Chapter I
Introduction
INTRODUCTION

“The earth provides every person’s need but not every one’s greed.”
-Mahatma Gandhi

The world started realizing the importance of words of Indian Mahatma. It is also widely known that he was a humanist and pacifist of international glory. Industrialization has given tremendous material pleasure and prosperity to human society. But at the same time, it has also imperceptibly done irreparable loss to mankind. Reckless and limit less pursuit of Industrialization by all nations are now posing serious problems for very existence of not only man but also for all living flora and fauna on our planet. Gandhi is a passionate champion of a life pattern based on three cardinal principles; Simplicity, Slowness and Smallness. Modernity makes life complex by multiplying its day-to-day needs. In fact this kind of complexity is ingrained in it. Over the past two centuries, both human population and the economic wealth of the world have grown rapidly due to advances in agriculture and food production, industrial development, energy production, Information Technology (IT) and urbanization. An example of the darker sides about 8.1 million square kilometers of once productive land have become desert in the last 50 years. Environmental awareness among the public and policy makers has been growing since the 1960s because of widely recognized human activities were having large-scale effects on environment.

1.1 ENVIRONMENT

The term “Environment” is derived from the French word “Environ”, means to “encircle” or “surround”. The Environment Act, 1986 defines the term environment as “Environment is the sum total of water, air, and land, inter-relationship among them.”

Encyclopedia Britannica defines environment as “The complex of physical, chemical, and biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival.” Environment can be divided into two categories - natural and manmade.
RESOURCES

The word resource means source of supply or support that is generally held in reserve. Resources can be divided into two types namely natural and manufactured one.

1. Natural Resources

The natural resources are the materials, which living organisms can take from nature for the substances of their life or any components of the natural environment that can be utilized by man to promote his welfare, which can be divided into two types namely renewable and non-renewable resources.

2. Manufactured Resources

Manufactured resources are tangible products and intangible services created from the conversion of raw materials into consumable or useful products. They are manufactured products and services for both household consumption and/or business use.4

1.2 CONSUMERISM

Consumerism is an organized movement of citizens to strengthen their rights and powers. Consumers need to be protected against environmental pollution of water, air and noise and the surroundings be kept neat and clean5.

1.3 IDEAL CONSUMPTION FOR HUMAN DEVELOPMENT (ICHD)

An Ideal Consumption for Human Development enriches the lives of people to purchase and promote the products with eco-label and creates awareness to the effect that it is worth paying higher price for product that are eco-friendly and do not affect environment while producing or consuming6.

1.4 ENVIRONMENTAL DEGRADATION

The population explosion, economic development, improved standard of living, enhanced income and affluence, change in life style, reckless consumerism etc., resulted in environmental degradations, global warming various types of pollutions such as air pollution, water pollution, land pollution, noise pollution. There is a depletion of non-renewable natural resources such fossil fuels, coals etc., at faster
rate. The renewable resources like ground water, soil, forests are polluted affecting flora and fauna including human beings.

As the environmental degradation has transcended the national borders, there is a need for concrete efforts and cooperation between countries in the international level for environmental protection. The United Nations organisation, national governments, non-governmental organisations and also the individuals who are consumers and also forming families and nations have not only individual role but also cooperative role in the environmental production. They have an important role in creation of environmental awareness.

### 1.5 ROLE OF INDIVIDUAL CONSUMERS TOWARDS ECO-FRIENDLY CONSUMPTION

Eco-friendly products and services promote green living help to conserve energy and also prevent air, water, soil and noise pollution. They prove to be boon for the environment and also protect human health from deterioration. While consuming goods and services, the consumers can contribute to better environment as follows:

1. **3 R’s of Waste Hierarchy:** The 3 R’s (Reduce, Reuse and Recycle) of waste hierarchy can reduce the amount of waste generated and improve the waste management processes. Reducing of what is produced and what is consumed can reduce the amount of waste that is generated. Reusing items for different purposes instead of disposing them off. Recycling items like aluminium cans, plastic, paper, glasses etc., can be shaped into a new item.

2. **Conserve Water and Electricity:** It takes water to produce electricity and the energy is needed for pumping up or transporting or purifying water. Few simple ways like turning off lights when not in use, fixing leakages or recycling gray water, proper insulation, using maximum daylight, installing energy efficient windows, purchasing energy efficient gadgets etc., can reduce daily electricity consumption.

3. **Plant More Trees:** It is well known why there is a need for more trees on this planet. They give us oxygen, fruits, timber, prevent soil erosion, control floods, and provide shelter to wildlife.
1.6 OTHER REVIEW OF LITERATURE

General Review

Deepa (2012)\(^8\) has studied the contribution of individual consumers towards eco-friendly consumption in Chennai. Water crisis factor is the most dominant factor in general environmental awareness among consumers followed by energy conservation, water pollution and reckless consumerism.

