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# PCERP Seminar Proceedings

## Book 17

National level Seminar on  
**ENVIRONMENTAL RE-ENGINEERING**

**SERIES 10**

**People & Nature–A Livable and Sustainable Future**

23rd December, 2019



**Organized by:**

**Mahatma Education Society's  
Pillai College of Education & Research**

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# *VISION*

*“To foster positive attitudes and ideals to be socially responsible and competent teachers with individual identities in order to enable the student teachers to translate great ideas into good actions”*

# *MISSION*

*To promote purposive education through globalization of mind and society and using education for value transmission in order to enable the student teacher to perform effectively different roles as a teacher in the present society.*



## *Objectives of the Institution*

- *To prepare humane professionals by enhancement of the heart and soul.*
- *To prepare the Student teachers to perform effectively different roles expected in changing global Scenario.*
- *To empower Student teachers with competencies required for professional growth.*
- *To develop attitude of Professionalism by inculcating Dedication, Commitment, Accountability and Professional Ethics.*
- *To foster virtues like Sincerity, Sympathy, Gentleness, Modesty, Humility, Compassion, Courtesy, Co-Operation, Fair play, Self Esteem Self-Control and Truthfulness.*
- *To develop Sensitivity towards Society related issues and concerns.*
- *To encourage student teachers to apply the knowledge creatively to relevant situation.*
- *To develop Leadership Competencies to plan, organize and conduct various Educational activities.*
- *To prepare humane professionals by enhancement of the heart and soul.*
- *To develop an appreciation of the role of the teachers in the prevailing socio – cultural and political context in educational system.*
- *To provide avenues to the Student teachers for exchanging ideas, raising issues and discussing themes and problems.*
- *To create environmental consciousness and concern among the student teachers.*



# *Core Practices of the Institution*

- . Social commitment*
- . Global mindedness*
- . Value transmission*
- . Environmental consciousness*
- . Reflective Approach*
- . Integrating Technology*
- . Professionalism*



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Sheth N.K.T.T. College, Thane-West





## ABOUT THE INSTITUTION

MES' Pillai College of Education and Research, New Panvel was established in the year 2007. It is affiliated to the University of Mumbai and is approved by the NCTE (National Council of Teacher Education). Our institution has been accredited by NAAC with a CGPA of 3.31 on a seven point scale at 'A' grade. The grade reflects the able leadership of our Principal Dr. (Ms.) Sally Enos and the efforts put in by the staff and students of PCER.

The college has an intake capacity of 100 students for the B.Ed. programme and 35 students for the M. Ed. programme. It is also a PCP centre for M.A. (Edu.) of IDOL, Mumbai University and a recognized Ph.D. centre for research studies in the field of education. Pillai College of Education and Research, Panvel has shown consistent results at the B.Ed./M.Ed. University examination with 100% results.

The institution is situated amidst tranquil residential housing societies and provides a sound, conducive learning environment to the student teachers. Green environment and proximity of the institution to the nearest road and rail services serves as an added advantage. The institution is designed with a futuristic outlook and boasts of well-equipped state-of - the - art technology. All the classrooms are spacious and have a provision for AV devices i.e. computers having LCD monitors and Wifi connectivity, Overhead Projectors, Tape recorders and Television. The computer laboratory has sixty computers connected through LAN while the library is well equipped to meet the needs of the intellectual minds. Additionally there is a spacious activity hall, psychology laboratory, teaching aids room, separate boys' and girls' common room, a conference room, playground and a recreational arena.

A perfect blend of talented and qualified teaching and non-teaching staff relentlessly strive towards providing the best to the stakeholders. Our aim is the enhancement of heart and soul which is reflected through the various activities organized in the institution. Responsible, creative, sincere, enthusiastic, energetic and highly motivated human resources harmonize the material resources. Our actions speak larger than words! They resonate to the tunes of global concerns, emphasizing and encouraging sustainable eco-friendly behaviour.



We constantly work towards fostering concern towards environmental issues by making all its members' environment conscious and accountable.





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**REPORT OF THE NATIONAL LEVEL SEMINAR ON  
ENVIRONMENTAL RE-ENGINEERING SERIES-10  
PEOPLE AND NATURE: A LIVABLE AND SUSTAINABLE FUTURE**

*Reported by Dr. Geeta S. Thakur*

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MES' Pillai College of Education and Research, New Panvel, organized a one-day National Level Seminar on 'Environmental Re-Engineering Series-10: People and Nature: A Livable and Sustainable Future' on 23<sup>rd</sup> December 2019. The registration began at 9.00 am and saw a multitude of participants registering for the event.



Dr. Bhavna Dave welcomed the guests to the 19<sup>th</sup> National Level Seminar and her words of welcome added vibrancy, concern and thought for a need to co-exist and co-habitat with nature. The Seminar had a solemn beginning as it was opened with the lighting of the lamp by guest speaker Ms. Meera Shah, Mr. Jomon Mathew, Principal, Mahatma Education Society and Dr. Sally Enos, Principal, Pillai College of Education and invoking the blessings of the almighty for this wonderful gathering of likeminded people. The participants were taken on a short journey of Mahatma Education Society followed by a video depicting the sorry state of our planet. Organizing Secretary, Dr. Pratima Pradhan in her welcome address elaborated the concept and rationale behind the topic of the seminar. Her address included some significant questions which were going to be discussed and pondered over during the course of the day.



The first session of the day was on Sub theme 1: A Livable Earth for Present Generation. A brief introduction of our first guest speaker. Ms. Meera Shah was presented by Dr. Geeta Thakur. Also known as the City's Zero Waste Woman, she gave us some hard hitting facts on the present situation of waste generated in Mumbai and the amount of money investing in getting the waste sorted.

The speaker struck a cord with the audience by her simple and minimalistic approach towards life. She expressed her reasons to start with a low waste lifestyle and strictly follows the 5 R's of sustainability: Reduce, Reuse, Refuse, Recycle and Rot. In her session she also gave information on the organization which works effortlessly for improving living environmental conditions. The session apart from being informative, was interactive and encouraged participants to share their observations and experiences with all. She satisfactorily answered the questions of the inquisitives. Her approach towards the environment is mindful, she has influenced people around her; bringing about a change in their attitude and approach towards life. Mrs. Namrata Saxena proposed the vote of thanks.



Mrs. Bindu Tambe was in-charge of the session on the sub theme 2: Mindful Consumption for a Sustainable Gen-Next. She introduced Dr. Ketna Matkar, an educationist and a hard core environmentalist – working tirelessly and extensively in projects towards building a sustainable living world. She emphasized that being mindful is the only way out of our crisis.





She effectively brought to our notice the two patterns of consumption – mindful and mindless and took us through facts and figures related to our consumption pattern. Her session was interactive and she posed thought provoking questions related to Sustainability and sustainable practices. She led us all to a broader perspective of sustainability and the 3 pillars on which it stands: Planet, People and Profitability. She emphasized that making reasonable choices forms the backbone of sustainable practices. She elaborated on the United Nations: Sustainable Development Goals and took us through all its parts. Her talk was supported with many related videos which were very inspiring. The session was highly informative and her suggestions were valuable. She concluded her expert talk using the quotes by Mahatma Gandhi and John Sawhill. The vote of thanks was proposed by Mrs. Bindu Tambe.



Two poster presentations were chaired by **Dr. Ketna Matkar** – one was on composting for sustainable agriculture and the other on the effect of light on bacteria used degrading PAH from soil.





The session was followed by a lunch break...



The post lunch session was filled with a diversity of paper presentations. This session was coordinated by Dr. Pratima Pradhan and was chaired by Dr. Moses Kolet, Principal Momin College, Bhiwandi. The paper presenters were students from school, junior college and teacher training institution, degree college teachers and teacher educators.





Ideas and viewpoints on different aspects of environment were shared by the paper presenters. Some papers were research based, some conceptual while some highlighted the actions taken by the presenters at the individual level. A range of ideas were seen across papers focusing on studies like use of solar roof calculators, survey report on replacing non-renewable with renewable energy in consumer products for sustainable development, case study on air-purifiers and sustainable farms at Govardhan eco-



village, survey on customer perception towards organic products and encashing waste; garbage management at home, opinion on relationship of man and its environment, sustainable material management, mindful consumption and mindfulness, food for thought - if we do not want to deprive the next generation of natural resources what steps do we need to follow. Vast amount of information was shared and made available to all.

**Dr. Moses Kolet** assimilated the ideas beautifully in his comments and appreciated the efforts taken

by the institution to bring presenters from different organization under a single roof.

The paper presentation session was followed by the valedictory session and was coordinated by Mrs. Bindu Tambe. During the valedictory session, the participants expressed their gains from the expert sessions and the paper presentation session. The certificates were awarded to the paper presenters followed by a vote of thanks by the organizing secretary of the seminar Dr. Pratima Pradhan.





The Gathering at the Seminar







## BURSTING THE MYTH OF THE CENTURY: DO PLASTICS REALLY DEGRADE?

**Moses J. Kolet**, Principal, KME Society's G.M. Momin Women's College,  
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### **Abstract:**

Plastics are intimately associated with our lives and today one cannot imagine life without plastics. Synthetic products made to last long if not forever; plastics take thousands of years to degrade, but do they really degrade or is plastic degradation a myth? The communication deals with the degradation phenomenon of plastics; rendering a brief historical account of plastics, their widespread use and ill effects on the environment, ecosystem and living organisms after dumping, and specially focuses on *microplastics* and *nanoplastics* as products of degradative fragmentation of plastic waste; their characteristics and probable effects on human health.

**Key Words:** Plastic, degradation, micro-plastics, nano-plastics

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### **Introduction:**

Plastic takes 400 to 1000 years to degrade....every child all over the world has been taught this punch line, origin of which might be attributed to two obvious reasons, the first being to fortify the indestructible nature and permanent place of plastics in our lives and the second, probably, after ill effects of plastics being known; to advocate that plastics degrade after all...albeit taking a longer time in doing so. Let us delve a bit deeper into this scenario of plastic degradation with reference to some common items associated in our daily lives....thick plastic bags require 500-1000 years to degrade; PET (Polyethylene terephthalate) bottles, commonly used for packaging aerated soft drinks and a variety of packaged drinks, take 450-1000 years to degrade; plastic bottle caps (polypropylene) take at least 100-500 years; monofilament fishing lines take around 600 years; disposable diapers and sanitary pads need around 250-500 years to degrade; discarded toothbrushes are believed to require at least 500 years; *dahi* and yogurt cups and containers take 100-500 years; plastic drinking straws



require 100-500 years after being disposed, to degrade and vanish from the earth; Styrofoam cups take 50-500 years (Wright et al., 2018); and on the relatively quicker side, thin ubiquitous plastic grocery bags which are now banned in many states and countries take around 10-100 years to degrade (Business Ethics, 2010) apart from being associated with other civic and environmental problems.

**The Questions:** Whatever way we see the above time frames, a basic question which strikes the inquisitive mind is... 'if plastics were invented just around 150 years ago and widely popularized after ending of the second world war, around 75 years ago, the ubiquitous plastic grocery bags being in circulation since 1990s, just 30 years ago; then how could anyone say with certainty that this synthetic product takes 400 to 1000 years to vanish from the environmental scenario after disposal?' Obviously there have been no on-ground tests conducted in real time and in the absence of a time machine the assertion blindly accepted and advocated by us all gives a strong impression of being based on simulative speculations rather than solid proof and experimental scientific in vivo studies in actual field conditions.

**Do Plastics Degrade?** Going a little further and assuming all statements on plastic degradation to be true, the factual reality of this phenomenon is rather shocking and hovers around a basic question 'do plastics really degrade?' Well...Unlike other natural products, plastics are not known to degrade or decompose; rather they break down or photo-degrade, even crumble in a manner akin to fragmentation, many a times hastened by sunlight or other evidentially supported factors such as waves and cross currents, into smaller and smaller broken parts and finally particles of various dimensions carried by wind, mixing with soil and water and, lacking sufficient research, let us assume, are here to stay indefinitely.

**Experimental Results:** Try keeping any plastic article such as a mug, tub or polythene grocery bag exposed to the elements, especially to sun to practically visualize this photo-degradation induced breaking down of plastic into fragments which keep fragmenting with time and environmental impacts; finally crumbling into fine sand like particles. In an experiment conducted using a household plastic clothes pin, discolouration and degradation by fragmentation and crumbling of the moulded



plastic structure was revealed after exposure to the sun and natural elements for a period of few months (Fig.1).

Such small fragments less than 5 mm in dimension, widely assorted, inconsistent in shapes and sizes; originating from plastic wastes dumped into the ocean, constitute the ocean soup dispersed over and under the oceanic surface for several hundreds of kilometers endangering marine life and ecosystem (Main, 2018); the so called degradation of plastics is also reported to be responsible for leaching potentially toxic compounds (Webb et al, 2013), unnatural to the respective ecosystems, with toxic and most probably some yet unstudied aberrant effects on ecosystems and living organisms; and most important of all, the ultimate still smaller and tinier outcomes of fragmentation are minuscule microscopic particles of plastic, the *microplastics* and *nanoplastics*, invisible to the human eye, but nevertheless very much there on this planet; ubiquitous all around us; and in light of scanty scientific data available, most probably affecting humanity in a multitude of unseen ways beyond comprehension.

**Historical Account:** A brief excursion into the journey of plastics would be educationally fascinating at this point. It was December 2016, when a simple small plastic yogurt cup, similar to standard cups in which *dahi* is marketed, washed ashore on a beach (Orlov, 2016). Well...this was nothing novel, but this cup itself was rather special, being one from the limited commemorative edition of the 1976 Olympic Games and this specimen, relatively well preserved even after 40 years, gave a loud and clear message that plastics are here to stay. Even today no one can really predict how long plastics will stay put in oceans and landfills. Their existence currently seems indefinite. The environmentally damaging leaching effect during degradation of some plastics is equally felt on land and water alike. Most ironically, plastic was invented to save the environment (Freinkel, 2011), in response to an announcement in 1860s urging for an alternative to ivory, a then widely used natural resource; for saving wild elephants from slaughter. The part-synthetic wonder polymer invented in response, was viewed as a means to save depleting and expensive natural resources; by replacing them with this inexpensive easily obtainable industrial product.

The moulding ability of this new invention- plastic, into any desired shape when heated and its ability of retaining this shape after cooling was unique, probably seen



till then only in glass, clay and metals, but each having obvious drawbacks; while plastic was unbreakable, light weight and long lasting...within no time research in this field gained momentum. The year 1907 saw the first fully synthetic polymer, Bakelite. With technological improvements, plastics soon started flooding production lines of industries. The steeply rising demands on scarce natural resources during the Second World War coupled with user- and industry friendly properties of plastics fuelled major escalations in their production and novel applications during war years. After the war, the flood gates of this greatly augmented production were opened to the public, bringing affordable luxury within easy reach of the common man in the form of this safe and inexpensive substance which could be shaped according to one's wishes. As recent as 1970s the captivatingly alluring branded plastic shopping bags from saree- and cloth stores were a rare novelty; slowly PET replaced glass for bottling packaged beverages and cold drinks, plastics replaced metals in a variety of applications, plastic grocery bags replaced conventional paper, jute and cloth bags and by 1990, this substitution was complete, worldwide; however this boon soon proved a bane for environment and consecutively, humanity.

The ill effects of this indestructible material started showing soon after its popularization and usage in all possible ingenious thinkable ways. As early as in the 1960s, environmentalists had observed plastic debris floating in the ocean (Gill, 2019) and persistence of plastic wastes in the environment has since been a perpetual source of worry to conservationists, naturalists and observers. The plastic bag and plastic items once considered novelties have turned into a menace and such wastes can now be seen ubiquitously, sometimes in colossal quantities as municipal solid wastes; apart from landfills and garbage dumps, being sighted in oceans, mountains, metro cities clogging sewage lines, in rural and urban landscapes alike, in wastelands, picnic spots, grasslands, forests, historical places, all over modern civilization, even polar regions; their ill effects (West, 2020b) inviting enforcing bans in many countries.

**Urban India Specific Scenario:** A specifically unique scenario observed in Indian cities and towns is, religious refuse after *puja* and religious ceremonies, being disposed off relentlessly into water bodies along with plastic bags in which the floral wastes were carried for disposal..



**The Current Scenario:** Plastics today have an important place in human lives. Seven kinds of plastics viz. Polyethylene terephthalate (PET), High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE), Poly Vinyl Chloride (PVC); Polypropylene (PP), Polystyrene (PS) and other plastics, which may include polycarbonate, polyurethane, polylactic acid, acrylic, nylon and other forms and polymers (Scalenghe, 2018) are in production today. One cannot imagine life without plastics which also figure in future plans (BPF, 2020). No one can tell how long the dumped plastic wastes will continue to haunt us. To a certain extent, cloth, jute and paper bags have made a welcome comeback replacing the flimsy one piece plastic grocery bags. Researchers are working tirelessly to make plastics more sustainable and safer for the planet. Biodegradable plastics, PET degrading enzyme (Fecker et al., 2018) and research on microorganisms capable of degrading plastics (Urbanek et al., 2018, 2020) are all welcome news. With the yearly global generation of plastic wastes currently pegged at a whopping 400 Metric tons (Chamas et al., 2020); even with recycling (Earth Talk, 2020; West, 2020a) the apparent scenario is serious, potentially disastrous to the environment (Parker, 2018) and questions our extravagant lifestyles, habits and ‘use and throw culture’.

Coming back to *microplastics*, a new term introduced in 2004; estimates in 2014 approximated the world’s oceans to contain 5.25 trillion plastic particles collectively weighing 268,940 tons (Eriksen et al., 2014), this figure further augmented by their counterparts in other marine environments, on land, in air, fresh water and snow. Talking about size, the smallest microplastics detected in the ocean are 1.6 microns in diameter, invisible to human eye and those below 1 micron are now further classified as nanoplastics. Owing to their extremely tiny size, posing challenges to their detection and measurement, their existence itself is argued by some; however their presence has been amply detected in air (Vianello et al., 2019), drinking water sources, tap water, packaged drinking water, sea food, food and processed food items and even in common salt all over the world. Going by this data, an average human being is estimated to ingest and inhale lakhs if not millions of microplastic particles per annum. Scanty scientific data is available on their effects on humans; but the topic has attracted research attention (Smith et al., 2018). Research on fish has revealed that microplastics can easily pass through epithelial membranes and accumulate in internal



organs; being detected in gall bladder, pancreas and brain; inducing marked effects such as stress response, accompanied by behavioral changes. While they pose a factor of concern for human health as well, precious little is currently known on their effects on human beings and one cannot but help wonder if global escalations in cases of stress and anxiety and changes in behavioral patterns in the last few years are a synergistic outcome of compulsory universal exposure to indestructible micro and nanoplastics?

