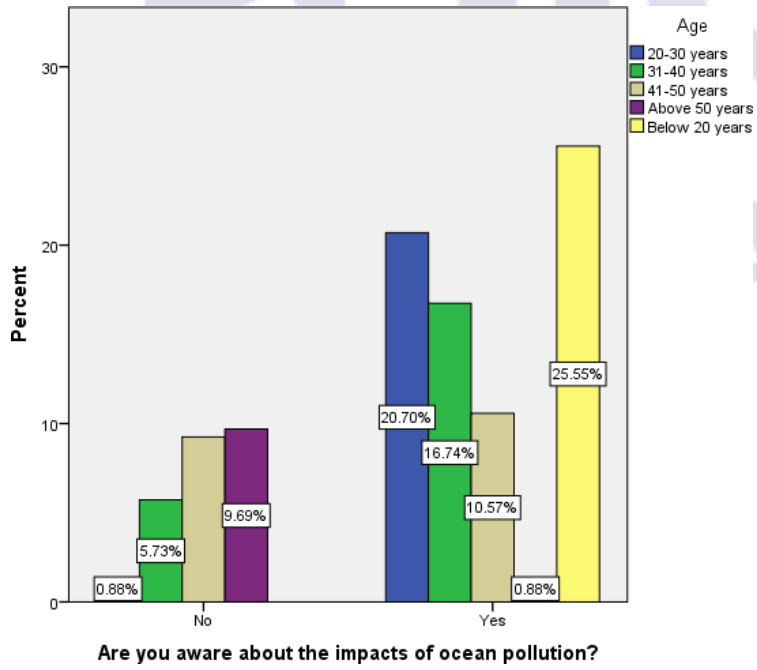
Figure 5:



Legend: Figure 5 shows the locality of the respondents.

Figure 6:



Legend: Figure 6 shows the age of the respondents and their awareness towards impacts of ocean pollution.

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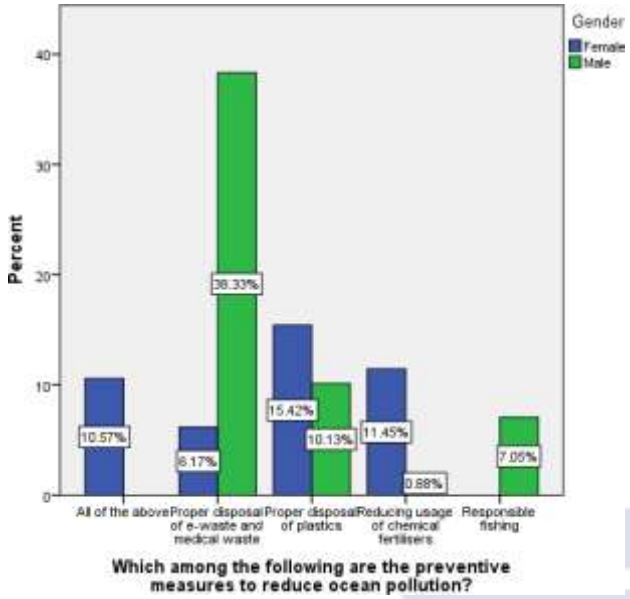
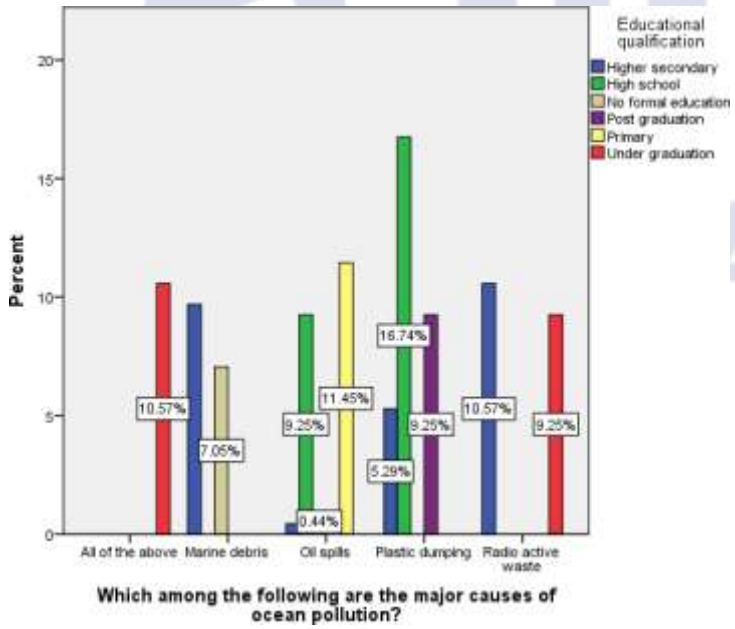
Figure 7:



Legend: Figure 7 shows the gender of the respondents and their perception towards preventive measures to reduce ocean pollution.

Figure 8:



Legend: Figure 8 shows the educational qualification of the respondents and their perception towards major causes of ocean pollution.