Tyler Miller (2004)\(^9\) states that 65-70% of the water people use throughout the world is lost through evaporation, leaks and other losses. World Health Organisations (WHO) defines the percentage of people in developing countries with access to clean drinking water increased from 30% in 1970 to 72% in 2000. Water conservation implies improving the availability of water through augmentation by means of storage of water in surface reservoirs, tanks, soil and groundwater zone. It emphasizes the need to modify the space and time availability of water to meet the demands.

Rakesh Singh et al., (2005)\(^10\) have studied availability and demands of water recourses in India as well as describe the various issues and strategies for developing holistic approaches for sustainable development and management of the water resources of the country. They highlighted integration of the blue and green flows and concepts of virtual water transfer for sustainable management of water resources for meeting the demands of the present, without compromising the needs of future generations.

Meena Panickar (2007)\(^11\) has highlighted prime responsibility of the state with respect to drinking water supply. The water supply to households and commercial concerns is based on connections and charges are levied. The water laws focus on offences by water subscribers and silent on accountability of the state authorities.

Safari et al., (2014)\(^12\) have contributed to the education of conservation of natural environment and presented solutions for training community environmental awareness through formal training of youth population for the impact on promoting culture of environmental and sustainable development goals. Introduction of youth to
environmental sciences and inclusion of environment issues in study curriculum can support at large to boost the morale in protection of natural resources.

**According to Integrated Energy Policy (IEP)**

According to Integrated Energy Policy (IEP)\(^{13}\) it is the first comprehensive energy policy by the Indian government and oversees all energy sectors. The prime minister directed the Planning Commission to form an expert committee “to prepare an integrated energy policy linked with sustainable development that covers all sources of energy and address all aspects of energy use and supply including energy security, access and availability, affordability and pricing, as well as efficiency and environmental concerns.”

The National Electricity Policy 2005 provided detailed initiatives and programmers to carry out the mandates of the Electricity Act 2003 (TGOI, 2005). It addressed issues including rural electrification, recovery of cost of services, targeted subsidies and energy conservation.\(^{14}\)

**Carlsson-Kanyama et al., (2005)**\(^{15}\) tested the relevance of the generational hypothesis on residential energy use of Swedish households. In the households the elders are more energy conscious and conserved more energy than the youngsters. This implies that there would be increase in demand for energy in future.

**Tilikidou, I. (2007)**\(^{16}\) investigated the effects of knowledge and attitudes upon Greek’s pro-environmental purchasing behaviour. Pro-environmental Purchasing Behaviour (PPB) was found to be adopted at a rather low level; less than 20% of Greeks were characterized as relatively frequent pro-environmental purchasers and higher scores were obtained with reference to **energy and water conservation**, reduction of overall consumption and avoidance of products containing genetically modified organisms. The consumers also declared that they very often chose the eco-friendly alternative of a product when there is no significant price difference. As far as the demographic profiles of the consumers were considered, the results indicated that professionals, 35–55 years old, holding graduate and/or postgraduate degrees and with an annual income of 25–30 thousand Euros were those who were more engaged in PPB in Greece. PPB was found to be correlated positively and moderately with environmental knowledge and negatively and moderately with environmental unconcern.
Roy, J., Pal.S. (2009) studies the relationship between life style and climate change. His conclusion was the life style change would contribute to low carbon emission for equitable and sustainable development, of the focus was on pattern of energy consumption, the life style change could be brought about by creating sustainable life style awareness and energy concern and building synergies among energy policies, regulations, technology and market forces.

Mahapatra, K., G. Nair, et al., (2011) examined the perception of Swedish house owners about energy advice service. Majority of the owners of the detached houses were of the opinion that the energy advisers are the major source of information consulted them and implemented the energy efficiency measures suggested by them. They felt that continuation of their energy advice service would benefit them. Therefore, there was a need for increasing energy advice service awareness among the householder.

Harald et al., (2008) identified cultural beliefs; economic condition and lack of information are the barriers to the energy saving solutions in the households.

Schwartz,S.H. (1972,1977) advocates that the norm-activation theory of altruism is applicable for pro-environmental action of the individuals, of they are made to believe that environmental degradations are threat to fellow human beings or other species or biosphere and their actions can avert those adverse consequences on response to their personal moral norms they take pro-environmental action.

Stern, P.C. (2000) in his Value-Belief –Norm theory had some success in explaining sustainable behaviour. According to him, personal norms are the main basis for individual’s predispositions to act in favor of the environment. Thus, an individual’s attitude and values influence his or her consumer behaviour.