**Fig.1. Fragmentation and crumbling of a moulded plastic clothes pin exposed to sun for few months**



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## A STUDY ON CUSTOMER PERCEPTION TOWARDS ORGANIC PRODUCTS

Ms. Kinjal Gosai, Asst. Professor, Sheth N.K.T.T. College,  
Thane (W)

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### Abstract

**Purpose:** The contemporary times are marked with business making a steady shift to the eco-friendly and organic products in the backdrop of rising environmental concerns. The research aims at understanding the support received from the customers to the green ideas initiated by the companies by studying their perception towards the organic products. The study also focuses on customer satisfaction derived from the organic products compared to the inorganic products.

**Methodology:** For the purpose of data collection, 100 respondents are surveyed. One-sample t-test is used for studying customer perception and the level of satisfaction derived from the organic products.

**Findings:** The findings of the study suggest that the customer have embraced the concept of organic products realizing the impact of these products on extenuating the environmental. The findings further indicate that the growing awareness of the benefits of consuming organic products on the health has facilitated smooth adoption of the idea of organic products.

**Keywords:** Organic products, Green marketing, Eco-friendly living

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### Introduction

Consumption of organic products cannot only help to preserve and protect the environment but also promote a healthy diet. Organic products are environmental friendly and also protect humans from increased cases of adulteration. Creating awareness and promoting the idea can increase the consumption and also be a win-win situation for producers as well as consumers.



### **Research question:**

What factors influence adoption of organic products?

### **Research objectives**

- To study customer perception towards organic products.
- To determine the factors which influence adoption of organic products.
- To determine the barriers to adoption of organic products.
- To understand beliefs of customers towards the use of organic products.

### **Review of literature**

**Marija Radman** in the research paper titled “**Consumer consumption and perception of organic products in Croatia**” aims at understanding the attitude of customers towards the organic products and its adoption in day-to-day life. The survey of 179 respondents was conducted to understand their beliefs with respect to the organic products, frequency of use and supply satisfaction. Further, for purpose of data analysis, univariate analysis, correlational analysis, chi-square and ANOVA test were applied. The findings of the study suggested customers to believe that organically grown products are good in quality, healthy and tasty. Though customers find these products to available at expensive rates in the market some customers shared a positive attitude towards the organic products and are will to pay high prices for them.

**Laurence Fillion and Stacey Arazi** in the research paper titled “**Does organic food taste better? A claim substantiation approach**” seeks to resolve the doubts with respect to the nutritional value, safety and environmental friendly aspect of organic products. Customers question the high price at which these products are available at the market and mainly the taste of the organic products. For the purpose of the study, sensory analysis was applied observed by a panel of analysts to prove the claim that organic foods taste better. The findings of the study suggested that the claim of organic food tasting better cannot be held valid as when experimented with orange



juice, the organic juice taste better than the conventional one while no conclusion can be derived when it came to tasting of milk.

**Susanne Padel and Carolyn Foster** in the research paper titled “**Exploring the gap between attitudes and behaviour: Understanding why consumers buy or do not buy organic food**” aims at exploring the various factors which influence the buying decision in case of organic products. For the purpose of data collection 181 customers were interviewed. The findings of the study suggests that people associate the word organic with vegetables and fruits. The study further indicates that the motives and barriers to purchase may vary for different product categories.

### **Methodology**

For the purpose of data collection, a questionnaire has been drafted to collect responses of customers with respect to their demographics and their perception towards various attributes of organic products. The response will be further analysed through one sample t-test to determine favourable or unfavourable perception towards organic products. The sample size has been limited to 70 owing to time restrictions.

Frequency distribution has been applied for questions on nominal and ordinal scale and for the purpose of determining customer’s preference for organic products and measuring their attitude towards it, one sample t-test will be applied.

### **Scope of the Study**

The study covers only organic products and cosmetics. The respondents to the survey are chosen from Mumbai city and Thane city.

### **Limitations of the Study**

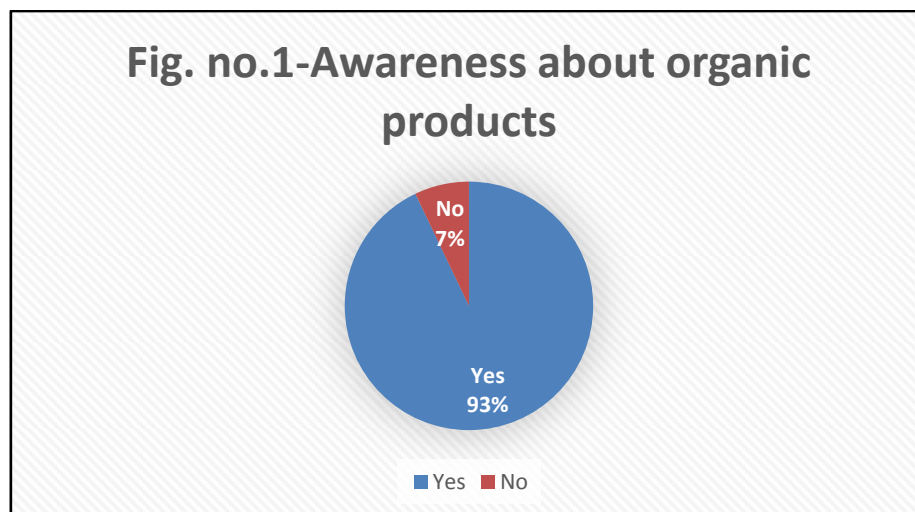
The study was limited to only Mumbai and Thane and thus the findings of the study may not be applicable elsewhere. It is important to note that the study limits its focus only on organic food and cosmetic products. Customer preference and perception may vary for other organic product categories.



## Data analysis

**Table no. 1: Are you aware about organic products?**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	5	7.1	7.1	7.1
	Yes	65	92.9	92.9	100.0
	Total	70	100.0	100.0	



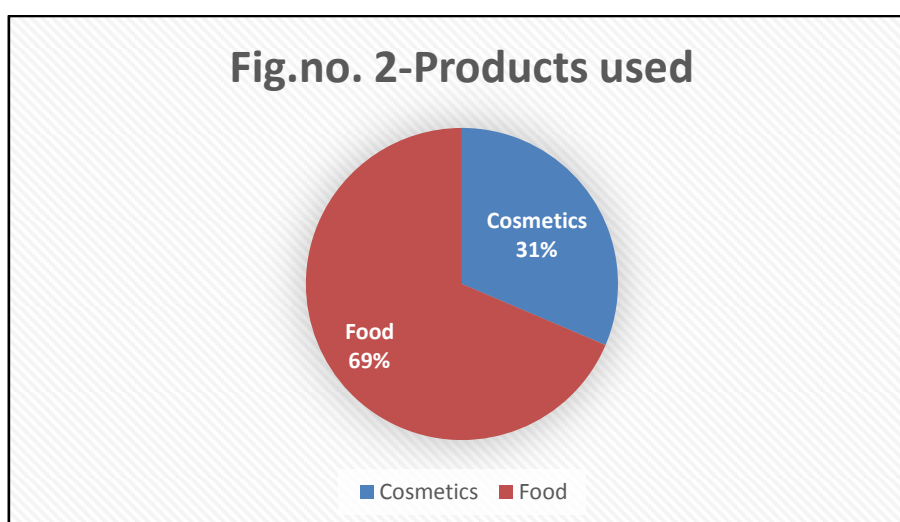
### Findings and interpretation:

Out of the total 70 respondents, 65 respondents are aware about organic products, whereas 5 respondents lacked awareness with respect to organic products. Thus, out of the total 100%, 92.9% are aware of the organic products while 7.1% lack awareness with respect to organic products.



**Table no. 2- Which category of organic products do you purchase the most?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Organic cosmetic products	22	31.4	31.4	31.4
Organic food products	48	68.6	68.6	100.0
Total	70	100.0	100.0	



**Findings and interpretation:**

Out of the total 70 respondents, 22 respondents use organic cosmetic products while 48 respondents have bought organic food products. Thus, out of the total 100%, 31.4% have used organic cosmetics whereas 68.6% have used organic food products.

**One Sample t-test**

**Objective:**

To identify positive (favourable) or negative (unfavourable) perception towards organic products



### Findings and Interpretation:

H0: There is **no significant difference** in the average perception towards all the factors which influence the purchase of organic products. ( $\mu = 3$ )

H1: There is a **significant difference** between the average perceptions towards all the factors which influence the purchase of organic products. ( $\mu \neq 3$ )

As the data is primary, the confidence level is assumed at 95% and so the significance level  $\alpha$  is at 5% or 0.05.

As hypothesis is non directional (two-sided), so the level of significance is divided by 2, thus  $5/2 = 2.5\%$  or 0.025.

$\alpha : 0.05$  (non-directional :  $0.05/2 = 0.025$ )

To identify positive or negative perception towards organic products the table of One sample t-test will be referred to.

**Table no.3**

Parameter (variable)	Hypothesis	P-value	Dec ( $\alpha/2 - 0.025$ )
Preference	H0(preference) $\mu = 1.5$ H1(preference) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Nutrition	H0(nutrition) $\mu = 1.5$ H1(nutrition) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Safe	H0(safety) $\mu = 1.5$ H1(safety) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Healthy	H0(healthy) $\mu = 1.5$ H1(healthy) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
High Price	H0(high price) $\mu = 1.5$ H1(high price) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0



Value for money	H0(value) $\mu = 1.5$ H1(value) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Recommend	H0(friendliness) $\mu = 1.5$ H1(friendliness) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Difficult to find	H0(difficult) $\mu = 1.5$ H1(difficult) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Sustain	H0(sustain) $\mu = 1.5$ H1(sustain) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0
Know more	H0(know) $\mu = 1.5$ H1(know) $\mu \neq 1.5$	0.000	$p < \alpha = 0.025$ , Reject H0

It is observed from the above table that the p value for all the attributes is low that  $\alpha/2$ , 0.025 at 5% level of significance, thus providing evidence to reject null hypothesis, suggesting there is a significant difference in the perception and to further identify positive or negative perception, one sample statistic table will be referred to.

**Table no.4-One-Sample Statistics**

Factors	N	Mean	Interpretation
Prefer	70	3.8429	Customers prefer organic products over conventional products
Nutrition	70	4.0857	Customers consider organic products to have nutritional value
Safe	70	4.2286	Customers consider organic products organically safe
Healthy	70	4.2857	Customers consider organic products to be healthy
High Price	70	3.8571	Customers are willing to pay higher price for organic products



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Value for money	70	3.8714	Customers believe that organic products provide value for the money paid
Recommend	70	4.0429	Customers agree that they would recommend organic products to family and friends
Difficult to find	70	3.8286	Customers find it difficult to find organic products in the market
Sustain	70	3.9429	People believe that consumption of organic products can help to sustain the needs of the future.
Know more	70	4.0286	Customers would like to gain more knowledge about organic products

It is observed from the above table that all the attributes have a mean greater than 3 which substantiates that respondents have a positive perception towards all the attributes of organic products.

### **Findings**

The above analysis suggests that customers prefer organic products over conventional products and are willing to pay higher price as they believe that it provides them with health and nutritional benefits and value for their money. Customers further perceive the organic products to be safe and would recommend it to their family and friends. For most of the respondents the source of the information was television, newspaper, magazine and exhibition.

### **Conclusion and Recommendation**

The future for organic products seems bright witnessing a high rate of acceptance among the customers for these products. Though, customers find it hard to find in the market, they believe that organic products provide one with the value for money and above all believe that the consumption of organic products can help preserve environment and sustain for the needs of the future. Creating awareness and promoting the idea of organic products can boost the industry and can be a step to preserving environment.





**Future scope for research:**

Researches in the future could study customer perception towards categories of organic products other than food and cosmetics. Researchers in future undertake similar research in other cities in India.

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## MINDFUL CONSUMPTION FOR A SUSTAINABLE GEN-NEXT

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Mindfulness is defined as the awareness that emerges through paying attention to purpose, in the present moment. Mindful consumption is where in an individual has a compassionate approach towards self, community and environment.

Food is an essential and an obvious aspect of our lives. It nourishes our body, energises our mind and helps us to work and carry on our tasks tirelessly throughout the day. Now very often when we look around or investigate our own lives, we will be able to see how we carelessly waste food.

Hyper-consumption has been identified as one of the dominant drivers of environmental degradation and climate change. It accelerates when individuals acquire a product or a service, food just for the sake of using or consumption with no attention to the hazards involved while disposing the same.

The United Nations Food and Agriculture Organization (FAO) estimates that the world population will surpass 9.1 billion by 2050. Research suggests that agricultural systems won't be efficient or functional to feed during that time. That would probably lead to a global shortage of food.

How can I contribute to this? How about sticking to the pre-planned list of shopping items and not buying endless stuff that will probably never be used? Let me also remind you the next time you think of throwing anything from your plate. Remember, the pain and the harsh weather the farmers have gone through and toiled for so that you and I could enjoy the best food in our homes. Let us be conscious of the fact that the food that is wasted ends up in landfills which could have not reached there.

How about adopting a lifestyle that leaves a lesser carbon footprint? The hard truth is that sooner or later this planet is going to be in a serious chaos. We can be proud of our rapid globalisation but at the same times the ravages that we cause to our Mother Earth is beyond comparable. We ought to rise from our slumber and work our way towards creating a place where our children breathe clean air and drink safe water.



It has been identified that household food wastes contribute to huge losses and mostly end up in landfills. These foods were potentially recoverable for human consumption. Global food shortages pose a great threat to humanity which is further challenged by population increase, drought and a changing climate. (UN,2011 Escaler and Teng)

According to studies, the estimates and the amount of food wasted in the United States is a staggering 40 per cent of the total available food supply. 25 per cent of fresh water is being used for a crop which ultimately gets discarded. This also has something to do with the mindset of people fresh fruits and vegetables are preferred, appearance of these also matters the most to the customers. All that doesn't look good is thrown away. These are known as minor aesthetic imperfections. Hotels and restaurants follow a very rigid approach of selecting the best ingredients to offer luxury to their customers. In the pursuit of this, a lot of vegetables and fruits are wasted or thrown away.

Over-buying is a major contributor to overall food waste generation and is driven by frequent shopping. Piling up on bargains or discounted items serves no purpose. Plenty of storage space or back up freezers allow consumers to store food. Impulse shopping and purchasing perishable foods in bulk quantities are also responsible for food wastes.

Manufacturers and advertising for foods or other materials are also responsible for the consumerist lifestyle that we live in. Manufacturer's engage in aggressive marketing tactic resulting in mindless consumption. Retailer's under pricing, bundle pricing and other price-volume strategies also increase food waste.

Decreased food consumption and mindful consumption of all goods can lead to decrease in food wastes. Also, expiry-labelling which leads to one-third of goods directly being thrown away, is also a factor. The manufacturers need to address such issues.

An answer to this crisis is Minimalism. A minimalist lifestyle is living with the things you only need. Minimalists are free from the desire to buy and accumulate more. Instead, they find pleasure in relationships and experiences. It allows one to live with less clutter. It is a practical approach and is being practised in many countries.



Minimalism is way to put a stop to the gluttony of the world around us. It's the opposite of every advertisement that we watch on the television. We live in a society which prides itself in accumulation of stuff, material possessions, clutter, debt and distractions. Less is more, is the concept as it allows us to own only important things and erases all the clutter. It allows us to have more freedom with our time and money.

There are various cultures around the world which follow minimalism. Danish culture is one of them. It focuses on less space, less things and more life. One will be amazed on the appearance of their houses. They are small but yet full of life. They value people and not material possessions.

If we want to leave a place where our future generation can have access to clean water and fresh air to breathe, Minimalism is certainly what we each one can do and keep our children away from a consumerist lifestyle. We need to mould them into thought-provoking individuals so that they can contribute and save our Mother Earth.

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Exploring the concept of Mindfulness of consumption (Sabrina Helm)

Benefits of living a Minimalist lifestyle by Tina Williamson



## **CASE STUDY OF A SUSTAINABLE FARM: GOVARDHAN ECO VILLAGE**

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Our Mother Earth is currently facing lot of environmental concerns. The environmental problems like global warming, acid rain, air pollution, urban sprawl, waste disposal, ozone layer depletion, water pollution, climate change and many more affect every human, animal and nation on this planet. Over the last few decades, the exploitation of our planet and degradation of our environment have gone up at an alarming rate. As our actions have been not in favor of protecting this planet, we have seen natural disasters striking us more often in the form of flash floods, tsunamis and cyclones. These disasters steel away the life of people all over the world daily.

Keeping in mind the consequences of the problem, we need some appropriate solutions which can help us out. These solutions may be: -

- Afforestation
- Landfills
- Conservation of water and electricity
- *Sustainable Development, etc.*

### **What is Sustainable Development?**

“The principle of common but differentiated responsibility is the bedrock of our enterprise for a sustainable world” – PM Narendra Modi.

Sustainable development is the organizing principle for meeting human development goals while simultaneously sustaining the ability of natural systems to provide the natural resources and ecosystem services based upon which the economy and society depend.



The desired result is a state of society where living conditions and resources are used to continue to meet human needs without undermining the integrity and stability of the natural system. Sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

The concept of sustainable development has been, and still is, subject to criticism, including the question of what is to be sustained in sustainable development. It has been argued that there is no such thing as a sustainable use of a non-renewable resource, since any positive rate of exploitation will eventually lead to the exhaustion of earth's finite stock; this perspective renders the Industrial Revolution as a whole unsustainable. It has also been argued that the meaning of the concept has opportunistically been stretched from 'conservation management' to 'economic development', and that the Brundtland Report promoted nothing but a business as usual strategy for world development, with an ambiguous and insubstantial concept attached as a public relations slogan.

Sustainable development has been defined in many ways, but the most frequently quoted definition is from Our Common Future, also known as the Brundtland Report.

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development has continued to evolve as that of protecting the world's resources while its true agenda is to control the world's resources. Environmentally sustainable economic growth refers to economic development that meets the needs of all without leaving future generations with fewer natural resources than those we enjoy today.

The essence of this form of development is a stable relationship between human activities and the natural world, which does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own.

The idea of environmentally sustainable economic growth is not new. Many cultures over the course of human history have recognized the need for harmony between the environment, society and economy. The 'environmentally sustainable economic growth' is synonym to the prevalent concept of 'Sustainable Development'. The goal



of which is to achieve balance/harmony between environment sustainability, economic sustainability and socio-political sustainability.

However, one problem faced by environmental managers is that the goal of sustainable development is not fully formed and its fundamental concepts are still debated. Sustainable development, like environmental management, is not easily defined.

### **Importance of Sustainable Development:**

Sustainable development is a hard topic to nail down because it consists of a wide range of things. Due to the technicality and complexity of this topic, it's best to check out its importance holistically to be able to grasp it easily. Population is the main factor driving up sustainable development campaigns. So, the importance of sustainable development can be viewed from this perspective:

#### **1. Provides essential human needs**

The explosion of population means people will have to scramble for the limited life essentials like food, shelter, and water. Adequate provision of these basic needs almost entirely hinges on infrastructure capable of sustaining them for a long time. If governments insist on utilizing fossil fuel based sources of energy instead of renewable and sustainable options, the cost and environmental effects of supplying these basic needs would become a tall order.