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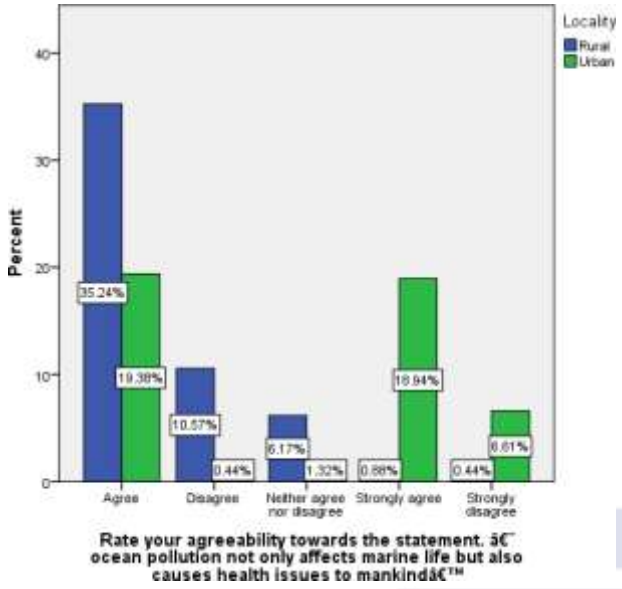
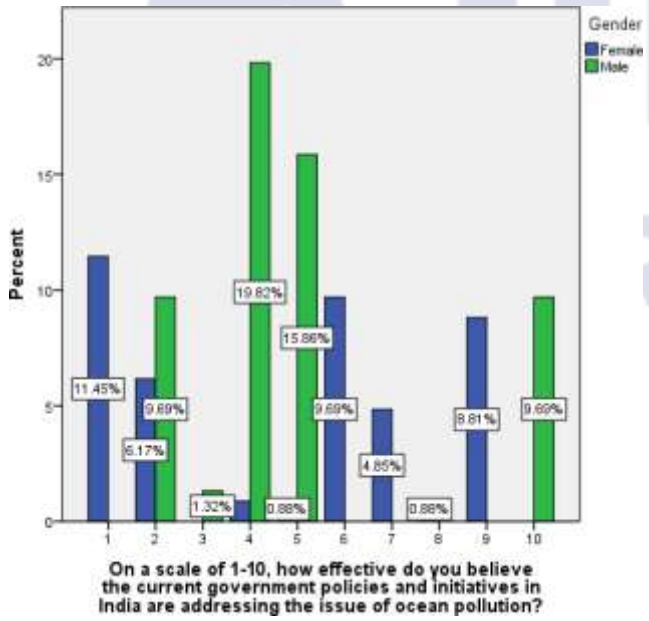
Figure 9:



Legend: Figure 9 shows the locality of the respondents and their agreeability towards ocean pollution.

Figure 10:



Legend: Figure 10 shows the gender of the respondents and their perception towards the effectiveness of government policies to address the issue of ocean pollution.

Ha: There is significance relationship between age and the frequency level government policies

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to address the issue of ocean pollution

Ho: There is no significance relationship between age and the frequency level government policies to address the issue of ocean pollution

Table 1:

Age * On a scale of 1-10, how effective do you believe the current government policies and initiatives in India are addressing the issue of ocean pollution? Crosstabulation

Count

		On a scale of 1-10, how effective do you believe the current government policies and initiatives in India are addressing the issue of ocean pollution?										Total
		1	2	3	4	5	6	7	8	9	10	
Age	20-30 years	24	1	0	3	21	0	0	0	0	0	49
	31-40 years	0	14	1	0	3	0	11	0	0	22	51
	41-50 years	0	21	0	22	0	0	0	2	0	0	45
	Above 50 years	2	0	0	0	0	22	0	0	0	0	24
	Below 20 years	0	0	2	22	14	0	0	0	20	0	58
Total		26	36	3	47	38	22	11	2	20	22	227

Symmetric Measures

		Value	Approximate Significance
Nominal by Nominal	Phi	1.600	.000
	Cramer's V	.800	.000
N of Valid Cases		227	

Legend: Table 1 shows the chi square test, since p value is less than 0.05, Null hypothesis is rejected. Alternative hypothesis is accepted.

RESULTS:

It is revealed that 25.55% of the respondents are from age group below 20 years, 22.47% of the respondents are from age group 31-40 years, 21.59% of the respondents are from age group 20-30 years, 19.82% of the respondents are from age group 41-50 years and the remaining 10.57% of the respondents are from age group above 50 years **(Figure 1)**. It is revealed that 56.39% of the respondents are male and 43.61% of the respondents are female **(figure 2).** It is revealed that the maximum percentage (25.99%) of the respondents are from higher secondary school **(Figure 3).** It is revealed that 54.63% of the respondents are from the private sector, 17.18% of the respondents from the public sector, 16.74% of the respondents are self-employed and the remaining 11.45% of the respondents are yet to be employed **(figure 4)**. It is revealed that 53.30% of the respondents are from rural areas and the remaining 46.70% of the respondents are from urban areas **(Figure 5).** It is revealed that the maximum percentage (25.55%) of the respondents from the age group below 20 years are aware about the impacts of ocean pollution **(Figure 6).** It is depicted that the maximum percentage (38.33%) of the male