Many researchers have focused on environmental values and environmental awareness as predictors for sustainable consumer behaviour and have found it to be significant in many cases. But other non environmental orientations such as career, status or security orientation that an individual holds may conflict with environmental orientations. However, other orientations such as health, life quality etc., may act complementary to the environmental values. He also suggests that environmentally responsible behaviour is of two types:
1. Private sphere behaviour in which the consumer involves in direct action by boycotting harmful products, changing consumption pattern and reducing consumption etc.,

2. Public sphere behaviour in which the consumer involves in indirect actions such as petition signing, joining environmental groups comparing etc.

Simha (1998)\(^{22}\) explains Ideal Consumption for Human Development on the part of the consumers forms an integral aspect of both human and social capitals in a market driven economy. It contributes to human development when it enlarges the capabilities and enriches the lives of people without adversely affecting the well being of others. An ideal consumption has the following characteristics of:

a. Sharing is ensuring basic needs for all,

b. Strengthening is building human capabilities,

c. Socially responsible is not compromising the well being of others and

d. Sustainable is without mortgaging the choice of future generations.

Some consumers are using their power to purchase to promote the interest of the community. Studies have shown that the consumers in Europe are willing to pay 5% – 10% more for the products with Eco-label or Social label because of their concern for ecology or well being of others. Such labeling also ensures the consumers to exercise their right of accessibility to information for assessing the impact of their choices on others.

Arulalan M.V., (2005)\(^{23}\), based on a sample survey of 320 Chennai consumers, the researcher has found that majority of them have attitude and willingness to pay higher price for the eco-friendly products or services. The study reveals the following positive and consumption attitudes of Chennai people.

1. The higher strengthening and sharing attitudes to life and higher education of the consumers significantly influence their higher attitude for sustainable consumption (i.e, consumption/production should not affect environment or fellow human beings). The compulsory education of environmental studies in all higher educational institutions would further strengthen such sustainable consumption attitude.
2. Self-employment of the consumers significantly influences their higher socially responsible consumption attitude. This may pave way for eco-friendly labeling of the goods and services.

3. The higher strengthening attitude significantly influences higher the ideal consumption attitude of the consumers. The more health awareness creation would strengthen the ideal consumption attitude.

Venkiah Naidu (2017) President of the UN Habitat’s Governing Council and Union Minister of Urban Development, Government of India, (2017), in his presidential address of making our cities livable, declares that irreversible urbanization is the driving force of development. While cities and towns occupy 2% of the total land, but contribute 70% of the GDP by consuming 60% of the global energy and contributing 70% of Green House Gas (GHG) emission. While 38% of the world population lived in cities in 1976, it has increased to 45% in 1996 and 54% in 2016 and expected to increase to 80% in 2050. In the face of socioeconomic, demographic and environmental challenges, “UN – New Urban Agenda calls for redesigning and developing the vibrant cities into eco-friendly areas providing basic amenities to all citizens on an equitable and sustainable basis.”

1.7 STATEMENT OF PROBLEM

Chennai Metro City is the Capital of Tamil Nadu state in India. Its’ population is 1 crore and the density is 27,000 people per square kilometer. It is the sixth most populous city in India and 30th in the world. It is the hub of educational institutions, industries, trade, tourisms, commercial and residential areas, infrastructures and Information Technology. It is also one of the most congested and polluted cities. Despite its rich traditional and cultural heritage, the rapid globalization, post liberalization economic development, migration from not only other districts of Tamil Nadu but also from other parts of India, changing life styles, climate change, environmental pollutions, rising income levels and reckless consumerism etc., have led to greater strain on Chennai environment especially on water and electricity. With the high density of population, the demand for water and electricity for residential purpose is high. The water consumption in Chennai is 2,400 Million Liters Day (MLD) but Chennai Metro Water Supply and Sewerage Board (CMWSSB) supply
only 830 MLD and electricity consumption is 300 MW which is 20% of power consumption in Tamil Nadu. Both the resources are having increasing consumption trends. The conservation of water by households leads to that of electricity which in turn can reduce air pollution as the major source of electricity is thermal power stations. As the care and share policy and sustainable development are the means of ideal consumption, the Water and Electricity Conservations by the Chennai households and especially women consumers of them can contribute their mite for better Chennai Environment. More over the young female consumers of them have the benefits of mandatory Environmental Education and higher Education and their mothers do not have such benefits but have traditional wisdom of environment. They play a deciding role in their household management. In such circumstance a number of questions arise. What are measures adopted by female consumers in conserving Water and Electricity? What are the significant determinants of them? What are their characteristics? What are their sources of Water and Electricity? What is the gap between awareness and practice in conservation of water and electricity? And what are ways and means to enhance it in Chennai? The present study seeks to answer these questions.