#### **2. Agricultural requirement**

Growing population means agriculture must catch up. Finding ways to feed more than 3 billion people can be staggering. If same unsustainable cultivation, planting, irrigation, spraying, and harvesting techniques are utilized in the future, they might prove to be financially burdening considering fossil fuel resources are projected to run out. Sustainable development focuses on sustainable agricultural methods such as effective seeding techniques and crop rotation to promote high yields while maintaining the integrity of the soil, which produces food for a large population.

#### **3. Manage climate change**



Climate change can be mitigated by sustainable development practices. Sustainable development practices seek to reduce the use of fossil-based sources of fuel like oil, natural gas, and coal. Fossil fuel sources of energy are unsustainable since they will deplete in the future and are responsible for the emission of greenhouse gasses.

#### **4. Financial stability**

Sustainable development practices have the ability to create more financially sustainable economies across the globe. Developing countries that can't access fossil fuels can leverage renewable forms of energy to power their economies. From the development of renewable energy technologies, these countries can create sustainable jobs as opposed to finite jobs based on fossil fuel technologies.

#### **5. Sustain Biodiversity**

Unsustainable development and overconsumption practices greatly impact biodiversity. Life ecosystem is designed in such a way that species depend on one another for survival. For instance, plants produce oxygen that humans need for respiration. Humans exhale carbon dioxide that plants need for growth and production. Unsustainable development practices like emission of greenhouse gases in the atmosphere kill many plant species resulting in reduction of atmospheric oxygen. This is not good for humans. Sustainable development practices encourage the use of renewable energy resources, and organic farming practices that do not emit any greenhouse gas to the atmosphere.

#### **How is Sustainable Development practiced?**

Sustainable Development can be practiced in many ways. It varies at different levels. Commercially, renewable resources [such as solar energy, etc.] and green spaces must be feasted. At local levels, common principles of the 5Rs can be used.





### **Role of Government in Sustainable Development:**

- 1. Ratifying Paris Agreement:** The 21st Conference of Parties (COP 21) under the United Nations Framework Convention on Climate Change (UNFCCC) successfully concluded in Paris after intense negotiations by the Parties followed by the adoption of the Paris Agreement on post-2020 actions on climate change. This universal agreement will succeed the Kyoto Protocol. Unlike the Kyoto Protocol, it provides a framework for all countries to take action against climate change. Placing emphasis on concepts like climate justice and sustainable lifestyles, the Paris Agreement for the first time brings together all nations for a common cause under the UNFCCC. One of the main focus of the agreement is to hold the increase in the global average temperature to well below 2°C above pre- industrial level and on driving efforts to limit it even further to 1.5°.
- 2. The Clean Development Mechanism projects in India:** As on 4 January 2016, 1593 out of a total of 7685 projects registered by the CDM executive board are from India, which so far is the second highest in the world with China taking the lead with 3764 projects registered. Indian projects have been issued 191 million CERs, 13.27 per cent of the total number of CERs issued. These projects are in the energy efficiency, fuel switching, industrial processes, municipal solid waste, renewable energy and forestry sectors and are spread across the country. About 90-95 per cent of the CDM projects are being developed by the private sector, facilitating investments of about R583,751 crore (US\$ 87.77 billion) in the country, which is more than the total of multilateral grants available for climate change related activities.
- 3. State Action Plans on Climate Change:** The State Action Plans on Climate Change (SAPCC) aim to create institutional capacities and implement sectoral activities to address climate change. These plans are focused on adaptation with mitigation as co-benefit in sectors such as water, agriculture, tourism, forestry, transport, habitat and energy. So far, 28 states and 5 union territories (UTs) have submitted their SAPCCs to the MoEF & CC. Out of these, the SAPCCs of 32 states and UTs have been endorsed by the National Steering Committee on Climate Change (NSCCC) at the MoEF & CC.



4. **Coal Cess and the National Clean Energy Fund:** India is one of the few countries around the world to have a carbon tax in the form of a cess on coal. Not only has India imposed such a cess but it has also been progressively increasing it. The coal cess which was fixed at R50.00 per tonne of coal since 22 June 2010 and increased to R100.00 per tonne of coal in Budget 2014-15, was further doubled to R 200.00 per tonne in the 2015-16 Budget. 8.46 The National Clean Energy Fund (NCEF) which is supported by the cess on coal was created for the purposes of financing and promoting clean energy initiatives, funding research in the area of clean energy and for any other related activities. Till date 56 projects have been recommended by the inter-ministerial group (IMG) with total viability gap funding (VGF) of R34,784.09 crore spread over several years. For 2015-16, R4700 crore has been allocated in the Budget for NCEF projects. VGF is also being provided for Namami gange.
5. **National Adaptation Fund for Climate Change:** A National Adaptation Fund for Climate Change (NAFCC) has been established with a budget provision of I350 crore for the year 2015-2016 and 2016-2017. It is meant to assist in meeting the cost of national- and state-level adaptation measures in areas that are particularly vulnerable to the adverse effects of climate change. The overall aim of the fund is to support concrete adaptation activities that reduce the adverse effects of climate change facing communities, sectors and states but are not covered under the ongoing schemes of state and central governments. The adaptation projects contribute towards reducing the risk of vulnerability at community and sector level. Till date, the NSCCC has approved six detailed project reports (DPR), amounting to a total cost of I117.98 crore, submitted by Punjab, Odisha, Himachal Pradesh, Manipur, Tamil Nadu and Kerala.



## **CASE STUDY: GOVARDHAN ECO VILLAGE**

**Eco-community:** Govardhan School of Sustainability is an education initiative based in Govardhan Ecovillage, a multi award-winning eco-community located around 100km from Mumbai. With its 250 residents, Govardhan Ecovillage is striving to set up a role model village, nested in an ecological infrastructure amidst a picturesque landscape of the Sahyadri mountains. The ecovillage is composed of farms, animal shelter, yoga school, Ayurvedacentre, community area and ecotourism site, all nested in the setting of an ashram. Now GEV has broadened its outreach by being host for the GSOS, a learning centre oriented towards studies of ecology and transformation of self and society.

**Global approach:** Founded by an international team with diverse backgrounds, GSOS has a global outlook and is setting partnerships with several international universities, promoting increased cultural and academic exchange.

**Holistic learning:** The backbone of GSOS is to inspire transformative change towards sustainability. This is accomplished by bringing forth new modes of thinking, acting, living and being in the world. Students who come to GSOS are encouraged to engage not only in theories of sustainability, but also in hands-on activities, workshops, outdoor classes, cultural activities, art and spirituality.

**Theory of Sustainability:** By exploring different theories of sustainability, GSOS aims at bringing an in-depth understanding of the various applications of the concept of sustainability across different schools of thought. Emphasis is given to bodies of theories that enable critical thinking and that at the same time have potential for informing and triggering transformative action.

### **Theory of sustainability modules:**

- Deep Ecology
- Vedic Ecology
- Development Theories
- Theories of Urbanization
- Socio-environmental entrepreneurships



- Symbiotic Development Model
- Climate Change
- Environmental Justice
- Dharma and Ecology
- Sacred Ecology

**Solutions towards Sustainability:**

With the goal of sharing the many already existing solutions to sustainability challenges, GSOS offers a broad set of practical sessions and workshops on various topics. Students will be exposed to innovative technologies, bold fusions of traditional with modern techniques as well as simple examples for how to build a more sustainable life. From building, water, waste management, food production to various forms of producing natural self-care products, GSOS covers a wide scope of practical solutions for a low-impact life on Earth.

**Solutions towards Sustainability Modules:**

- Energy
- Water
- Waste and Sanitation
- Food / Agriculture
- Building Technology
- Low Impact Lifestyle
- Self-care Products
- Mud block Workshop
- Pottery
- Bio-construction
- Permaculture
- Food Forest
- Sattvic Cooking
- Biogas
- SBT



- Cow Care
- Bamboo Workshop
- Composting
- Seed Conservation / Bank
- Soil Preparation
- Permanent Raised Bed – Organic Farming Technologies
- Pyrolysis
- Natural Dying

**Culture of Sustainability:**

Sustainability in its holistic sense is when the principles of sustainability are not limited just to ecological systems but to human systems in the form of culture. India offers a treasure of earth-honouring practices that infuses the culture of sustainability into all walks of our life. Explore these wonderful life tools to imbibe an enriching culture.

**Culture of Sustainability Modules:**

- Ayurveda
- Warli Painting
- Life Skills
- Personal excellence
- Interpersonal excellence
- Organizational excellence
- Building Community and Embracing Diversity
- Sustainable Relationships
- Cultural Exchange
- Incense Making
- Community Arts and Rituals Traditional Indian Games
- Traditional Indian Music



- Biodiversity Exploration (trekking, river walk etc)
- Animal Ethogram
- Eco Group Dynamics
- Food for Life
- Traditional Indian Theatre
- Heritage Tourism

**Conclusion:**

Sustainable Development is the pathway to the future we want for all. It offers a frame work to generate economic growth, achieve social justice, exercise environmental stewardship and strengthen governance.

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## MINDFUL CONSUMPTION FOR SUSTAINABLE DEVELOPMENT

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### SUSTAINABLE DEVELOPMENT

Sustainability of development means that development which is not only for present times but also for the future generations. Sustainability is the capacity to use the resource judiciously and maintain ecological balance. Every generation wants to get the maximum benefit from the available resource. But such thing would be quite disastrous because the available resources shall be exhausted within short period of time and the future generation will be deprived of these resources.

#### **Challenges for sustainability of development:**

1. **Growing world population and increased consumption** –In 1960 the world population was 3 billion people. It is currently around 7.2 billion and expectations are that it will grow to 9.7 billion in 2050. More people in the world and more people being affluent means a bigger strain on the available resources and on the environment!
2. **Climate change and global warming** caused by rising levels Co<sub>2</sub> from burning fossil fuels and deforestation resulting in Loss of biodiversity and collapse of ecosystems. The International Union for Conservation of Nature (IUCN) says that “the current species extinction rate is between 1,000 and 10,000 times higher than it would naturally be” and the people are to be blamed.
3. **Pollution-** Plants, animals and people are equally affecting plants, animals and people. For example plastics in the ocean are responsible for the death of more than a million animals every year. It also affects the health of people because fish eat tiny plastic particles (that often contain toxins) and people eat those fish.
4. **Growing water stress** is caused by an increasing mismatch between water usage and availability of water resource.



### **Resource planning**

- Planning is a widely accepted strategy for judicious use of resource.
- There are some regions which can be considered self-sufficient in terms of the availability of some resource and there are some regions which have acute shortage of these vital resources

For e.g.- Arunachal Pradesh has abundance of water resource but lacks in infrastructural development. The state of Rajasthan is very well endowed with solar energy and wind energy but lacks in water resources.

### **Resource planning in India**

Resource planning is a complex process which involves:

1. Identification and inventory of resources across the regions of the country
2. Evolving a planning structure endowed with appropriate technology, skills and institutional set up for implementing resource development plans.
3. Mapping the resource development plans with overall national development plans.

### **Efforts can be made by an individual for sustainable development:**

- Reduce the material intensity of goods and services;
- Reduce the energy intensity of goods and services;
- Reduce [the potential for] toxic dispersion;
- Enhance material recyclability;
- Maximize sustainable use of renewable resources;
- Extend product durability; and
- Increase the service intensity of goods and services.
- Have smaller families



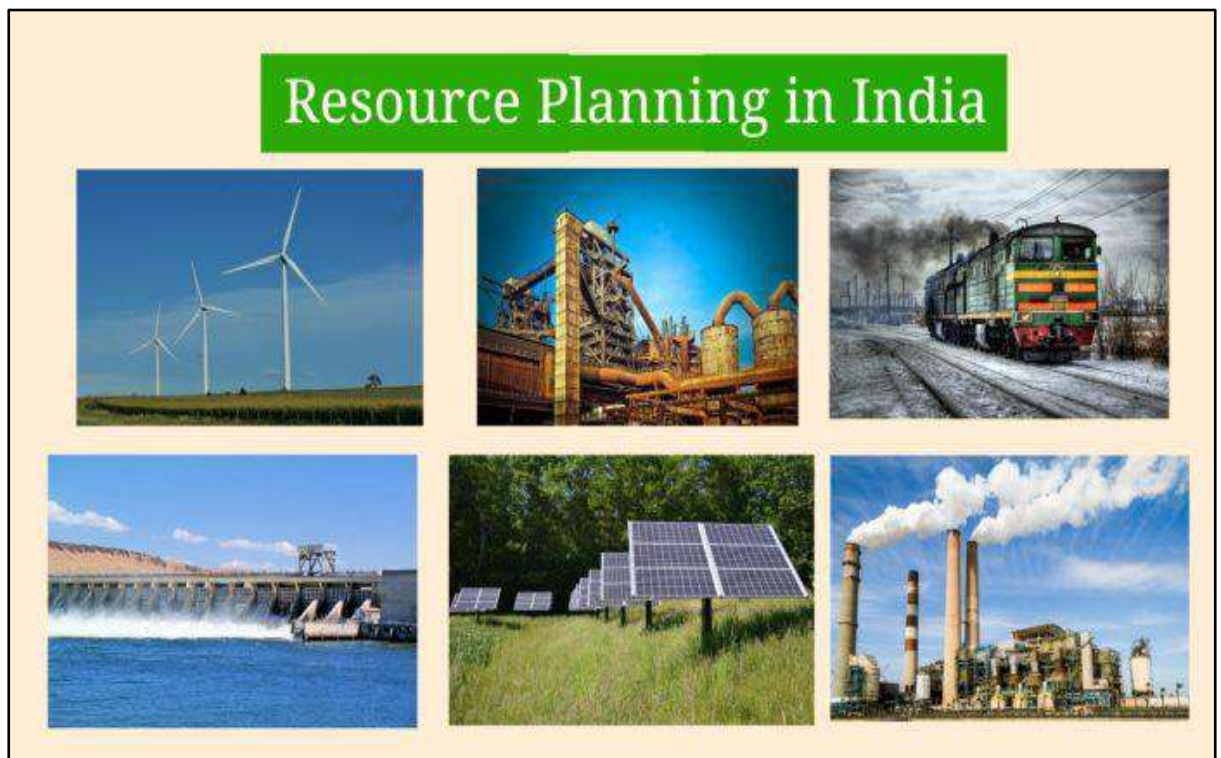


**Conclusion:**

The pursuit of sustainability demands choices about the distribution of costs and benefits in space and time. There is also need to take advantage of the ‘traditional ecological knowledge’ (TEK), which encompasses all issues related to ecology and natural resource management, both at local and regional levels. Along with political dimensions of environment- society relations, the TEK can be used for both eco-restoration and sustainable development.

“No challenge poses a great threat to future generations than climate change” and  
“Sustainable development is holding our world in trust for our future generation!”

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## ENCASHING WASTE-NEED OF THE HOUR!

**Dr. Bhavna Dave**, Asst. Prof., Pillai College of Education & Research, New Panvel

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### **Abstract:**

We need to refrain from disposing plastic along with other solid waste. This paper throws light on the work done by Aarohana EcoSocial Developments Private Ltd., a company that upcycles waste plastic bags and wrappers to make products of great utility value. The paper highlights how its products are ecosocial and how its team and the founder members are able to satisfy the needs of the people in the cities and yet are able to contribute towards making this world livable. Their ways of minimizing the negative effects of plastic on the surrounding environment are noteworthy and exemplary. A survey was also conducted to find out the awareness about recycling & upcycling of plastic bags/wrappers among women. The results of this survey revealed that it is necessary to spread awareness about disposal of plastic bags and wrappers. This paper also throws light on the research findings and presents the need of companies like Aarohana!

**Keywords:** Upcycle, Ecosocial, Aarohana

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### **Introduction**

The present urban environments have been found to exhibit unique local temperatures, precipitation, and other characteristic activity due to a variety of factors. One of these factors is plastic, the most versatile material that we make use of. Plastic is used everywhere and for varied purposes. Plastics such as Styrofoam, trash bags, zip pouches, bubble wrap, cereal box plastic, clear plastic wrap, potato chips bags, some department store plastic bags, candy wrappers and soiled plastic bags cannot be recycled. The unfortunate part about plastic is that once used it is simply thrown into landfills along with other waste. We are not only running out of landfill space at an

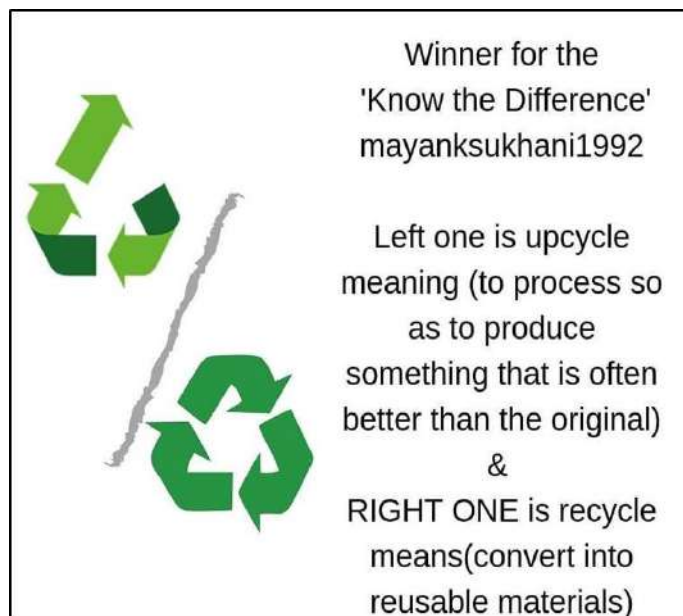


alarming rate, but such plastics also harm the environment in many other ways. Thus, we need to refrain from disposing plastic along with solid waste.

Over 60 percent of India's plastic waste goes for recycling, according to the Central Pollution Control Board. Across the country, high-value plastic waste such as shampoo bottles and PET water bottles are collected by rag pickers and sold to recycling companies for a tidy sum. The problem remains in the form of smaller plastics - thin carry bags and wrappers - often left to accumulate on roadsides, in landfills and garbage dumps, as they are perceived as not worth the effort. To address this problem, Pune-based AarohanaEcosocial is turning plastic waste management into an art form by '*upcycling*' non-biodegradable and non-recyclable plastic into fabric. It was founded in 2013 by former IT professionals Amita Deshpande and Nandan Bhat.

'*Upcycling*' is explained in the following picture:

Picture-1.1





### **Background of the beginning of Aarohana Ecosocial Developments Private Ltd.**

Amita and Nandan met as a part of a trekking group to Harishchandragad, a hill fort in the Western Ghats, Maharashtra. The nature lovers were shocked and disturbed by the number of plastic bags dotting the country's once-pristine mountain trails creating a tremendous eyesore and causing great damage to the plant and animal life there. Before deciding to become agents of change, Nandan was working at Sony, while Amita was with KPIT Cummins. It was during her time there that Amita realized that she truly wanted to do environment-related work. She quit her job to take a course in sustainability from Purdue University, Indiana, U.S. She reconnected with Nandan soon after, and the two started Aarohana Ecosocial. For the first two years, the duo travelled around India, learning about the value of different forms of plastic. They also saw that people in rural India were lacking employment options outside agriculture, compared with the number of odd jobs mushrooming in cities and towns. So in 2015, they started work in the Western India union territory of Dadra and Nagar Haveli where Amita is from. The duo set up a weaving unit in a tribal village that lacks access to alternate sources of livelihood. The locals there depend only on monsoon-fed farming and can take only one crop each year due to their small landholding and lack of irrigation. They employed about 13 people and started their enterprise.