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respondents have chosen proper disposal of e-waste and medical waste as a preventive measure to reduce ocean pollution **(Figure 7).** It is revealed that the maximum percentage (16.74%) of the high school respondents have chosen plastic dumping as the major cause of ocean pollution **(Figure 8)**. It is revealed that the maximum percentage (35.24%) of the respondents from rural areas have agreed that ocean pollution not only affects marine life but also causes health issues to mankind **(Figure 9)**. It is revealed that the maximum percentage (19.82%) of the male respondents have given a rating 4 for the survey question 'on a scale of 1-10, how effective do you believe that current government policies and initiatives in India are addressing the issue of ocean pollution' **(Figure 10).** Table 1 shows the relationship between age and the frequency level government policies to address the issue of ocean pollution The value of pearson chi-square is 0.000 **(Table 1).**

DISCUSSION:

It is revealed that the maximum percentage (25.55%) of the respondents from the age group below 20 years are aware about the impacts of ocean pollution. This is because Younger generations may have benefited from educational initiatives and awareness campaigns that focus on environmental issues, including ocean pollution. Schools, colleges, and various youth organizations often emphasize environmental education and sustainability **(Figure 6).** It is depicted that the maximum percentage (38.33%) of the male respondents have chosen proper disposal of e-waste and medical waste as a preventive measure to reduce ocean pollution. This is because Proper disposal of medical waste and e-waste is not only an environmental concern but also a public health one. Respondents may recognize that improper disposal of medical waste and e-waste can lead to the spread of diseases and contamination of water sources, which can affect both the environment and human health **(Figure 7)**. It is revealed that the maximum percentage (16.74%) of the high school respondents have chosen plastic dumping as the major cause of ocean pollution. This is because Many high school respondents would have reviewed various scientific research and studies in which it would have highlighted the pervasive and harmful effects of plastic pollution on marine ecosystems. Many individuals would have personally witnessed plastic debris in coastal areas or during recreational activities like swimming, boating, or snorkeling. These personal observations can lead people to recognize the tangible impact of plastic dumping on oceans and select it as a major cause **(Figure 8).** It is revealed that the maximum percentage (35.24%) of the respondents from rural areas have agreed that ocean pollution not only affects marine life but also causes health issues to mankind. This is because Rural communities often have a more direct connection to natural resources,

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including oceans and water bodies. People in rural areas may rely on these resources for fishing, agriculture, and access to clean water for drinking and other domestic uses. Consequently, they are more likely to witness and be directly affected by the consequences of ocean pollution on their livelihoods and health **(Figure 9).** It is revealed that the maximum percentage (19.82%) of the male respondents have given a rating 4 for the survey question 'on a scale of 1-10, how effective do you believe that current government policies and initiatives in India are addressing the issue of ocean pollution'. This is because Respondents may have personally witnessed de-improvements in their local environment, such as polluted beaches or high pollution levels, and it may perceive the government's efforts as moderately effective in addressing ocean pollution **(Figure 10).** The value of pearson chi-square is 0.000 which is less than 0.05. Hence the alternate hypothesis is accepted which says that there is a significance relationship between age and the frequency level of government policies to address the issue of ocean pollution **(Table 1)**

CONCLUSION:

This study on ocean pollution, focusing on Chennai, highlights the importance of addressing this global challenge due to its profound impact on marine ecosystems, the global economy, and human health. It emphasizes the need for multifaceted strategies including mitigation efforts, international regulatory frameworks, technological innovations, sustainable practices, and public awareness campaigns. The findings reveal that younger generations, particularly those below 20 years old, are more aware of ocean pollution, indicating the effectiveness of educational initiatives and environmental awareness campaigns. Gender differences also manifest in perceptions of preventive measures, with males showing a propensity towards proper disposal of e-waste and medical waste. High school respondents demonstrate a keen understanding of plastic dumping as a major contributor to ocean pollution, likely influenced by exposure to scientific research and personal observations. Rural communities display a heightened awareness of ocean pollution's dual impact on marine life and human health, reflecting their dependence on natural resources for sustenance and livelihoods. In comparison to India and Australia, India faces challenges from rapid industrialization, urbanization, and high population density along its coastline. The country has established legislative frameworks such as the Water (Prevention and Control of Pollution) Act and the Marine Pollution (Prevention and Control) Act, but challenges persist in enforcement and waste management. Australia, with its extensive coastal regions and robust environmental regulations, has made commendable strides in monitoring and protecting its marine environment. In conclusion, this

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study contributes to our understanding of ocean pollution, public perceptions, and varying approaches to address it. It calls for sustained global collaboration, innovation, and policy development to ensure the preservation of oceans and their vital role in the well-being of the planet and its inhabitants.

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