1.8 SCOPE OF STUDY

The present study brings out various conservation measures of the female young consumers and their mothers to conserve water and electricity in their households in Chennai. It focus on the identification of their general environmental awareness, water and electricity conservation awareness that significantly influence their conservation practices. It covers their personal and family profiles, personal habits, environmental awareness creators and ideal consumption for human development awareness, and opinion on the extent of adverse effect of various environmental degradation on their family members. It identifies the extent of their normal water usage purposes of water and electricity and their normal sources. It also deals with their opinion about the environmental awareness creators among them. It studies the gap between awareness and practices in consumption of water and electricity so that ways and means can be suggested to enhance better environment in Chennai. The study was confined to a period of four years from 2013 to 2016.
1.9 OBJECTIVES OF THE STUDY

The objectives of the study are as follows:

I. Primary Objectives: The primary objectives of the study are about water and electricity conservations by Female Consumers in Chennai and are as follows:

a) To study and measure water and electricity conservation measures and identify the dominant and latent dimensions of them.

b) To identify the factors which significantly influence water and electricity conservation measures.

c) To suggest ways and means to enhance the water and electricity conservations measures in Chennai.

II. Secondary Objectives: The secondary objectives of the study are about factors influencing water and electricity conservations and are as follows:

a) To examine personal and family profiles of Household Female Consumers.

b) To identify the extent of the different normal purposes for which water is used out of normal sources of water.

c) To identify the dominant and latent dimensions in the variables of Incidence of Personal Habits (IPH), Ideal Consumption for Human Development (ICHD), Environmental Awareness Creators (EAC), Personal Environment Awareness and Practice (PEAP), Environment Degradation Severity (EDS), General Environmental Awareness (GEA), Water Conservation Awareness (WCA), Electricity Conservation Awareness (ECA) and Polluting Asset Usage (PAU).

d) To find out the gaps between water and electricity conservation awareness and practices.

e) To examine the generational gaps in the environmental awareness and practice between household youth female consumers and their mothers.
1.10 RESEARCH METHODOLOGY

The present study is analytical and exploratory in nature. Adopting survey method for its findings, it depends mainly on the primary data collected from the household female consumers, comprising the young female consumers who have the benefits of mandatory environmental education and also higher education and their mothers who may not have such educations, using a well-designed and structured questionnaire. However, the essential informations have also been collected from available published sources, especially from print media, published books and articles on different environmental issues and websites.

1.10.1 Sampling Size and Design

The random sampling method has been adopted to collect primary data from the Household Female Consumers (HFC) of both Young Female Consumers (YFC) and Mothers of Young Female Consumers (MYFC) about their general environmental awareness, water and electricity conservation management at household level. A total of 1500 copies (750 sets; in each set, one questionnaire is for YFC and second is for her mother) of the well-designed structure questionnaire were distributed equally to each of three parts of South, North and Central Chennai. The data were collected from June 2016 to September 2016. After providing adequate time to the respondents, 624 sets of filled in questionnaires were received. On scrutiny, 110 sets of incomplete questionnaires were identified and 14 sets of questionnaires were found to be unsuitable for the study because of their extreme values and the remaining 500 sets of questionnaires were considered for the study.

1.10.2 Questionnaire Design and Scaling Pattern

The questionnaire with six sections was finalized to collect data from the household women consumers who are Young Female Consumers (YFC) and their respective mothers (MYFC) of the households in Chennai only.

Section I (a) – deals with three Personal Profile (PP) of the Household Female Consumers (HFC) and they are as follows:

1. Age
2. Education and
3. Occupation.
Section I (b) is about five Family Profiles (FP) of the Household Female Consumers (HFC)

1. Average Monthly Family Income (AMFI),
2. Average Monthly Electricity Bill (AMEB),
3. Average Monthly Water Expenditure (AMWE),
4. Family Size and
5. Number of family members employed.

Section I (c) is about the Incidence of Personal Habits (IPH) and they are listed as follow:

1. Physical Exercise,
2. Medical Check-up,
3. Vegetarian Food,
4. Social Service involvement and
5. Environment cleanliness around their residence.

Section II- deals with 12 Polluting Asset Usages (PAU) and 15 Environmental Degradation Severities.

II. (a). Polluting Asset Usage (PAU)

1. Two/Four wheeler,
2. Washing Machine,
3. Air Conditioner,
4. Television,
5. Refrigerator,
6. Investors,
7. Water Heater,
8. Computer,
9. Water motor pump set,
10. Water Purifier,
11. Electric Oven/ Electric Cooker and
12. Induction / Electric stove.