### **Working of Aarohana Ecosocial Developments Private Ltd.**

The social enterprise has tied up with NGOs who collect waste, to source its bags. Waste plastic bags are first cleaned and sundried. These are then manually cut into strips and rolled on a traditional charkha. Aarohana's unique designs are also dependent on whatever waste is available. Finally, a handloom is used to weave the plastic yarn into cloth. Once the plastic is spun and woven, it is sent to its Pune workshop, where product design and production happens. The cloth is stitched into various items including totes, cushion covers, and table mats. About 50 small plastic carry bags go into one Aarohana beach bag, and the founders estimate they have salvaged over 776,500 bags since August 2015. The bulk of their sales comes from retail as well as exhibitions. Aarohana has received numerous corporate orders from various companies and in 2018, it sold about 10,000 products. The company has also



introduced the repair facility for free which adds a new 'R' - REFUSE, REDUCE, REPAIR and RECYCLE!!!

The picture below shows the various products it makes-

Picture 1.2 Products made by Aarohana



In this way, Aarohana generates livelihood opportunities for the grassroots while integrating social and environmental sustainability and engages its consumers and associates in this EcoSocial development process, to create a responsible economy!



### **Awareness about Recycling and Upcycling of Plastic**

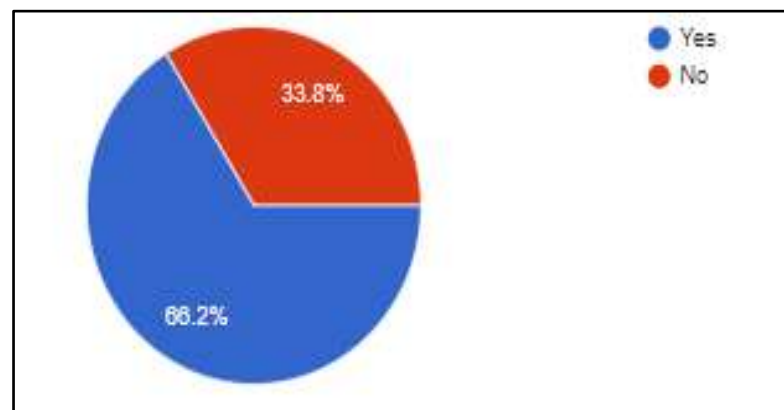
On March 23, the Maharashtra government had issued a notification, imposing a ban on the manufacturing, use, sale, distribution and storage of all plastic materials. Yet it is seen that people, especially women still carry plastic bags and demand for it when they go shopping. Agreed that for many purposes graded plastic bags have high utility but it is equally important that people know that even these can be reused. The concept of 'Upcycling' as introduced by companies like Aarohana should be made more popular. Therefore a survey was conducted to check the awareness about recycling and upcycling of Plastic bags/Wrappers amongst the women of Panvel.

### **Findings and Conclusions:**

The researcher prepared a questionnaire on Google forms and collected data from the women of Panvel and its nearby areas. The sample size was 300.

The following are the findings of the study:

**Picture 1.3-Do you use Plastic Bags?**

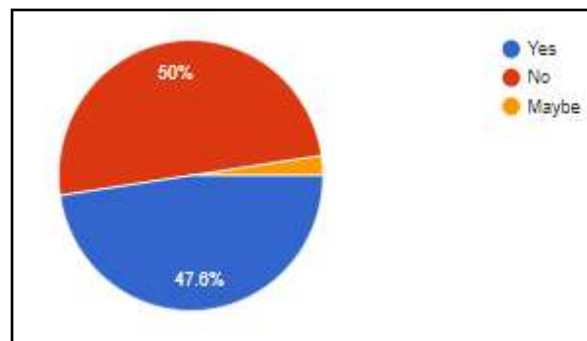


We can see that though 33.8% of women say that they don't use plastic bags, 66.2% respondents say that they use plastic bags.



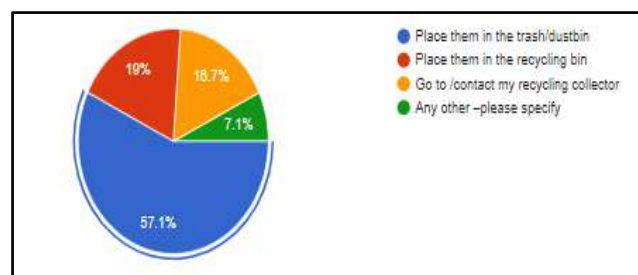
**Picture 1.4**

**Do you have separate dustbins and recycling bins in the society or surroundings?**



50% respondents said that they had separate dustbins and recycling bins in their society. Whereas 47.6% did not have and a few were not even aware. But even those who had, complained that the Municipality trash picking van does not collect it separately, they mix everything together.

**Picture 1.5 -When unsure whether an item is recyclable, what do you do?**

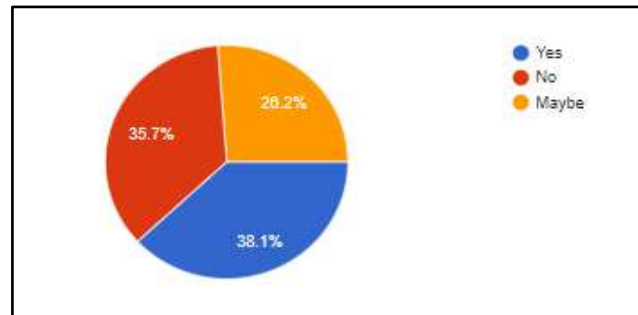


57.1% respondents said that when they are unsure whether an item is recyclable or not, they put the plastic into the dustbin. 19% respondents said that they keep it in the recycling bin whereas the other 16.7% respondents said that they went to sell it to their recycling collector. The other 7.1% respondents said that they reused the plastic in some way or the other like for keeping it on shelves or drawers etc. or just kept it aside for some use later on.

**Picture 1.5**

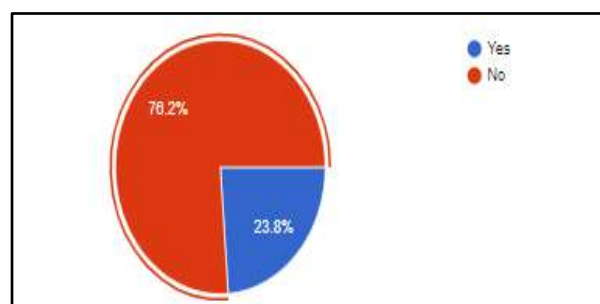


**Do you know that a variety of things can be made from plastic wrappers/ plastic bags?**



38.1% of the respondents were aware that a variety of things can be made from plastic wrappers and plastic bags. 35.7% of the respondents said that they did not know whereas 26.2% respondents were unsure of the variety of things made from plastic wrappers and plastic bags.

**Picture 1.6:**  
**Do you know any companies that recycle/upcycle plastic waste?**



The above picture clearly indicates that majority of the respondents that is 76.2% of respondents are not aware about companies recycling plastic waste; only 23.8% respondents said that they knew about it. This shows the need of spreading awareness among the people of the kind of work done by companies like Aarohana Ecosocial



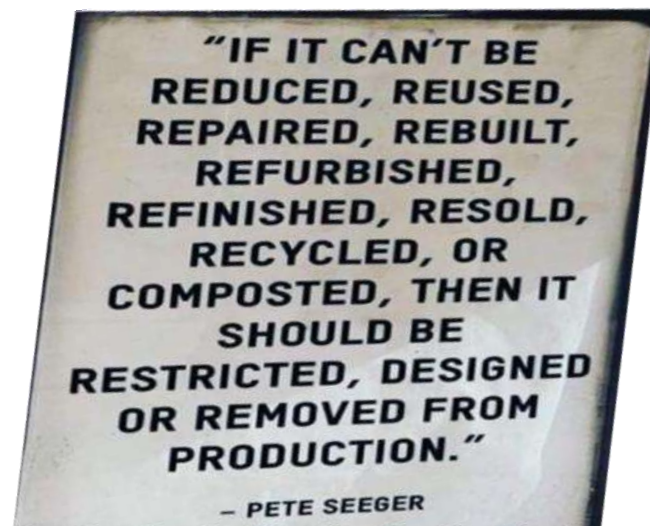


Developments. Perhaps more people would consciously then keep plastic wrappers and plastic bags separately and give away for recycling or upcycling.

**Conclusion:**

Aarohana approaches the conservation of our environment and heritage using social involvement and traditional technology. Let us cooperate, encourage and join with companies like Aarohana and do our bit for the environment.

**So...Let's ask ourselves every time we go shopping...Can it be reused, resold, recycled or upcycled???**



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## WILL OUR NEXT GENERATION BE DEPRIVED OF RESOURCES BECAUSE OF US? START THINKING!

**Nitika Srivastava**, Student Teacher, K.J. Somaiya B.Ed. College, Mumbai

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### **Abstract:**

We have natural resources created by environment which are essential for sustaining life on Earth. We have limited resources which took years to be formed after various transformations in different stages. Continuously increasing population and demand for resources has made a critical situation for the survival of living beings. Industrial revolution, modernization and urbanization has showed a path of growth towards materialism and fashion trends. Now the trend of buying new things and unnecessary utilization of needless products is deteriorating the environment at the same time increasing manufacture of the new ones. The tendency of consuming more leads to a society which runs after money to buy new things. The more you desire, the more you work for buying and you are becoming part of this blind race of consumption. The suggestion for the youth of this country is to observe the influence of mall culture on society. Earlier we had durable and long lasting products which somewhere created no need for overconsumption as those could be reused but now the companies have degraded the product quality and made it easily accessible which tempt the society towards buying. Though our youth believe in the concept of 'live in present' but they must have mindfulness about the waste generated by them due to excess consumption and also the deprived future generation. Leading marketing companies have strategies of making products fascinating and approaching consumer through a number of ways. Currently we have various online shops available where you can browse and purchase by replacing your old article by spending some money in less time. But oblivious consumption leads to Environmental as well as Moral degradation. Our descendants are at high risk of deprivation of natural resources which is their birth right. For that reason it is the responsibility of current generation to maintain the balance of our environment and resources. Big changes start from small steps so we must start taking measures to overcome this heedless consumption by our consciousness. The aim of



this paper is to emphasize the effects of mall culture on society by fascinating products and marketing strategies which lead to needless shopping and consumption.

**Keywords:** Materialism, blind race of consumption, industrial revolution, mindful consumption

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### **Introduction:**

The earth has not always looked the way it looks today. The estimated age of earth is 4.54 billion years. Since the origin the planet earth have gone through several changes. Earth and its atmosphere are constantly altered. Plate tectonics shift the continents, raise mountains and move the ocean floor. It further preceded to the emergence of life and its effects on environment. Exploring this past offers not only possibility of understanding the origin of life but also its future. After the emergence of life, the earth had all the natural resources generated by environment. The human evolved, developed physically, mentally ,socially and utilised the resources to survive and applied their skills and knowledge to create innovations for their better life and comfort. It was running sound when natural resources were being treated for survival. The human could continue the process peacefully. But the urge to get more comfort, fame and name turned the whole scenario. Earlier the basic human needs were food to eat, clothes to protect and cover his body and shelter to protect from environment and animals. Now the needs have become desire and there is no end of Desire as said by our ancestors. Desire to get good status in society, to earn fame, to live a lavish life, full of luxuries has become the declining factor for the society. Society has turned up to the platform to demonstrate individual's capability to earn and utilize this money to purchase things heedlessly. Malls have the major contribution for such circumstances. Before it there was no trend of restaurants, food courts and coffee houses which has now become the need of this hour.

### **Industrial revolution and its impact:**

The Industrial revolution started in 18<sup>th</sup> century when agricultural societies became more industrialized and urban. The Industrial revolution made remarkable changes in ecological systems on Earth along with its environment. It affected human development, health and age, social improvements and impact on natural resources, energy usage and sanitation. It results in increase in population as well as living



standard of society. In demand to survive people, excess use of chemicals and fuels in factories increased the air and water pollution and increased use of fossil fuel. It has created intense effect on society in terms of growth and abundance of innovations which facilitated humans in many ways. Though it provided new tools for taking the society to new heights but also made the society dependent and immobilize without these facilities. The society today is so reliant on these innovations that life seems almost impossible. Currently we have alternatives for all our work and things and human somehow developed the habit to treat everything as perishable. Though everything is impermanent but has its own life period. Industries are there to produce things as per societal demands but mankind should be aware of the fact that we have limited resources and we are now at the edge of extremity.

#### **Current Youth Population:**

Current Youth population of the world is estimated to reach 1.4 Billion. The youth are population between the age of 10 to 24. The world population will reach 9.8 billion in 2050, up 31% from an estimated 7.5 billion now, according to projections included in the 2017 **World Population** data sheet from the Population Reference Bureau (PRB).It shows that there are youth who will turn to adult in coming decade. These young people hold the future of our generation. To meet their needs is a big challenge. The population explosion has created Crisis of every resource whether we think of education, livelihood, employment and all the materialistic things available now for us. The youths are much advance in thinking and managing their things. They have the democratic feeling in them which leads them to fight for their improvement, needs and rights. Youth of world feel the urgent need for change to make their life better in future. Different protests and gathering can be seen everywhere for their rights and demands. Now we can also observe the huge migration of people from villages to cities just to earn their livelihood. It results in crowded cities and vacant villages. As villages do not provide them ample opportunities to utilize their skills and talent whether the cities do thus they find their prospects here. Though new agricultural technologies & planning are new areas to explore but after certain level wide exposure is important so people tend to migrate to cities. The cities have good platforms to demonstrate and enhance their talent and utilise their skills in different



areas like education, jobs and trade. The young generation is quite in hands of modernization which teaches them to make friends on social media, showcase their precious things and demonstrate their life events. This fictitious lifestyle drag them towards a competitive society where the competition is to prove yourself superior to others in purchasing, to collecting materialistic things, to consume more and to dispose more. Every alternate week fashion trend changes and we can notice the mob for grabbing the opportunity to buy more. We should see the problems and scarcity which the next generation has to face. They will not be responsible for their situation as they will get the inherent qualities from their parents. So still we have time to change their future by turning ourselves as their role models and should aware them to become responsible and hold the process of blind consumption to save our environment, our Earth.

#### **Emergence of mall culture:**

Victor Gruen was the first person to design the Southdale Centre, regarded as the World's first shopping mall, opened in 1956 in Edina, Minnesota. The credit goes to US automobile for the emergence of malls. The malls were developed to meet all the needs of society under one roof. It smoothened the marketing process as well as saved time. In India it can be said that the malls were originated after 1991 economic policy by Finance Minister, Manmohan Singh. Before the arrival of this policy India was facing the economic crisis and this policy provided speed to development of Indian economy. It provided reduced import duties and opened reserved sector for private and foreign players. Malls are centralized concentrated commerce. Malls formed separation between middle class and lower class. Though they facilitated the middle class by new products from competing producers under one roof and rescuing them from unwanted hard work but at the same time developed habit of buying useless products in bulk. The products and offers are being so fascinated that created interest in consumes mind to buy a thing and store. The other attractions are also so appealing as well as distracting that the consumer gets drawn in it. Different sections like community centre, game zone, food courts, outlet centres and fashion centres, all have blend of products appropriate to the age of consumer and their needs. Malls generated job opportunities for the mass of the country along with urban lifestyle.



### **Mindful consumption:**

Malls helped for economic development and lifestyle of the consumers. They made shopping entertaining and fun activity which was earlier time consuming but definitely based on the needs of a person or family. People used to buy products occasionally plus they had practice of retaining things and using it constantly until it loses life. The trend now is to purchase as per the offers which the retailers are providing. The youth come up with the habit of buying clothes according to current fashion and once the fashion gets over they throw it away. Malls have become the place of entertainment. People like to visit there with family and friends due to cool environment, different fun filled activities, varieties of cuisines, better shopping options from competing producers, parking area and window shopping. They spend good time there as each and every member of the family find innovative and attractive things as per age. But we can't imagine the whole consumption we do in a day. If we talk about electricity consumption in a mall for one day the data is shocking. a shop in a mall runs for at least 12 hours a day. If we assume 100 shops in shopping mall and each shop consumes 2 kilowatt electricity to run the air conditioning system. Then the electricity consumes in a day will be  $2 \times 12 \times 100$  that is 2400 kilowatt hour electricity daily. Ideally domestic use of electricity in a home is 24-25 kwh, so one day of electricity consumed by a mall can be used by 100 families now and later also. Malls use up almost 4 megawatt to 14 megawatt energy everyday in their air conditioning systems, lighting systems, escalators and other units. We all know that natural sources that create electricity are non renewable. So we must consciously consume electricity keeping consequences on the future generation in mind.

Water is another resource and the most important thing to survive. A number of activities like kitchen or dishwashing, irrigation, cooling and heating and sanitation. Most of the water gets wasted in toilets while flushing. A single flush uses about 13.6 litres or 3.6 gallons water. Generally 1000 to 1200 visitors visit a mall daily. Water wastage can be observed here. Earth has 97% saline water in seas and oceans which is not drinkable by humans so we have only 3% fresh water available which if will not be used mindfully can make the survival difficult for us as well as next generation also.



Malls have developed the trend of purchasing food which was not the characteristics of Indians ever. Specially youngsters these days are in temptation of spicy junk food which is obviously not healthy and also affecting their health resulting in obesity, high blood pressure, diabetes and adverse impact on cardiovascular and digestive systems. Fast foods are high calorie food which is high in fat content, high in sodium and low in overall nutrition. We can see the changed habits of Indians and the obesity in kids leading to inactive lifestyle. There are many articles in newspapers about the particular brands and their food quality in malls. Other problems like overpricing of products and growth of degraded quality also hampers the growth of society. Growth in the sense we have to buy the products frequently due to easy availability and poor quality of the products. Consumers waste a lot of their expenditure in purchasing heedless products which are not their requirement. They can invest a huge amount of money in future and save for their family. These malls have come up with troubles of moral degradation of society and blind purchasing. Society should realize that there should be a halt to all such activities and be aware of future ahead. We may be able to run our life smoothly but our next generation will not if we will keep pace with such activities. Its high time now to realize to end such practices of buying unnecessary products and think mindfully for our future generation.

### **Climate change:**

The unnecessary purchasing and consumption made a remarkable change in climate and society. Continuous waste generation and alteration of products resulted in heap of food waste, plastic waste, electronic waste, chemical wastes some of which are nondegradable so we are creating environment polluted or we can say poisonous for our descendants. Air gets polluted, water polluted, soil polluted what rest for them. Now the time is not only to get knowledge about our mistakes but to move from knowledge to wisdom and take action to stop it. Air pollution in many cities of India too at high level if we see the statistics the air quality index of our capital becomes more than 500 sometimes which is poisonous what our future are going to face we can judge. Now we are leading to survive on oxygen bars where we will get oxygen for 15 minutes at the cost of 299 rupees. People are helpless to use mask to protect themselves. If we do not want to see worst than this, our initiative should be improve



environment by mindful consumption of resources. Current generation should realize the needs and problems of the future generation as it is their responsibility and humanity too. Think and Act!