II. (b). Environmental Degradation Severity (EDS)

The Environmental Degradation Severities are listed out as follows:

1. Air Pollution,
2. Dust Pollution,
3. Noise Pollution,
4. Water Pollution,
5. Water Scarcity,
6. Electricity power cut,
7. Floods, Excess Rain,
8. Heat,
9. Drought,
10. Health Problem(breathing, stomach pain, skin problem etc),
11. vitamin D deficiency,
12. Traffic Congestion,
13. Land Pollution,
14. Waste Disposal and
15. Sewage Problem.
Section III is about General Environmental Awareness (GEA), Personal Environmental Awareness and Practices (PEAP) and Ideal Consumption for Human Development (ICHD).

III. (a). General Environmental Awareness (GEA)

The General awareness on environmental issues are listed out as follows:

1. Government takes satisfactory steps to increase awareness,

2. Government laws lead to reduced pollution,

3. The Wildlife Protection Act and The Forest Conservation Act protect animals and forests,

4. Eco-culprits escape through loopholes in laws,

5. There are separate Acts like Water Act, Air Act, and Environment Act to prevent and control pollution of water, air and environment,

6. Public liability insurance is mandatory for all companies,

7. Anti-pollution measures against motor vehicles are being strictly enforced,

8. Rapid icecaps melting is dangerous to humankind,

9. Our coastline will be lost by the end of this century,

10. Sea surface temperature increase causes cyclone and hurricanes,

11. Animal produced methane is harmful than CO$_2$ (carbon di-oxide),

12. Cutting of trees leads to global warming,

13. Chloro Fluoro Carbon (CFC) Gas released from A.C and Fridge causing ozone layer depletion and global warming,

14. Socio-Economic development in India will be affected, if global warming is not checked immediately,

15. Acid rain has an ill-effect on buildings and also human skin,
16. Ozone depletion has an adverse effect on natural vegetation and human health,

17. Transport system creates air pollution,

18. Acid rain is caused due to burning of petroleum and coal,

19. Improvement in mass transportation system will reduce fuel consumption and air pollution,

20. Rail and pipeline transportation to be used instead of road transport to reduce pollution,

21. Dumping garbage in water bodies leads to flood and water pollution,

22. Mounting plastic waste aggravates flood,

23. Disposal of E-waste poses adverse health and environmental implications,

24. Poor waste disposal method causes eco-degradation,

25. Solid wastes burnt at high temperature leads to emission of poisonous gases,

26. Usage of high phosphate detergents affects water and soil,

27. Pesticides and fertilizers spoil ground water and soil,

28. Pesticide kills plant friendly organisms,

29. Land pollution reduces the amount of land available for cultivation,

30. Land pollution has an adverse effect on human life,

31. Industrial effluents pollute water,

32. Bleaching of paper causes water pollution,

33. Chemical dyes causes water pollution,

34. Dry cleaning of clothes pollutes water,
35. Water has to be given important place in the Constitution and human life,

36. More energy is used by filament bulb,

37. Electrical equipment with higher watts consumes more energy,

38. Pressure cooker saves up to 75% of energy,

39. Indian Petrol has highest lead content which creates air pollution through automobiles,

40. Irresponsible consumption leads to environmental degradation,

41. Man is closely related to nature,

42. Poor water management practices leading to water crisis,

43. Erratic season occurs due to climatic change,

44. Loss of wet and agricultural land due to human occupation for residence and industry,

45. Greenhouse gases have increased average global temperature,

46. Keep the vessels covered with lid while cooking,

47. More energy is consumed to turn on and off the light,

48. Each individual can contribute to save energy for collective real change,

49. Each individual can contribute to save water for collective real change,

50. Climate change and air pollution will kill more people in India,

51. Water scarcity leads to disputes between states in India and between countries in the world,

52. Refuse, reuse and recycle leads to better environment,

53. Tamil Nadu has achieved self-sufficiency in energy in electricity production,

54. Reducing water usage leads to reduce electricity bill,
55. Installing and checking water meter reduce water usage,

56. E-Waste is growing global problem of pollution,

57. Reducing waste to reduce litter (Garbage) for reducing pollute water and soil,

58. Reduce waste, use products that reduce waste,

59. Re-use containers, packaging or waste products and

60. Recycle waste material into usable product.

III. (b). Personal Environmental Awareness and Practices (PEAP)

The mutual opinion of Young Female Consumers and their Mothers about each other’s environmental awareness and practices are as follows:

1. Your mother /daughter have better environmental awareness than you,

2. Your mother /daughter have better environmental practice than you,

3. Your mother/daughter creates more environmental awareness than you,

4. You are a member of NGO Association creating environmental awareness and

5. You are a member of NGO Association involved in better environmental practice.

III. (c). Ideal Consumption for Human Development (ICHD)

The variables which constitute ICHD are as follow:

1. Production of a product or service should not affect ecology or environment,

2. Usage of a product or service should not affect ecology or environment,

3. It is worth paying higher price for products/service with Eco-label [the production of which does not affect ecology,

4. It is worth paying higher price for products/service, the usage of which do not affect ecology,
5. Banning imports, from India, of products without Eco-label, by western countries is a welcome measure,

6. Voluntary boycott of products without Eco-label in India should be advocated,

7. Manufacturers should be encouraged to declare their products eco-friendly and

8. Traders should encourage their customers to use Eco-friendly products/services.

III. (d). Environmental Awareness Creators (EAC)

Environmental Awareness is created by the Influencers which are listed out as follows:

1. Television,
2. Radio,
3. Newspaper/Magazines,
4. Movies,
5. Hoarding/ Wall Poster,
6. Government,
7. NGO-Service Organization,
8. Peer Group (Friends),
9. Relatives,
10. Enforcement of Environmental Laws,
11. School/College Education and
12. Religion.
Section IV is about Normal Usage Purposes of Water (NUPW) and Normal Sources of Water (NSW)

The purpose for which the water is normally used in the households is listed as follows:

1. Drinking without purification/boiling,
2. Drinking after purification/boiling,
3. Cooking Food,
4. Washing Utensils, Floors, Sinks, etc.,
5. Washing Clothes,
6. Bathing, Washing faces, hands, feet etc.,
7. Watering Gardening Plants and

Normal sources of water for the households as follows:

1. Open well/Bore well,
2. Corporation,
3. Can Water Suppliers and

Section V is about the Awareness and Practices of 30 Measures of Water Conservation which are listed out as follows:

1. Take short showers instead of long bath,
2. Reduce the cistern (Flush) capacity in toilet,
3. Use mug of water for shaving and brushing,
4. Avoiding running water from tap unnecessarily,
5. Use water consciously,
6. Rain water harvesting increase ground water level,
7. Reduce the amount of water used for daily activities,
8. Re-use the waste water from kitchen, bathroom and washing machine for garden use,
9. Check water meter to see the quantity of water usage,
10. Run washing machine only on full capacity,
11. If not required, close the tap immediately,
12. Turn off water tap in unused bathroom,
13. Re-use the boiled water,
14. Use front-load machine to wash your clothes,
15. Purchase of water efficient product,
16. Periodical inspection by plumber,
17. Use rain water to water plants,
18. Use fewer utensils to reduce water usage,
19. Toilet shouldn’t be used as Trash,
20. Gardens/Plants should not to be over watered,
21. Install water softening system only when necessary,
22. Ornamental water fountains can be avoided,
23. Awareness must be created in children to save water,
24. Install low-flow showerhead,
25. Don’t buy water toys that require a constant stream of water,
26. Indian toilets use less water,
27. Use a bowl of water not running water to wash your vegetables,
28. The leaking pipes and taps should be repaired immediately,
29. Don’t run the water continuously while washing your hands and face and
30. In case of well/bore well, check the pumping motor regularly.
Section VI is about the Awareness and Practices of 30 Measures of Electricity Conservations are listed out as follows:

1. Turn off all electrical items like light, fan etc.,
2. A.C should be used only in summer,
3. Avoid keeping electrical items in standby mode,
4. Look for star label in electrical goods before purchase is made,
5. Solar equipment usage will reduce electricity bill,
6. Keep the bulbs and tube clean,
7. Use stairs instead of lift,
8. Use rechargeable batteries,
9. Clean AC filter regularly to keep heating and cooling system running efficiently,
10. Set water heater to a lower thermostat setting,
11. Keep the coil clean on the back of the refrigerator,
12. Ensure the fridge door seals tight,
13. Use microwave rather than oven,
14. Close doors and windows while running AC,
15. Use table lamp instead of an overhead light,
16. Use sunlight whenever possible,
17. Keep refrigerator away from the wall,
18. Choose right capacity heater for your needs,
19. Light colored wall reflects more light,
20. Replace tube light with energy efficient LED,
21. Defrost freezer at regular intervals,
22. Use low watts night lamp at nights,
23. Read energy guide label when buying new appliances,
24. Don’t construct new building nearer to electricity lines,
25. Use washing machines to its full capacity,
26. “Don’t waste electricity” – Is voice of your conscience,
27. Don’t heat water very high temperature,
28. Don’t use lamps during day time,
29. Use appropriate cooking vessel to save electricity and
30. When overhead tank overflows, automatic electric cut off of motor saves the electricity.

1.10.3 Measurement of Variables and Scaling Pattern

1. **Nominal Scale:** The personal profile variables of the HFC of Education and Occupation are measured in appropriate nominal scales.