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## **SOLAR – THE BI-POLAR FOR ELECTRICITY**

### **A Study to use the Solar Rooftop Calculator & design a Financial Outlay of Solar Energy into Residential Complex in Dhokali region of Thane District**

**Vibhav Rajendra Galadagekar**, Asst. Professor, Sheth NKTTC College, Thane

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#### **Abstract**

It could be seen that not all of Indian territories are being connected with electric cables; while those that have being connected aren't getting sufficient supply of energy. Rural India is still in the darkness or in the curse of load shedding. Even though living in the urban parts of the country, we are not mature enough to conserve the valuable energy resource that can create a light of hope and happiness in the lives of many Indians. Hence this project will serve to educate people to invest a little money into the solar panels and generate electricity at domestic level for self-consumption.

**Keywords** – electric cables, load shedding, electricity, solar panels

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#### **Introduction:**

One of the most important modern-day necessity is called as electricity. We cannot look at our daily life without energy. Charging our smart phones to heating water; even now we are progressing to running cars and automobiles on electricity. We talk as if electricity is the gift that is endowed on all of the social and geographical circles across India. It could be seen that not all of Indian territories are being connected with electric cables; while those that have being connected aren't getting sufficient supply of energy. Rural India is still in the darkness or in the curse of load shedding. Even though living in the urban parts of the country, we are not mature enough to conserve the valuable energy resource that can create a light of hope and happiness in the lives of many Indians. Hence this project will serve to educate people to invest a little money into the solar panels and generate electricity at domestic level for self-consumption.

#### **Objectives of the Study:**

- To understand the attitude of citizens towards solar energy as alternate source of power.
- To understand the approach of societies to convert electricity points to solar generated power.



- To understand the impact of possible cost savings using solar power.
- To provide an amortisation schedule for the solarisation of the society's energy consumption.
- To provide a detail calculation of solar energy generated and utilised in the concern society.
- To provide a detail calculation of solar energy saved and equivalent monetary savings.

### **Hypothesis:**

H<sub>0</sub> – Societies will not gain financially from the solar panels installed.

H<sub>1</sub> - Societies will gain financially from the solar panels installed.

H<sub>0</sub> – Societies will not have the patience for the Payback period of 5 to 10 years.

H<sub>1</sub> - Societies will have the patience for the Payback period of 5 to 10 years.

### **Solar Energy – Financial Outlay**

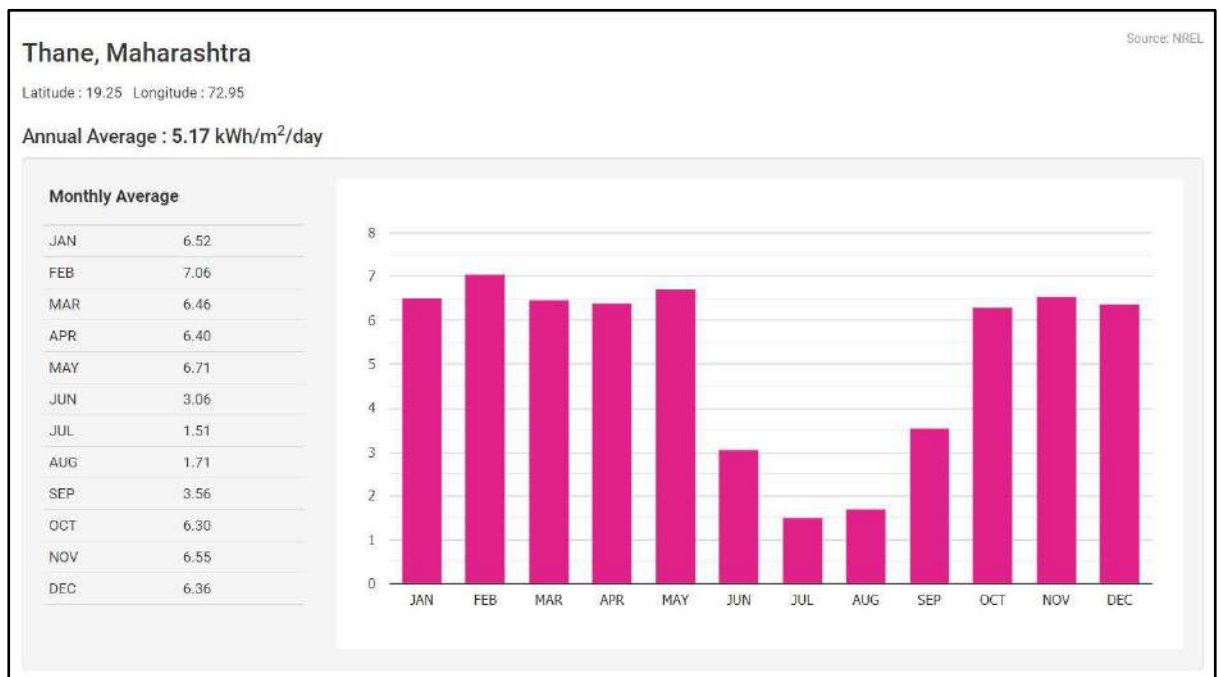
Assuming the monthly electricity bill of cooperative housing societies in Mumbai Suburban being roughly Rs. 10,000 at unit price of Rs. 11.5/kWh. There is hardly any scope for reduction in the consumption of the electricity as the passage points, CCTVs, lift, any lights in the landscapes or boundaries of the society could not be turned out. Plus, the water motor that draws water from municipal corporation pipes runs on electricity too. The water heater / boilers in the houses are the highest consumer of electric units and causes a steep rise in the monthly electricity bill of residents.

Therefore, if the rooftop is installed with a solar panel in an inclined angle of roughly 25 to 33 degree facing the sunlight; looking at the temperature graph of Maharashtra 1266.52 W/m<sup>2</sup> of electricity is produced per day. In city of Thane, the average solar irradiance is 5.17 kWh/m<sup>2</sup> perday. It makes a saving of 5.17kWh/m<sup>2</sup> multiplied by Rs 11.5 per square meter (solar panels) per day. Extended, it will make an annual saving of Rs 21,701.52 through a single panel.



The chart below states that Thane City is sufficiently endowed with solar power to generate and store solar energy for domestic consumption (as could be seen in the chart below).

Figure no. 1



Source: <http://www.synergyenviron.com/tools/solar-irradiance/india/maharashtra/thane>

**Few of the functional areas that need to be considered are:**

- i. Area available on the rooftop.
- ii. Budget of the housing society.
- iii. Sunlight concentration / irradiance of the sunlight.
- iv. Minimum Six hours sunlight at 25 degree Celsius in the region.
- v. Alternate energy conversion through invertors/ parallel batteries.
- vi. Yearly Maintenance & replacement of batteries.

Every society with solar rooftop is to be installed with a Solar Energy Calculator connected to the solar panels. As the decent of sunlight falls on panels, it converts the



heat to the electricity. There is a conversion of Alternate Current to Direct Current and the said conversion is recorded. The conversion is in the form of kWh. The same could be financially interpreted by multiplying the units produced by rate per unit. The data could be published in the annual reports of the housing society. It could be a practice initiated to highlight return on investment of the members' funds.

Ideal cost for 1 kW (1080 watt) solar panel is approximately Rs 80000. Hence housing society with 100 families would require a solar panel of roughly of strength 5 kWh. Hence the investment may range up from Rs. 400000 to Rs 600000. The area required would be 2000 Sq. feet on the roof.

**Below are the charts presented for the following:**

- Solar panels calculations, space allocation etc
- Energy generation through solar panels.
- The amortisation schedule for the same (ignoring government subsidy)

Figure-2

Source: [https://solarrooftop.gov.in/rooftop\\_calculator](https://solarrooftop.gov.in/rooftop_calculator)



Figure No. 3

1kWp solar rooftop plant will generate on an average over the year 5.0 kWh of electricity per day (considering 5.5 sunshine hours)	
<b>1. Size of Power Plant</b>	
Feasible Plant size as per your Roof Top Area :	18.6 kW
<b>2. Cost of the Plant :</b>	
MNRE current Benchmark Cost :	Rs. 55000 Rs. / kW
Without subsidy (Based on current MNRE benchmark) :	Rs. 1023000.0000000001
With subsidy 30 % (Based on current MNRE benchmark) :	Rs. 716100
<b>New Subsidy will be updated soon</b>	
<b>3. Total Electricity Generation from Solar Plant :</b>	
Annual :	27900 kWh
Life-Time (25 years):	697500 kWh
<b>4) Financial Savings :</b>	
<b>a) Tariff @ Rs. 11.5 / kWh (for top slab of traffic) - No increase assumed over 25 years :</b>	
Monthly :	Rs. 26738
Annually :	Rs. 320850
Life-Time (25 years) :	Rs. 8021250

Source: [https://solarrooftop.gov.in/rooftop\\_calculator](https://solarrooftop.gov.in/rooftop_calculator)

Thus, it could be seen that with an average investment of Rs. 500000 over the next 25 years the society could make an approximately 700000 kWh of electricity using solar powers; saving Rs. 80,00,000. (all the electricity rates, standards, subsidies and factors remaining constant). This effort is equal to reduce a carbon saturation 6150 tonnes and also it equates to roughly 9840 trees being planted. To generate the reserves out of sinking funds and to procure loan from financial institutions an amortisation schedule is generated beneath.

Figure no. 4

Loan Amortization Schedule									
		Enter values				Loan summary			
Loan amount		\$	5,00,000.00			Scheduled per month		\$	24,428.33
Annual interest rate		%	9.00			Schedule number of payments			20
Loan period in years			4			Actual number of payments			20
Number of payments per year			4			Total early payments			
Start date of loan			01-01-2024			Total interest		\$	1,79,353.31
Optional extra payments									
Lender name:									
Prnt. No.	Payment Date	Beginning Balance	Scheduled Payment	Extra Payment	Total Payment	Principal	Interest	Ending Balance	Cumulative Interest
0	01-01-2024	5,00,000.00	0					5,00,000.00	0
1	01-07-2024	4,86,957.27	24,428.33		24,428.33	13,269.81	11,158.52	4,73,687.75	11,158.52
2	01-10-2024	4,73,687.75	24,428.33		24,428.33	12,644.70	11,783.63	4,46,043.15	22,942.15
3	01-01-2025	4,60,077.26	24,428.33		24,428.33	11,928.59	12,500.74	4,17,114.60	35,442.89
4	01-04-2025	4,46,186.80	24,428.33		24,428.33	11,213.63	13,215.70	3,86,900.90	48,658.59
5	01-07-2025	4,32,194.47	24,428.33		24,428.33	10,500.92	13,930.41	3,55,400.49	62,589.00
6	01-10-2025	4,17,909.40	24,428.33		24,428.33	9,790.50	14,645.83	3,22,614.66	77,234.83
7	01-01-2026	4,03,327.23	24,428.33		24,428.33	9,092.35	15,361.98	2,88,522.68	92,696.81
8	01-04-2026	3,88,455.90	24,428.33		24,428.33	8,406.03	16,078.95	2,53,143.73	109,775.76
9	01-07-2026	3,73,293.56	24,428.33		24,428.33	7,731.46	16,795.49	2,16,348.24	128,571.25
10	01-10-2026	3,57,841.23	24,428.33		24,428.33	7,067.65	17,512.84	1,78,225.40	148,984.09
11	01-01-2027	3,42,098.86	24,428.33		24,428.33	6,414.50	18,230.99	1,38,814.41	170,915.08
12	01-04-2027	3,26,066.50	24,428.33		24,428.33	5,772.01	18,950.98	94,513.42	195,366.06
13	01-07-2027	3,09,744.17	24,428.33		24,428.33	5,139.08	19,672.90	45,340.52	222,638.96
14	01-10-2027	2,93,131.86	24,428.33		24,428.33	4,514.71	20,396.19	0,117.53	252,842.77
15	01-01-2028	2,76,229.53	24,428.33		24,428.33	3,897.90	21,120.29	-3,117.76	285,063.02
16	01-04-2028	2,59,037.18	24,428.33		24,428.33	3,287.63	21,845.66	-7,345.31	319,308.68
17	01-07-2028	2,41,654.85	24,428.33		24,428.33	2,682.90	22,572.76	-11,576.46	355,580.22
18	01-10-2028	2,24,082.52	24,428.33		24,428.33	2,082.63	23,301.43	-15,803.11	393,881.75
19	01-01-2029	2,06,320.19	24,428.33		24,428.33	1,486.86	24,031.58	-19,934.39	434,216.36
20	01-04-2029	1,88,367.86	24,428.33		24,428.33	895.59	24,763.25	-23,865.64	476,680.71
21	01-07-2029	1,70,225.53	24,428.33		24,428.33	308.92	25,496.33	-27,607.41	521,174.30
22	01-10-2029	1,51,893.20	24,428.33		24,428.33	-682.35	26,230.98	-31,176.16	567,704.14
23	01-01-2030	1,33,370.87	24,428.33		24,428.33	-1,476.68	26,967.31	-34,643.83	616,260.31
24	01-04-2030	1,14,658.54	24,428.33		24,428.33	-2,280.99	27,705.30	-37,949.13	666,959.44
25	01-07-2030	95,756.21	24,428.33		24,428.33	-3,095.30	28,445.01	-41,094.44	720,004.00
26	01-10-2030	76,163.88	24,428.33		24,428.33	-3,919.61	29,186.34	-44,000.59	775,993.41
27	01-01-2031	55,871.55	24,428.33		24,428.33	-4,753.92	29,929.23	-46,754.40	834,737.81
28	01-04-2031	34,869.22	24,428.33		24,428.33	-5,607.23	30,673.54	-49,376.67	905,361.14
29	01-07-2031	13,156.89	24,428.33		24,428.33	-6,480.54	31,419.85	-51,926.94	988,438.00
30	01-10-2031	0	24,428.33		24,428.33	-7,383.85	32,168.16	-54,404.21	1,083,842.16



Government subsidy could be acquired for lowering the rate of interest on the loans taken for installation of the solar panels. Also rebate on property tax could be acquired from the local municipal authorities. Societies could also sell back to government the energy generated from the solar panels. Government is strongly requested to make provision for such buyback which could facilitate additional financial initiatives to the societies.

**Hypothesis Testing:**

H<sub>0</sub> – Societies will not gain financially from the solar panels installed.

H<sub>1</sub> - Societies will gain financially from the solar panels installed.

Table no. 1

	<b>COOPERATIVE HOUSING SOCIETIES</b>	
<b>AREA</b>	<b>WITH SUBSIDY &amp; FINANCIAL GAIN</b>	<b>WITHOUT SUBSIDY &amp; FINANCIAL GAIN</b>
DHOKALI	8	3
BALKUM	6	2
KOLSHET	12	5
VASANT VIHAR	4	2
MANORAMA	3	0
MAJIWADA	2	0
KAPURBAWDI	11	0

From the following 58 samples we conclude that most of the societies are willing to invest in the solar projects only if the government is willing to provide any kind of rebate, concession, interest rate benefits, tax reliefs etc. All such facilities are deemed to be received in form of monetary compensation. Any relief in Kind or Gratitude will not be enough for the residents to invest money in the solar projects. Hence it could

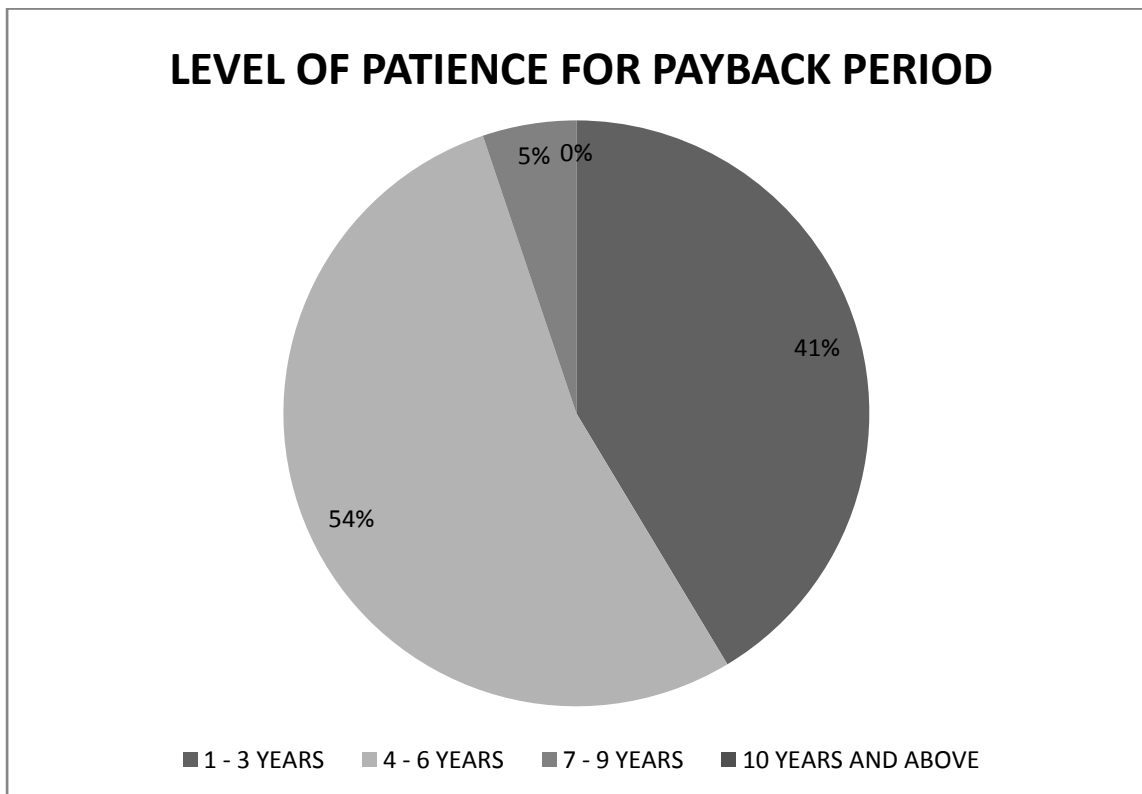


be concluded that the government must take proactive steps and provide reliefs and concession to the cooperative societies to promote solar energy generation.

H0 – Societies will not have the patience for the Payback period of 5 to 10 years.

H1 - Societies will have the patience for the Payback period of 5 to 10 years.

Figure no. 5



The chart here shows that the amount of patience of the residents to recover their money is substantially less than anticipated. Around 95% of samples want to recover their money withing 6 years of investment. The suggested graph says that a minimum of 7 to 9 years is required for the complete recovery of the investment taking into consideration the time value of money, the anticipated changes in the taxes and electricity rates, the maintenance charges etc. Hence it is required to raise the awareness of the long-term impacts and sustainability of the project. Irrespective of facts the project is economically viable.