2. **Ratio Scale:** Age, Monthly Family Income, Monthly Electricity bill, Monthly Water Expenditure, Family size, Number of children and Number of family member employed are measured in the appropriate ratio scales.

3. **5 Point Scale:** Opinion on severity of environmental degradation on family members has been measured using 5 point scale of Always, Many times, sometimes, Few times and Rarely with the weightages of 5, 4, 3, 2, and 1 respectively.

4. **5 Point Likert Scale:** The opinion of the Household Family Consumers (HFC) about each variable of their Good Consumption for Human Development, Environmental Awareness Creators, Personal Environmental Awareness and Practice, General Environmental Awareness, Water Conservation and Practice and Electricity consumption Awareness and Practice using 5 Point Likert Scale of
Strongly Agree, Agree, No opinion, Disagree and Strongly Disagree with the weightages of 5, 4, 3, 2 and 1 respectively.

5. Each incidence of personal habits practice has been measured using 5 Point Scale of Very Regular, Regular, Can’t Say, Irregular, Very Irregular and Never with weightage of 5, 4, 3, 2, 1 and Zero respectively.

6. The extent of usage of Polluting Assets has been measured using 5 point Scale of Daily, Many times, Few times, Occasionally, Rarely and Never (because not owned) with the weightages of 5, 4, 3, 2, 1 and Zero respectively.

1.10.4 Pilot Study and Pre-Testing

A pilot study was conducted with a sample of 30 cases. The data collected were subjected to Cronbach’s Alpha Test to check the internal consistency and reliability of the scales. The Cronbach’s Alpha coefficient values obtained are provided in Table 1.01.

<table>
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<tr>
<th>Dimensions</th>
<th>Number of Variables</th>
<th>Cronbach Alpha Coefficient Value</th>
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<tbody>
<tr>
<td>Incidence of Personal Habits (IPH)</td>
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<tr>
<td>Ideal Consumption for Human Development. (ICHD)</td>
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<tr>
<td>Personal Environmental Awareness and Practice (PEAP)</td>
<td>6</td>
<td>0.752</td>
</tr>
<tr>
<td>Environmental Degradation Severity (EDS)</td>
<td>15</td>
<td>0.926</td>
</tr>
<tr>
<td>General Environmental Awareness (GEA)</td>
<td>60</td>
<td>0.946</td>
</tr>
<tr>
<td>Water Conservation Awareness (WCA)</td>
<td>30</td>
<td>0.943</td>
</tr>
<tr>
<td>Water Conservation Practice (WCP)</td>
<td>30</td>
<td>0.872</td>
</tr>
<tr>
<td>Electricity Conservation Awareness (ECA)</td>
<td>30</td>
<td>0.931</td>
</tr>
<tr>
<td>Electricity Conservation Practice (ECP)</td>
<td>30</td>
<td>0.935</td>
</tr>
</tbody>
</table>
The table 1.01 shows that Cronbach Co-efficient Alpha values for all types of variables are high (above 0.700). There is higher consistency in measurement of difference types of variables and therefore, the scales used for measurement of variables are highly reliable. However, in the light of experience gained through the study, scheduled questionnaire was modified to elicit responses from HFCs.

1.11 STATISTICAL ANALYSIS

Primary data collected were subjected to statistical analysis using SPSS version 23. The following statistical tools have been applied to analyze the variables of water and electricity conservations and those having bearing on them.

1. The Percentage Analysis has been applied to the profiles of the respondents such as education and occupation and also the normal sources of water for different household purposes.

2. The Descriptive Statistical Analysis has been ascertained to describe the characteristics for various profiles of the respondents such as age, average monthly family income, electricity-bill, expenditure for water, family size, and incidence of family multiple employment and also measured variables of water and electricity conservations and those factors which have influence on them.

3. The Factor Analysis has been used as a method of data reduction to find out the latent and dominant dimensions in the variables of Incidence of Personal Habits (IPH), Ideal Consumption for Human Development (ICHD), Polluting Asset Usage (PAU), Environmental Awareness Creators (EAC), Personal Environmental Awareness and Practices (PEAP), Environmental Degradation Severity (EDS), General Environmental Awareness (GEA), Water Conservation Awareness (WCA) and Water Conservation Practice (WCP), Electricity Conservation Awareness (ECA), and Electricity Conservation Practice (ECP).

4. The Cronbach Alpha Reliability Test has been applied to ascertain the reliability and consistency of the measurement scales used in instrument
experimented in the pilot study of the survey of household water and electricity conservation management.