**Conclusion:**

The process to solarise all our residential equipment, domestic appliances, lights in the society is a baby step towards a much greener planet. Efforts are undertaken to convert the solar energy into electricity sufficient to run automobiles and heavy industrial components also. However, no efforts will be sufficient or everlasting unless people support it wholeheartedly. People should inculcate a habit of spending with a long-term investment point of view having triple benefits – property tax subsidy, energy bill reduction & environmental development. Once we are open for this broad- and open-minded plan of action overlooking long lasting future then only we can create a sustainable environment to live in.

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## **GARBAGE MANAGEMENT AT HOME-CREATING A LIVEABLE WORLD FOR ALL!!**

*Supriya Das, F.Y. B. Ed. Student-teacher, Pillai College of Education & Research,  
New Panvel (W)*

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### **Abstract:**

In the process of human evolution and growth, we somewhere forgot or neglect our nature and have taken it for granted that the waste produced by us humans would decompose easily, but did not realise the consequences of things produced would be so long lasting that it would probably never get decomposed and cause pollution, health hazards and reduce our standard of living while disturbing our ecosystem at different levels.

Over a period of time so much waste is gathered around us that we have to work on the waste management system and learning how difficult it is now to control our littering habit. Producing less waste is becoming more and more challenging day by day.

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### **Introduction:**

Cleanliness is contagious, the moment we start it, it begins to spread. We, as human beings care for everything around us, especially when it comes to our young and loved ones. We care for their food, clothes, school, health and various other things like the entire environment around us, but wait, do we really care for our young ones?

When it comes to cleanliness, we have compromised to a great extent. Our young ones have seen us only cleaning ourselves and our homes. They have seen us cleaning our homes but keeping our surrounding dirty, which is why it became our second nature to throw garbage and make others responsible to clean it.

Today, from this prestigious platform, I propose to present a contagious cleanliness drive which is the responsibility of each and every individual. We believe that every good thing begins with us.



Under this topic, I have covered:

1. Spreading awareness about making less garbage - would focus on how to create less garbage around us.
2. Self-management of garbage at home – which helps us keep our home garbage free.
3. Self-management of plastic bags – the easiest way to reuse plastic bags at home.

### **Spreading awareness about producing less waste / garbage**

*How to create less garbage around us-*

- Temptation control

All these supermarkets have a range of plastic products and packaging to tempt their customers, let's not fall prey to the obvious marketing strategies but control our desire to own it.

Even if packaging is part of the product, let's remove and leave it at the supermarket itself, so we carry home only what we purchased.

E.g. shoe boxes and any excess packaging materials.

Let us avoid buying eatables, cooked, ready to cook or preserved food packed in plastic containers, pouches or wrappers.

- **Promise to disconnect, discard and disassociate**

There is nothing called good plastic, bad plastic, user friendly plastic or food friendly plastic.

Any gift, wrapped with a beautiful piece of cloth would still be able to sustain the element of surprise.

The basic IDEA here is to reverse the market process, break the chain of bringing plastic home and creating unnecessary garbage. Instead let the supermarket own the responsibility of accepting excess packaging from the brands.

Their feedbacks will help Brands to notice this trend and changes will be inevitable.

Let's inculcate a habit of accepting right straight away and say no to wrong things no matter how tempting they are.

- **Self-management of waste/ garbage at home**



*Let us keep our home garbage free*

**Materials required:**

Take a plastic bucket or any container which is old and big

Few medium sized stones from wherever possible or pieces of hard plastic such as bottle cap/ broken pieces of toys or instruments.

Arrange some mud.

**Procedure:**

Place stones / plastic bottle caps / broken pieces of plastics at the bottom of a container which you want to throw away.

Add mud to it, just enough to cover the stones properly.

Add all wet garbage to it.

Cover it with mud again.

Keep the container at a convenient place.

Keep adding wet garbage to this container everyday or as and when required, and cover it with mud.

This helps to keep your house clean and garbage free and you can breathe easy.

Dig around the tree available close to you and empty out your container there. Cover the pit properly and there you are ready again with your container to manage wet waste of our home.

- **Self-management of plastic bags**

*The easiest way to reuse plastic bags or products at home*

**Materials required:**

Plastic bags / broken pieces of plastic

Scissors

Cement, water and gloves

**Procedure:**

Cut plastic bags into small pieces / break down plastic products

Mix cement and water in a container (thickness as desired)



Spread 2-3 plastic bags at even surface, spread some wet cement, add plastic cut outs or pieces to it, add some more cement to it and let it dry / keep adding layers.

A brick is ready for use.

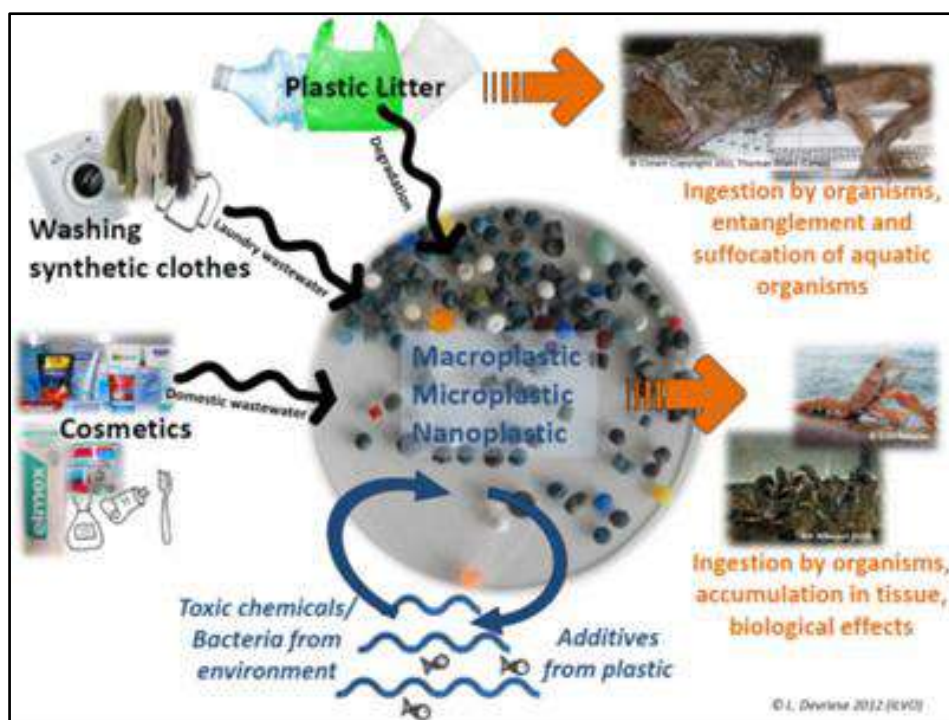
### Hope for Human being:

It is entirely on us how creative we can get to produce less waste and manage it well, so the scope is endless, the purpose of minimizing and managing waste at home should be the aim.

**Conclusion:** Every good deed starts from us!

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*“Plans to protect air and water, wilderness and wildlife are in fact plans to protect man.” —Stewart Udall*





### **CASE STUDY: AIR PURIFIERS IN CHINA**

**Anna Susan George**, F.Y. B.Ed. Student-teacher, Pillai College of Education &  
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#### **Abstract:**

Pollution has become one of the most debated and concerned topics of all times by global citizens. It is spreading like a wildfire in all regions of the world. Two most significant types of pollution is air and water pollution. There are also many more types like soil contamination, noise pollution, light pollution etc. Air pollution is the largest cause of pollution deaths, responsible for about 6.5 million deaths according to recent study. The status of air pollution in Delhi is increasing day by day and has adverse impacts in the quality of life. Environmental pollution with its health impact is a key issue for sustainable development. With advancements in technology, innovative techniques are implemented to reduce harmful effects of polluted air aiming towards a sustainable future. This paper highlights the incredible approach of china in the successful construction of world's largest air purifier which effectively purifies the air and makes it breathable.

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#### **Introduction:**

Air pollution is one of the most serious problems in the world. It refers to the contamination of the atmosphere by harmful chemicals or biological materials. According to the World's Worst Polluted Places by Blacksmith Institute in 2008, two of the worst pollution problems in the world are urban air quality and indoor air pollution. Statistically, nine out of ten people worldwide are exposed to levels of air pollutants that exceed World Health Organization safe levels. This means that with every breath, you are sucking in tiny particles that attack your lungs, heart and brain. Urbanisation, motorization has led to decline in air quality. Air quality is disturbed by interaction between natural and anthropogenic environmental condition. People exposed to poor quality air result in major health issues. These all reflects the urge for innovations and advancements that can make best use of science and technology.



### **Recent reports:**

India, Pakistan, Bangladesh, China have ranked top in pollution. Bangladesh has the worst air, followed by Pakistan and the India. Greenpeace report published last year, 1.2 million people die every year in India due to air pollution. Out of the 30 most polluted cities worldwide, 22 are in India, remaining 8 cities are in Pakistan, Bangladesh and China. The World Health Organization estimates seven million people are killed every year due to air pollution, while non-fatal effects of over-exposure to PM2.5 include irregular heartbeats, aggravated asthma and decreased lung function, according to the United States Environmental Protection Agency. Chinese cities, in particular, registering a 12 percent fall in average PM2.5 concentrations since 2017.

While the Asian economic powerhouse still accounted for 22 of the 50 most polluted cities worldwide, its capital, Beijing, showed a marked improvement on 2017 levels of pollution, with the average annual presence of particulates falling by more than 13 percent last year.

In U.S. and Canada, while average air quality is good in global comparison, historic wildfires had a dramatic impact on air quality in August and November, with 5 out of 10 most polluted cities in the world during August found in North America. Massive populations, including on continental Africa and South America, do not have adequate air quality measuring infrastructure.

In all such severe conditions, all institutions, corporate houses, government, social groups striving hard to improve air quality throughout country.

### **What is Smog?**

Smog is a yellowish or blackish fog formed mainly by a mixture of pollutants in the atmosphere which contains fine particles and ground level ozone. It is hazy air that makes breathing difficult. PM 2.5 finest particulate matter in smog is inhaled into lungs. Smog reduces visibility. The term "smog" was first used in the early 1900s to describe a mix of smoke and fog. The smoke usually came from burning coal. Smog was common in industrial areas, and remains a familiar sight in cities today. Today, most of the smog we see is photochemical smog. Photochemical smog is produced when sunlight reacts with nitrogen oxides and at least one volatile organic compound (VOC) in the atmosphere. Nitrogen oxides come from car exhaust, coal power plants,



and factory emissions. VOCs are released from gasoline, paints, and many cleaning solvents. When sunlight hits these chemicals, they form airborne particles and ground-level ozone—or smog.

Ozone can be helpful or harmful. The ozone layer high up in the atmosphere protects us from the sun's dangerous ultraviolet radiation. But when ozone is close to the ground, it is bad for human health. Ozone can damage lung tissue, and it is especially dangerous to people with respiratory illnesses like asthma. Ozone can also cause itchy, burning eyes. Smog is unhealthy to humans and animals, and it can kill plants.

Many countries, including the United States, have created laws to reduce smog. Some laws include restrictions on what chemicals a factory can release into the atmosphere, or when the factory can release them. Some communities have "burn days" when residents can burn waste such as leaves in their yard. These limits on chemicals released into the air reduce the amount of smog.

### **Xian: Smog Sucking Tower**

The metropolitan areas are the most important developing urban areas with serious air pollution problems. Chemical and environmental engineers, architects and structural engineers, urban planners and health scientists, physical scientists are starting to answer specific questions about how cities and the urban environment will interact in the face of global problem of air purification.

An experimental tower over 100 metres (328 feet) high in northern China – dubbed the world's biggest air purifier by its operators – has brought a noticeable improvement in air quality. The tower has been built in Xian in Shaanxi province. The Xi'an smog tower project was launched in 2015 as a trial version of a much larger system the research team hopes will be implemented in other Chinese cities in the near future. The full-sized tower would measure 500 meters tall and 200 meters in diameter, with greenhouses covering nearly 30 square kilometres. This system is hoped to be powerful enough to purify the majority of the air within a small city. The quiet, energy-efficient air purifying towers are a potential cost-efficient solution to the China's smog problem. However, building many of them to cover a large and dense city could be impractical, considering how much space they require, the one in Xian

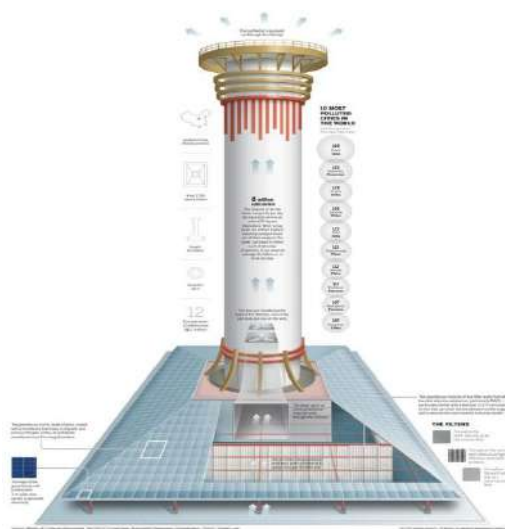


having been built in one of the city's outer industrial zones. Nonetheless, the towers represent China's continued efforts to aggressively address its air quality problems.

According to researchers from the Institute of Earth Environment at the Chinese Academy of Sciences, the tower has managed to produce more than 10 million cubic metres of clean air per day. In the 10 square kilometres observed area of the city, smog ratings have been reduced to moderate levels.

### How it filters air?

The device will be able to take in air from all 360-degree angles and generate 1,300,000 cubic metres of clean air per hour. The smog tower sucks the polluted air, which is purified by the multiple layers of filters before recirculating into the atmosphere. To clean the air, polluted smog is drawn in through a series of greenhouses surrounding the base of the tower and heated by the solar energy. Edge of greenhouse roof contains solar panels 3m wide that generate electricity. The newly hot air then rises up the tower through multiple scrubbing filters before it is



released back into the atmosphere. This technology called "solar-assisted large-scale cleaning system" (SALSCS) was first developed by

David Y.H. Pui's team at the University of Minnesota in 2014. This method allows the air to be cleaned using relatively minimal electric power. To purify the air; the highly effective H14 grade Highly Effective Particulate Arrestance (HEPA) filter is

used. This filter exchanges the air in the room by using a fan to draw the air through the purifier. The impurities remain on the filter leaving pure air to continue on through the machine and re-enter the room. As air flows into the purifier, the finer the sieve is, the smaller the particles it can trap onto the filter. HEPA air filters are made from very tiny glass fibres that are made into a tightly woven paper. They are guaranteed to trap 99.97% of airborne particles above 0.3 microns. The more times the air passes through the HEPA filter the cleaner the air will be.





The impact of purification is monitored by pollution monitoring stations situated at different places. It has been discovered that PM 2.5 fell 20% when pollution level is critical.

The method uses relatively minimal electric power consumption during daylight hours. It is an effective low cost method. The only limitation is that this tower can treat only small areas covered up to certain radius.

### **Hope for India:**

Considering the national capital's air condition in mind, India is also planning to take the same initiation. To tackle pollution, Delhi based company 'Kurin Systems' has got the patent to built air purifier. Kurin Systems have designed a 40x20 foot smog tower that will have the capacity to clean 32million cubic meters of air per day. The project is at a preliminary stage and will be given the green signal if the pilot is found effective. The project is headed by IIT Bombay in collaboration with IIT Delhi and the University of Minnesota. The central pollution control is also involved in this project.

### **Conclusion:**

India is a land of constant surprise, where through sheer will, people have the ability to achieve the unimaginable. Over the past few years, we have made rapid developments across ease of business, renewable energy, taxation, logistics and infrastructure. But it is now time, to take action and to show the world that the country has the ability to not only manage this pollution problem but in a similar manner, take leaps and bounds forward to improve it. Reducing the deaths and ill health from air pollution is one of the targets of sustainable development goals. Air purification in cities is one of the crucial challenges of 21st century since it requires large funding and mass production. Smog reducing technologies mainly treat the effect than eliminating air pollution at source.

Smog reducing towers provide great opportunities to explore citizens to experience the difference of clean air, empower them to self organize and demand change from government. This project is a series of urban innovations to reduce pollution and provide an inspirational experience of a clean future.



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## नैसर्गिक संपत्तीचा विचारपूर्वक वापर

प्रा.सौ.लक्ष्मी विष्णु भंडारे .संस्थामाता सुशिलादेवी साळुंखे महिला शिक्षणशास्त्र  
महाविद्यालय तासगांव

### प्रस्तावना:

पर्यावरण म्हणजे मानवाच्या सभोवतालची परिस्थिती किंवा सजीवाच्या वस्तीस्थानाभोवती प्रत्यक्ष किंवा अप्रत्यक्ष परिणाम करणाऱ्या घटकांचे भूजैविक दृश्य, पर्यावरण, वने, पर्वत, सरोवर, झाडे, जल यांचा मनुष्याच्या जीवनावर परिणाम होत असतो. म्हणून आपले ऋषीमुनींनी म्हटले आहे जोपर्यंत या भूतलावर पर्वत, वने, सरोवरे आहेत तोपर्यंत तुम्ही तुमची मुले व भावी पिढ्या सुखाने जगतील. जर आपण या कृतघ्नपणे माणसाने पर्यावरणाचा परिणामी स्वतःचा नाश ओढवून घेतलाय. हे स्वतःच्या पायावर कुऱ्हाड मारण्यासारखे आहे. पर्यावरणाचा समतोल ढासळत चालला आहे. लोकसंख्येचा विस्फोट होत आहे. आज आपल्याला या उद्योगीकरणामुळे, शहरीकरणामुळे नैसर्गिक साधनसंपत्तीचा अविचार, वापर यामुळे विनाश ओढवला आहे. मनुष्याच्या हव्याशापोटी या सर्व गोष्टी घडतात. म्हणून गांधीजी म्हणत की There is sufficient in the world for man's need but not for man's greed.

आपल्याला आवश्यक असणारे सरपण, वनौषधी, कागदासाठी लागणारा बांबू, इमारतीसाठी लाकूड, उद्योगधंद्यासाठी आवश्यक असणारा कच्चा माल इत्यादीमुळे मोठ्या प्रमाणावर जंगलतोड झाली. त्यामुळे जमिनीवरील आच्छादन गेले. त्यामुळे मातीची धूप झाली. वृक्षसंपत्ती कमी झाली. त्यामुळे पावसाचे प्रमाणे कमी झाले. परिणामी देशाच्या अर्थव्यवस्थेवर ताण पडत आहे.

महाराष्ट्रात अनेक वेळा ओला दुष्काळ व कोरडा दुष्काळ यामुळे काही भागात अतिवृष्टीमुळे जीवित हानी वित्तहानी होते तर कोरडा दुष्काळामुळे प्राण्याची मोठ्या प्रमाणात हाल होतात. ना चारा ना पाणी अशी स्थिती होते. शेतात



कुठेही पीक घेता येत नाही. केवळ पाण्यासाठी दाहीदिशा फिरून पाणी आणले जाते.

मानवाने याची भयानकता ओळखून कोणत्याही प्रकारची संकटे ओढवण्याअगोदर, ओढवून नये यासाठी काळजी घेतली पाहिजे.

नद्या स्वतःचे पाणी स्वतः पित नाहीत. झाडे स्वतःची फळे स्वतः खात नाहीत. निसर्गातील प्रत्येक घटक आपल्यासाठी झटतो. कार्बनडॉयक्साईड स्वतः घेतात व मानवाला ऑक्सिजन पुरवतात. मग मनुष्य किती कृतघ्न आहे! असे मनात येते. ओझोन म्हणजे या पृथ्वीतलावरचा आत्मा. त्याच्यामुळे पृथ्वीचे आयुष्यमान व तापमान स्थिर राहण्यास मदत होते.

**In nature there are no rewards or punishments.**

**There are only consequences.**

जसे मानवाला श्वासोच्छ्वास महत्वाचा आहे तितकेच पर्यावरण संरक्षण महत्वाचे आहे. जसे एक दाणा पृथ्वीवर रूजत घातल्यावर पृथ्वी आपल्याला भरभरून धान्य देते तसेच या पर्यावरणातील स्वच्छ, सुंदर निसर्गाच्या बचावासाठी सगळ्यांनी ठरवले पाहिजे. निसर्ग हा दारातच, घराच्या अंगणापासून सगळीकडे असायला हवा.

**Education Activities for Climate Changes :**

उद्दिष्टे :

- १) निसर्गात समतोल राखण्यासाठी नैसर्गिक साधनसंपत्तीचा तारतम्याने वापर करण्याची क्षमता विकसित करणे.
- २) मानवी जीवनशैली व नैसर्गिक स्रोतांचा व्हास यातील परस्परसंबंध लक्षात आणून देणे.
- ३) जीवनाची गुणवत्ता राखण्यासाठी प्रदूषण नियंत्रण खाली ठेवण्याची गरज ओळखणे.



- ४) पर्यावरणीय समस्या सोडवण्यासाठी व्यक्ती समाज व शासन यांच्या भूमिकांचा अभ्यास करणे.
- ५) लोकसंख्या वाढीची कारणे व पर्यावरणावर होणारे त्याचे दुष्परिणाम याविषयी जागरूक बनविणे.
- ६) घरात सुधारणा करण्याच्या सवयी कृतीचा विकास करणे.
- ७) स्वच्छ, हरित व सुरक्षित पर्यावरणासाठी योगदान देणे.

प्रत्येक व्यक्ती माहिती तंत्रज्ञानाच्या युगात नवनवीन ज्ञान आत्मसात करत असते. आज शिक्षण क्षेत्रातील व्यक्तीबाबत अखंड ज्ञानयज्ञाला विशेष महत्त्व आहे. स्वतः सतत प्रज्वलित असणारा दीपच दुसऱ्या दिपाला प्रज्वलित करू शकतो. म्हणून पर्यावरण शिक्षण ही निसर्ग संरक्षण, आरोग्य, चिरंजीवी विकास यासाठी त्याची नव्याने गरज निर्माण झाली आहे. आज अनेक शिक्षक आपल्या दैनंदिन अध्यापनातून आणि उपक्रमातून पर्यावरण शिक्षण समस्या, तिचा होणारा न्हास याची जाणीव करून देत असतात. सर्वच विद्यार्थ्यांत या पर्यावरण पैलूची शास्त्रीय माहिती अचूकतेने पोहचविली पाहिजे. आज पर्यावरणाच्या ज्वलंत व महत्त्वाच्या समस्या शाळा व महाविद्यालयातून जाणीव जागृती व्हावी यासाठी प्रयत्न व्हावे. आज बघावे तिकडे प्रदूषणाचे साम्राज्य पसरलेले दिसते. हे प्रदूषण ही काही एका घटकापुरते मोजकेच नाही तर त्याने जमीन, हवा, पाणी, ध्वनी या साऱ्यांचाच मक्ता केव्हाच घेऊन टाकला आहे.

#### **पर्यावरण शिक्षणाचे महत्त्व :**

पर्यावरणाची अवस्था ज्या वेगाने व पध्दतीने पर्यावरणाचा न्हास होत आहे. लोकसंख्येची वाढ झाल्याने, नैसर्गिक स्रोतांच्या न्हासाचे व प्रदूषणाचे संकट उभे टाकले आहे हे सर्व विषयाचे गांभीर्य व तीव्रता विद्यार्थ्यांना लहान वयापासूनच कळली तरच पुढे काहीतरी विधायक कार्य घडण्याची शक्यता आहे. याच उद्देशाने सर्वोच्च न्यायालयाच्या निर्णयानुसार हा स्वतंत्र व अनिवार्य विषय म्हणून जाहीर करण्यात आला आहे. तसेच १९७२ साली स्वीडनमधील



स्टॉकहोम येथे भरलेली परिषद जागतिक स्तरावर पर्यावरण विषयक जाणीव जागृती घडवून आणण्याची गरज लक्षात घेऊन शिक्षण घेतील.

### पर्यावरणीय समस्या :

आज जीवनात प्रचंड अस्थिरता, अशांतता, अनिश्चितता भरतीच्या सागरात सापडलेल्या नावेप्रमाणे हेलखावे खाते आहे. तर कोणत्या पर्यावरणीय समस्या येतात ते पाहू.

१) कुंभमेळा आयोजित करून चेंगराचेंगरीत भाविकांचा मृत्यू ह्या घटना घडत असतात. शासन देखील यासाठी सामान्य जनतेच्या कष्टातील पैशाची उधळण करून काय साध्य केले. यातून केवळ पर्यावरणाचा बळी घेतला. या कुंभमेळ्यामुळे अनेक प्रश्न निर्माण झाले आहेत. लाखो भाविक देशभरातून येतात. पहिले नुकसान होते ते नद्यांचे प्रदूषण. या नदीमध्ये स्नान केल्याने पापक्षालन होते म्हणून या पात्रात अंधोळ करण्याची सर्वांची धडपड चाललेली असते. यातच दिवे सोडणे, वस्तू दान करणे, विविध यज्ञ करणे अशासारख्या गोष्टी केल्यामुळे पर्यावरण प्रदूषित होऊन अनेक समस्या निर्माण होतात. केरकचरा पडतो, स्वच्छतागृहे, दळणवळण सुविधा इत्यादीमुळे हवा प्रदूषण, जलप्रदूषण, ध्वनीप्रदूषण, भूमीप्रदूषण मोठ्या प्रमाणात होऊन परिसरातील लोकांच्या आरोग्यावर परिणाम होतो. या सोहळ्यामुळे पर्यावरणाला धोका पोहचतो हे विसरतो.

आज आपल्या देशात अनेक आव्हाने आहेत. दारिद्र्य, भूक, निरक्षरता, जातीयता अशा अनेक आव्हानापेक्षा कुंभमेळा महत्वाचा वाटतो. एकीकडे देश महासत्ता बनू पाहतोय तर दुसरीकडे असे मेळावे आयोजित करून उधळपट्टी करण्यापेक्षा ज्ञानमेळावा आयोजित करायला हवे म्हणून शासनाने कशावर पैसा खर्च करावा हे ठरवावे. देश विकास की पर्यावरण न्हास.

२) घरात माणसे किती? वाहने किती? यांचा जर मेळ घातला तर माणसे दोन वाहने तीन अशी अवस्था दिसते. तुकोबांनी वृक्ष वेर्लीना आपले सगे सोयरे मानले आहे. या झाडापासून आपल्याला प्राणवायू मिळतो. आपल्या गरजा



सगळ्या ह्या निसर्गातून भागतात. आपल्या प्राणवायूचे हे कारखाने आहेत. हे कारखाने नष्ट करत आहेत. शहरात दगदगीच्या जीवनात शांती मिळत नाही. ही शांती शोधायला निसर्गाकडे धावतो आहे. याला जबाबदार तर आपणच आहे.

३) शहरात दगदगीच्या जीवनात शांती मिळते कुठे! माणूस ती शोधायला निसर्गरम्य परिसराकडे वळतो. पण अशी वृंदावने, बागा आहेत तरी कुठे? ती तर मानवाने टुमदार इमारती, मोठमोठे कारखाने, बांधकामे याकरिता वृक्षाचा नाश केला. वृक्षतोडीमुळे डोंगर उजाड झाले. त्यामुळे वातावरणात रखरख वाढली. पाऊस अनियमित झाला व पर्यायाने पर्यावरणाचा, निसर्गाचा समतोल बिघडला. स्वच्छ हवेऐवजी प्रदूषित हवा येऊ लागली. त्यामुळे रोगराई वाढू लागली. धुरामुळे सातत्याने श्वसनाचे आजार वाढले. त्यामुळे वेळीच जागे झाले पाहिजे. एके ठिकाणी संत सेना महाराजानी म्हटले होते 'खडकाखाली राहणाऱ्या बेडकाला आपण चारा देत नाही तर आपण त्याला नष्ट करण्याचा अधिकार आहे काय!' पर्यावरण दूषित करणारे कृमी, कीटक खाऊन बेडूक पर्यावरणाला मदत करतो. तो मानवाचा मित्र ठरतो. वृक्ष तोड झाल्याने प्राणी जीवन विस्कळीत होऊन त्यांना निवाऱ्याची उणीव भासते. त्यामुळे त्यांचा मानव वस्तीत शिरकाव होतो आहे. पाणी, हवा, प्राणी, वृक्ष या सर्वांचा हितकारी संगम म्हणजेच पर्यावरणाचा समतोल साधणे होय

४) वृक्ष हा मानवाचा खरा मित्र आहे. तो त्याला लागवड करून सांभाळ करणाऱ्याला आणि तोडणाऱ्याला ही सारखीच सावली देतो. फळे देतो, फुले देतो. तो कुणाचाही दुस्वास करत नाही. ऊन, वारा, पाऊस, धूळ, कार्बनडायऑक्साईड सर्व काही सहन करून मानवाला मात्र पर्यावरणाच्या समतोलाचा संदेश देणाऱ्या वृक्षाबद्दल बोलताना ज्ञानेश्वर माऊली म्हणतात. 'समबृद्धीची शिकवण देणारा हा महान वृक्षांचे याचे आपण संवर्धन केले पाहिजे.'



वृक्ष म्हणजे पृथ्वीने आशीर्वादासाठी उचललेले हात आहेत. वृक्षाच्या हया फांदया म्हणजे आपल्या मस्तकावर दिलेला आशीर्वाद आहे. हा आशीर्वाद नसतील तर मानवजीवन टिकणार नाही. बालपणीच्या पाळण्यासाठी मृत्युनंतरच्या सरपणापर्यंत वृक्ष आपल्याला सोबत करतो. या भूतलावर आधी वनस्पती व नंतर प्राणीसृष्टी जन्माला आली आहे जर हया वनस्पती नष्ट झाल्या तर त्या मागोमाग मानवी जीवनही नष्ट होईल.

शहरातील सिमेंट काँक्रीटच्या उंच जंगलापेक्षा आपणांस जीवन ताळयावर आणण्यासाठी उंच उंच वृक्षराजीची मानवाला तनशांतीपेक्षा मनःशांतीसाठी जास्त भटकावे लागत आहे. बाजारात पैसा दिल्यानंतर अनेक वस्तू मिळू शकतात पण मनःशांती मिळू शकत नाही. निसर्गरम्य वातावरणासाठी वृक्षाची गरज आहे. सामाजिक वनीकरण इ. माध्यमातून केलेल्या वृक्षांचे संवर्धन करणे काळाची गरतज आहे. आपल्या या नियोजनशून्य वृत्तीमुळे पर्यावरणाचा समतोल ढासळला आहे. आज सर्वांनी वृक्षरोपणाचा ध्यास घेतला पाहिजे. झाडाविना जीव म्हणजे जीव नसलेल्या प्राण्यासारखे आहे. आपल्याकडून पर्यावरणाचा समतोल राखण्यासाठी काही केले जात नसेल तर किमान पर्यावरणाचा असमतोल होईल असे आपणाकडून काही होऊ नये याची दक्षता आपणच घ्यायला हवी.

सर्व अंधाधुदीत संवदेनशील मनुष्य मात्र पूर्वीचे सुखद अनुभव विसरला आहे. सागरी वाळूत दिवसभरात एकदा तरी किल्ले बांधणे, मातीत खेळणे, झाडावरून बागडणे, झाडांची असंख्य नमुन्याची फळे झाडावरून चढून खाणे, रानोमाळ हिंडून निसर्गातील हजारो रंगाची पारख करणे. वन्य पशू पक्ष्यांची दंगामस्ती करणे, वाहत्या पाण्याचा पोहण्याचा मनमुराद आनंद लुटणे. जंगल दऱ्याखोऱ्यातून कच्च्या पक्व फळांचा आस्वाद घेणे. प्रत्येक वळणावरील अनुभवांतून साकारलेला समुद्र म्हणजेच जीवन होय. पण या मनमुराद कल्पना, ते स्वातंत्र्य नी चंचलता निरागस व खळखळत्या पाण्यासारखी अवखळता असे ते दिन आजच्या या जागतिकीकरण, प्रदूषण, दहशतवाद यासारख्या अनेक





गोष्टीनी संवेदना हरवत चालल्याची जाणीव होते. आज जीवनात प्रचंड अस्थिरता, अशांतता, अनिश्चितता जाणवत आहे. लोकसंख्या वाढीचे दुष्परिणाम जाणवतात. लोकसंख्यावाढीमुळे नवी तंत्रे, अवजारे, खते, यामधून प्रदूषण कसे होते ते समजावून देता येईल. परिसरातील उद्योगधंदे यामुळे हातभार लावणारे उद्योग व औद्योगिक प्रक्रिया याविषयी माहिती होते. या विज्ञानामुळे एकीकडे प्रगती होते तर दुसऱ्या बाजूने ते संपूर्ण मानव जातीलाच नव्हे तर सृष्टीच्या नाशाला खाईत लोटत आहेत याचे भान यायला हवे. विज्ञानाचा उपयोग तारतम्याने झाला पाहिजे. परिसरातील टाकाऊ वस्तूपासून टिकाऊ पदार्थ बनविणे. वृक्षारोपण करून हवा शुद्ध करण्यात मदत करणे. मानवाने आरोग्याची काळजी घेऊन आरोग्य विषयक चांगल्या सवयी अंगी बनविणे इ. घटकातून पर्यावरण रक्षणाची दशसूत्री विद्यार्थ्यांपर्यंत पोहचविता येईल. तसेच समाजाचा जबाबदार नागरिक म्हणून आपली भूमिका काय आहे असा प्रश्न विद्यार्थ्यांच्या मनात निर्माण करून त्यांना विचारप्रवृत्त बनविले पाहिजे.

#### पर्यावरण संरक्षणासाठी उपाय :

- १) शासनाने कायदे व नियम बनविले त्याचे पालन काटेकोरपणे झाले पाहिजे.
- २) शासनाने ३३ कोटी वृक्षलागवड हा उपक्रम राबविते पण वृक्षलागवड होते पण संरक्षण करून किती झाडे जगली याचा पाठपुरावा तेथील संस्थेने करावा व या शासन उपक्रमास हातभार लावावा.
- ३) निसर्ग बदलतोय असे आपण म्हणतो पण आपलाही वाटा मोठा आहे हे विसरतो. त्यासाठी निसर्ग बदलण्याची कारणे शोधून आपली वृत्ती तशी ठेवावी.
- ४) मानसिक ताणातून मुक्त होण्यासाठी अनेक ठिकाणी सहली काढता पण शांत प्रसन्न वातावरण हे आपल्या सभोवताली बनवा यामुळे सहलीत जे पाहणार ते आपण आपल्या भोवताली परिसरात पाहता येईल.



५) आपण वृक्षतोडीचा विनाश करून पर्यावरण बिघडवतो. रस्ते रूंदीकरण, कारखाने बांधण्यासाठी वर्षानुवर्षे मोठ्या प्रमाणात वृक्षतोड करतो. आपला विनाश आपणच करून घेतो. यासाठी रस्ता रूंदीकरणानंतर रस्ताने दुतर्फा झाडे लावावीत.

६) आज मोबाईल हा जीवनाचा अविभाज्य अंग बनला आहे. पण याचा परिणाम आपल्या वर होतोच. शिवाय वर्षानुवर्षे अनेक जीवांचे, पक्ष्यांचे आश्रयस्थान असलेले, दमलेल्या पांथस्थास सावली देणारा, विश्रांतीची हक्काची जागा असलेल्या हे सर्व केवळ टॉवर उभारून सर्वांचे जीवन हिरावून घेतो याचे भान ठेवून टॉवर उभे करावे

७) प्रदूषण मुक्त भारत ही घोषणा शासनाने राबवावी. अनेक प्रकारची प्रदूषणे, आवाजाची तीव्रता ठराविक मर्यादेपलिकडे गेल्यास तो आवाज आपल्याला नकोसा होतो. हा कर्णकर्कश गोंगाट रस्त्यावरील चालणाऱ्या व दिवसेंदिवस वाढणाऱ्या वाहनांचे हॉर्न, लोह, पोलाद निर्मितीचे कारखाने, छापखान्याचा आवाज, लाकडाचे कारखाने, कापडगिरण्या, मिक्सर, विविध समारंभात लावले जाणारे आवाजवर्धक लाऊडस्पीकर्स, विमानांचा आवाज या सान्यामुळे होतो. यांचा परिणाम म्हणून मानवाला बहिरेपणा, मानसिक शांती नष्ट होणे, डोकेदुखी, चिडचिडेपणा या व्याधी जडतात सातत्याने मोबाईलचा ध्वनी ऐकल्याने किरणे प्रारणे यामुळे कर्करोगाची शक्यता नुकतीच शास्त्रज्ञांनी वर्तविली आहे. प्रदूषण मुक्त कसे करता येईल याचे नियम पालन कटाक्षाने करावे.

८) सर्वात जास्त प्रदूषण हे विज्ञानाच्या आधुनिक जगात आण्विक कचरा, जुने लॅपटॉप, कॉम्प्युटर फ्लॉपी, सी.डी. हार्ड डिस्क, खराब टि.व्ही., घरातील इलेक्ट्रॉनिक वस्तू, कारखान्यातील खराब वस्तू याचे विघटन होत नाही. यामुळे जमीन, हवा, पाणी या प्रमुख घटकांचे प्रदूषणामुळे पर्यावरणातील जैविक संतुलन बिघडवण्यास कारणीभूत ठरतात. याचे नियोजन होणे गरजेचे आहे.



९) सर्वात मोठी समस्या म्हणजे परिसरातील वन्यप्राणी, पशू, पक्षी जवळून पाहायला मिळायचे पण आज ह्या दुर्मिळ पक्ष्यांचे फोटो पेपरमधून पाहायला मिळतात. कारण वृक्षतोडीमुळे दुष्काळ, दुष्काळामुळे कर्जबाजारीपणा, पाण्यासाठी वनवन, शेतकऱ्यांच्या आत्महत्या अशा समस्या निर्माण झाल्या नसत्या यासाठी प्राणी, पक्षी व जमीन यांचे संरक्षण करायला हवे.

१०) १९५२ पासून शासनाने वनमहोत्सव, देवराई, वनराई अशा विविध चळवळी राबविते. सामाजिक वनीकरण, वृक्षारोपन, वृक्षसंवर्धन केले जात आहे पण जमीन, पाणी, हवा यांचे प्रदूषण होते आहे. यासाठी अशा उपक्रमाची जबाबदारी गावात सोपावून त्याचा पाठपुरावा करून स्पर्धेत सहभागी होण्यास प्रोत्साहन द्यावे. सर्वाना सहभागी करून घेऊन काहीना काही बक्षीस ठेवावे. नंबर काढून त्यांनी वृक्षसंवर्धनचा पाठपुरावा करावा.

११) भारतात आढळणारे अनेक आजार हे केवळ दूषित पाण्यामुळे होतात. यासाठी कारखान्यातून उत्सर्जित होणारे द्रव्य, मळी, साफसफाई, शीतकरण, रसायनांचे विलिनीकरण या साऱ्यांचे सांडपाणी शेवटी नदी, नाले, समुद्रात सोडले जाते. शहरी व ग्रामीण भागात सांडपाणी हे तर औद्योगिक वसाहतीच्या सांडपाण्यापेक्षा चारपटीने जास्त असते. भारतातील ३११९ महानगरे व शहरे यापैकी फक्त २१७ शहरात अंशतः सांडपाण्याची योग्य विल्हेवाट लावली जाते. यासाठी शासनाने याचे नियम तयार करून सांडपाण्याची योग्य विल्हेवाट लावावी.

१२) जमिनीवरच्या प्रदूषणामध्ये उल्लेख करावा तेवढा कमी पडेल. घरातील केरकचरा रस्त्यावर फेकणे, अंगणात टाकणे, ऑफिस, कंपनी याठिकाणी पान, तंबाखूच्या पिचकान्या मारणे, निरूपयोगी कागद, पिशव्या, कापडाचे गोळे कोठेही फेकणे, रस्त्यावरील कचरा कुंड्यातून ओलांडून वाहणारा केरकचरा, प्लॅस्टिक, भंगार, शिवाय भाजी विक्रीचा पडलेला कचरा, उघड्यावर केले जाणारे मलमूत्र विसर्जन यामुळे परिसरात रोगराई निर्माण होते. त्यामुळे त्यांच्यावर कडक कारवाई करावी.



१३) विद्यार्थ्यांमध्ये पर्यावरणविषयक विशिष्ट उद्दिष्टे फलद्रुप झाल्याचे दिसून यायला हवेच.मुलांमध्ये प्रकल्पासंबंधी काम करता करता इतरही काही रोजच्या जीवनात कामी येणारी काही कौशल्ये रूजली जातात की नाही ते पहावे. सभोवतालच्या झाडांची विविध ऋतूंमध्ये दिसणारी रूपे पाहून त्यांच्या माहितीचा संग्रह करणे. असे वर्षभर चालणारे प्रकल्प देऊन सजगता निर्माण करता येते. त्यामुळे कृतियुक्त आणि आनंददायी शिक्षणाचे अतिशय प्रभावी साधन आहे.

१४) जैवविविधता वाढविणे हा आजचा सर्वात महत्वाचा प्रश्न आहे. यासाठी झाडे लावणे आवश्यक आहे हे पटवून देऊन झाडांवर अवलंबून असणारे प्राणी पक्षी यांनाही जीवनदायी मिळते. तसेच अनेक वृक्षजाती नष्ट होण्याच्या मार्गावर आहेत तर या जाती वाचविणे आपल्या हातात आहे.

१५) पूर्वी पावसाची वाट लोक आतुरतेने पहायचे परंतु आता पावसाळा आली की महापूराचे भय निर्माण होते. यामुळे सरकारचे नुकसान, जीवितहानी, वित्तहानी होते. जमिनी पाणथळ बनतात. पावसामुळे सुपीकता कमी होते व मातीचे घरे वाहून जातात. उदरनिर्वाहाचे साधन नष्ट होते. याचा विचार करून निसर्गाचे चक्र व्यवस्थित रहावे हे पाहिले पाहिजे. तसेच कोरडा दुष्काळही पडतो हे सर्व आपली बदलेली जीवनशैली यामुळे घडते. यासाठी नैसर्गिक साधनसंपत्तीचा वापर विचारपूर्वक करावा.

### संदर्भ ग्रंथसूची :

पर्यावरण शिक्षण : डॉ. नीला पाथरे

आरोग्यदायी पर्यावरण : डॉ. भूषण पटवर्धन

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**A STUDY ON REPLACING NON-RENEWABLE ENERGY WITH RENEWABLE ENERGY IN  
CONSUMER PRODUCTS FOR SUSTAINABLE DEVELOPMENT**

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**Abstract**

**Purpose:**

Current business environment is marked with intense competition and realizing the impact of industrialization and commercialization on environment, companies are trying to win the markets and its customers by being environmentally conscious. Companies world-wide are exploiting opportunities by going green and playing their role in the community by being socially responsible. Catering to the need of the hour, the research focuses on the initiatives of replacing non-renewable energy with renewable energy and customer attitude towards embracing it.

**Methodology:**

For the purpose of data collection, 100 respondents are surveyed. One-sample t-test is used for studying customer perception and satisfaction towards products equipped to operate on renewable energy.

**Findings:**

The findings of the study suggest that customer have embraced the concept of renewable sources of energy realizing the impact of technology on extenuating the environmental impact. The findings of the study imply that customer have embraced the idea of replacing non-renewable energy owing to its cost-saving aspect and being environmentally conscious by playing their role in preserving it.

**Keywords:** Green marketing, Renewable energy, Sustainable living.

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**Introduction**

In the contemporary times, the world is witnessing shortage of resources which is leading to sky-rocketing prices. Renewable energy can be a solution to the crisis proving to be an environmental friendly source of energy, cost effective and also a sustainable solution for future. Use of renewable energy in the future can also assure less strain on the present reserve of the non-renewable energy reserves.

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### Research Question

What is the attitude of customers towards replacement of non-renewable energy with renewable energy in consumer products?

### Research Objectives

- To determine customers willingness to purchase products operating on renewable energy.
- To determine factors which influence adoption of renewable energy.
- To understand customer beliefs with respect to environmental impact of using renewable energy

### Review of Literature

**Adam Faiers and Charles Neame** in the research paper titled “*Consumer attitudes towards domestic solar power systems*” aims at understanding customer attitude towards use of solar energy applying Diffusion of Innovations theory understanding difference in the consumption pattern of the energy among different innovator categories. The findings of the research suggest that though early majority had a positive perception towards solar energy however, the aesthetic, financial and economic aspects hold back the adoption. The research suggests that until the advantage of solar power is realized, it will hinder the adoption of the same.

**Usama Al-Mulali** in the research paper titled “*GDP growth – energy consumption relationship: revisited*” aims at understanding the relationship between the consumption of renewable energy and GDP growth. The research has been undertaken by studying energy consumption in 82 countries from 1999 to 2009. The findings of the study suggest that consumption of renewable and non-renewable energy has strong relationship with growth in various economic sectors, further indicating that use of non-renewable energy has a stronger impact on economic sectors compared to renewable energy.

### Methodology

For the purpose of data collection, a questionnaire has been drafted to collect responses with respect to customer perception towards replacement of renewable energy with non-renewable energy. The sample size has been limited to 65 considering the time constraints. Frequency distribution has been studied for



responses measured on nominal and ordinal scale and to study customer perception one sample t-test has been used.

### Scope of Study

The study is conducted by collecting data from Mumbai and Thane.

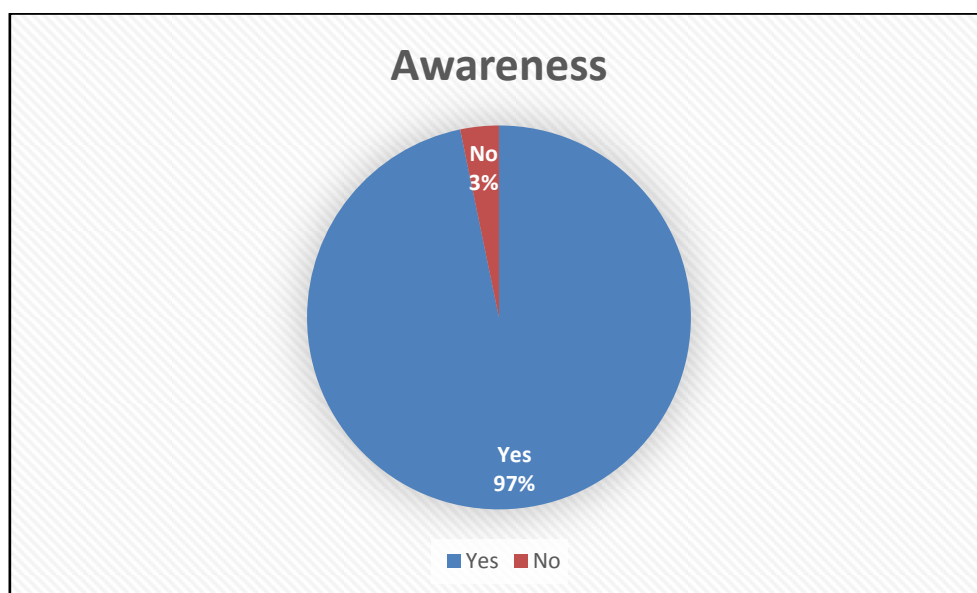
### Limitations of Study

As the research is undertaken only in Mumbai and Thane the findings of the study may not be applicable elsewhere.

**Table no. 1- Are you aware about renewable energy resources?**

	Frequenc y	Percent	Valid Percent	Cumulative Percent
No	3	4.6	4.6	4.6
Yes	62	95.4	95.4	100.0
Total	65	100.0	100.0	

**Figure no. 1- Are you aware about renewable energy resources?**



### Findings and interpretation:

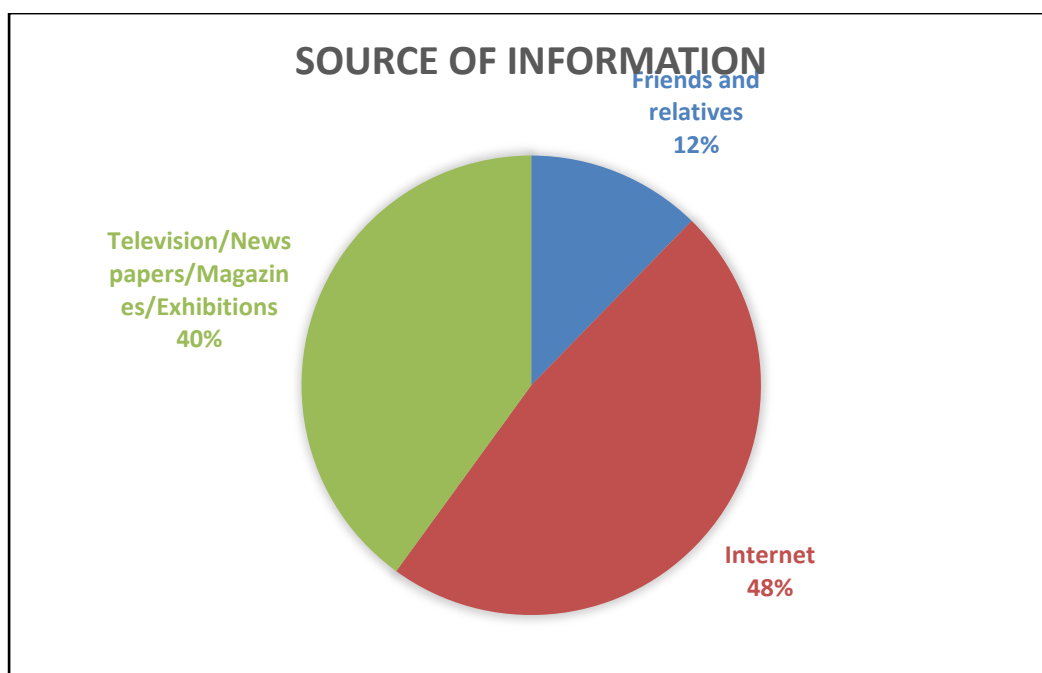


From the above table, it can be observed that out of the total 65 respondents, 62 respondents are aware of the renewable energy while 3 respondents are not aware of renewable energy. Thus, out of the total 100%, 95.4% respondents are aware of the renewable source of energy while 4.6% were not aware about renewable source of energy.

**Table no.2- How did you come to know about renewable energy sources?**

	Frequency	Percent	Valid Percent	Cumulative Percent
Friends or Relatives	8	12.3	12.3	12.3
Internet	31	47.7	47.7	64.6
Television/ Newspapers Magazines Exhibitions	26	40.0	40.0	100.0
Total	65	100.0	100.0	

**Figure no.2- How did you come to know about renewable energy sources?**







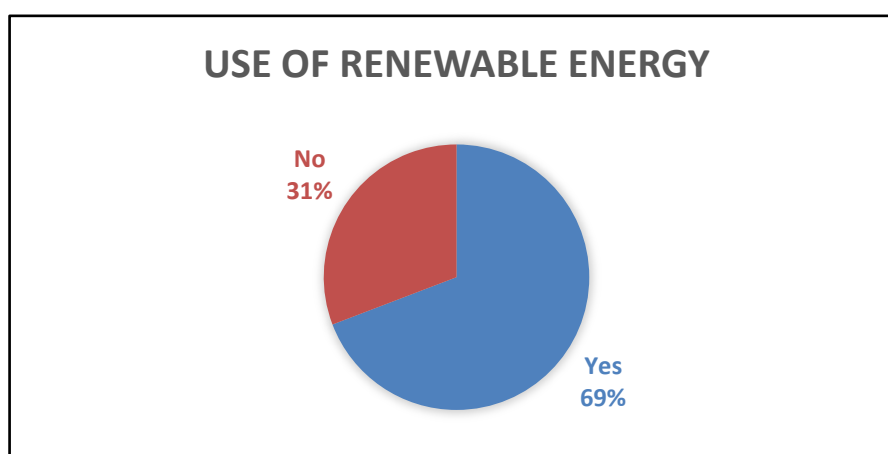
**Findings and interpretation:**

Only maximum and minimum values will be interpreted. From the above table, it can be observed that out of the total 65 respondents, 31 respondents came to be aware about renewable energy through internet while 8 came to know about it through friends and relatives. Thus, out of the total 100%, 47.7% came to know of the renewable energy through internet whereas 12.3% came to know of it through friends and relatives.

**Table no. 3-Does your society or nearby areas use any kind of renewable energy?**

	Frequency	Percent	Valid Percent	Cumulative Percent
No	20	30.8	30.8	33.8
Yes	45	69.2	69.2	100.0
Total	65	100.0	100.0	

**Figure no. 3-Does your society or nearby areas use any kind of renewable energy?**



**Findings and interpretation:**

From the above table, it can be observed that out of the total 65 respondents, 45 respondents were affirmative of having witnessed their society and nearby areas using



renewable energy whereas 20 respondents have not. Thus, out of the total 100%, 69.2% respondents have witnessed use of renewable energy in their society and nearby areas whereas 30.8% have not.

### *One Sample t-test*

#### **Objective:**

To identify positive (favourable) or negative (unfavourable) perception towards renewable energy technology.

#### **Findings and Interpretation:**

H0: There is **no significant difference** in the average perception towards all the factors influencing adoption of renewable technology ( $\mu = 3$ )

H1: There is a **significant difference** between the average perceptions towards all the factors influencing the adoption of renewable technology. ( $\mu \neq 3$ )

As the data is primary, the confidence level is assumed at 95% and so the significance level  $\alpha$  is at 5% or 0.05.

As hypothesis is non directional (two-sided), so the level of significance is divided by 2, thus  $5/2 = 2.5\%$  or 0.025.

$\alpha : 0.05$  (non-directional :  $0.05/ 2 = 0.025$ )

**Table no. 4:**

<b>Parameter (variable)</b>	<b>Hypothesis</b>	<b>P-value</b>	<b>Dec (<math>\alpha/2 - 0.025</math>)</b>
Environment friendly	H0(envfriendly) $\mu = 3$ H1(envfriendly) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0
Switch to renewable energy	H0(switch) $\mu = 3$ H1(switch) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0
Use solar energy	H0(solar) $\mu = 3$ H1(solar) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0



CNG	H0(CNG) $\mu = 3$ H1(CNG) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0
Better performance	H0(performance) $\mu = 3$ H1(performance) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0
Upcoming projects	H0(projects) $\mu = 3$ H1(projects) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0
Highprices	H0(prices) $\mu = 3$ H1(prices) $\mu \neq 3$	0.001	$p < \alpha = 0.025$ , Reject H0
Maximum use	H0(maxuse) $\mu = 3$ H1(maxuse) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0
Explore	H0(explore) $\mu = 3$ H1(explore) $\mu \neq 3$	0.000	$p < \alpha = 0.025$ , Reject H0

It is observed from the above table that as the p-value is less than  $\alpha/2$ , 0.025, it provides evidence to reject the null hypothesis at 5% level of significance. Thus we reject that there is no significant difference in the average perception with respect to the use of renewable energy technology. Further, to identify positive or negative perception one sample statistics table will be referred to.

**Table no. 5: One-Sample Statistics**

Factors	N	Mean	Interpretation
Environment friendly	65	4.3846	People consider renewable technology to be environmental friendly
Switch	65	4.2769	People prefer to switch to renewable energy from non-renewable energy



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Solar energy	65	3.7231	People prefer to use solar panel and cooker for daily activities
CNG transportation	65	4.0462	People believe that use of CNG in public transport has brought down pollution
Better performance	65	3.8615	People perceive renewable energy to perform better than non-renewable energy
Upcoming projects	65	4.3846	People believe that upcoming projects should be equipped to run on renewable energy
High prices	65	3.4308	People are willing to pay higher prices for renewable energy
Maximum use	65	4.0462	People believe that renewable energy can help to sustain the needs of the future
Explore	65	4.3231	People would like to know more about the renewable energy

### **Findings**

It is evident from the above interpretations that people consider renewable energy to be environmentally friendly and thus would consider switching from non-renewable energy to renewable energy. People also had a positive attitude towards using solar panels and CNG in transportation. People are willing to pay a higher price for renewable energy as they consider it to be better in performance compared to non-renewable energy.

### **Conclusion and recommendations:**

Findings suggest that people believe that projects in future should be equipped to operate on renewable energy as it can help to sustain the needs of the future. In times



of crisis, where resources are limited for the present generation, it is need of the hour to develop a technology which not only ensures that the need of the present is taken care of but also sustains the need of the future.

### **Future Scope of Study**

The research is undertaken to understand customer perception towards renewable energy in general. Researchers in future can adopt a more specific approach by focusing on a particular type of renewable energy. Similar researches can also be undertaken in other cities in India to understand the impact of consumption of renewable energy on economic growth of the country.

### **References:**

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