5. The **Paired ‘t’- test** has been applied to find out the significance of difference between the **Water Conservation Awareness (WCA)** and **Water Conservation Practice (WCP)**; **Electricity Conservation Awareness (ECA)** and **Electricity Conservation Practice (ECP)** and also water and electricity expenditures.

6. The **‘t’- test** has been applied to find out the significance of difference between the young female household consumers and their mothers in their environmental awareness and practices.

7. The **General Linear Model (GLM)** has been used to identify influencers which have significant and simultaneous impact on both **Water Conservation Practice (WCP)** and **Electricity Conservation Practice (ECP)** and also on factors of them.

8. The **Structural Equation Model** has been applied to trace out the path of impact of environmental influencers and awareness on the practices of the water and electricity conservations.

### 1.12 LIMITATIONS OF THE STUDY

The limitations of the present study are as follows:

1. The study is based on the primary data collected only from the respondents, of young female consumers who have the benefits of higher education and exposure to mandatory environment education and their mothers who may not have such benefits, who reside in urban Chennai, Tamil Nadu. Therefore, the findings may not be generalized to the other districts/ the other states/the country.

2. Owing to time, physical and resource constraints, only few dimensions of the water and electricity conservation practices have been considered.

3. This study is confined only to urban educated population of the Youth Female Consumers with English knowledge and also their mothers. Therefore, it
cannot be generalized to those urban populations who do not have English knowledge and those who live in rural areas.

4. Limitations of the structured questionnaire are due to limited choices available to the respondents.

5. The life style factors, perceptions, awareness and attitudes are very difficult to measure because they are mostly subjective and are self-reported by the consumers. There may be possibilities of withholding information due to fear or apprehensions of exposure, or embarrassment or loss of privacy.

6. A study on consumer behavior cannot lead to long lasting findings as they are presently worthy only for a short period. In the long run, the behavior is likely to change with socio economic and cultural changes.

7. The study is concentrated only on water and electricity awareness and practices of individual female consumers of the house holds only and not on cooperative efforts of all members of the households and also not on the collective measures in the public domain.

1.13 CHAPTER SCHEME

The thesis has been divided into 10 chapters which are as follows:

Chapter I – THE INTRODUCTION chapter contains brief introduction to the study, brief review of literature, statement of problem, objectives, research methodology, limitations of the study and chapter scheme.

Chapter II – THE REVIEW OF LITERATURE Chapter has brief definitions of environment, issues, resources and types, climate change and its effects, environmental degradation and pollution, environmental awareness and its creators, measures for environmental enhancement, previous studies and researches, reports etc., water pollution and scarcity and also electricity power cuts and responsive measures to conserve water and electricity and the need for present study.

Chapter III – THE PROFILES OF HOUSEHOLD FEMALE CONSUMERS (HFC) chapter contains percentage analysis of education and occupation and descriptive statistics of age of both Young Female Consumers (YFC) and Mothers of
Young Female Consumers (MYFC) and also descriptive statistics of their family profile such as family size, monthly income, multiplicity of employment, electricity bill and water charges. It also identifies dominant and latent dimensions in the variables of Incidence of Personal Habits (IPH) which have bearing on water and electricity conservations.

**Chapter IV-ENVIRONMENTAL AWARENESS** chapter deals with identification of dominant and latent dimensions and their relative importance in the variables of General Environmental Awareness (GEA), Environmental Awareness Creators (EAC), Personal Environmental Awareness and Practice (PEAP), Ideal Consumption for Human Development (ICHD) and Environmental Degradation Severity (EDS) which have bearing on Water Conservation Practice (WCP) and Electricity Conservation Practice (ECP).

**Chapter V – SOURCE OF WATER AND ELECTRICITY** chapter deals with various sources of water and electricity. It also identifies the extent of usage of water for different purposes from each source. Moreover it examines the monthly family expenditure for water and electricity and the significance of difference between them. It also studies the extent of usage of assets using electricity, leading to pollution.

**Chapter VI – WATER CONSERVATION** chapter deals with identification of latent and dominant dimensions in the variables of Water Conservation Awareness (WCA) and Water Conservation Practice (WCP) and their relative importance. It also identifies Household Female Consumer (HFC) profiles, environmental awareness factors of General Environmental Awareness (GEA), Environmental Awareness Creators (EAC), Personal Environmental Awareness and Practice (PEAP), and Ideal Consumption for Human Development (ICHD), Environmental Degradation Severity (EDS), Polluting Asset Usage (PAU) and Water Conservation Awareness (WCA) which significantly influence total Water Conservation Practice (WCP) and also WCP factors. The gap analysis between Water Conservation Awareness (WCA) and Water Conservation Practice (WCP) has also been carried out.

**Chapter VII- ELECTRICITY CONSERVATION** chapter deals with identification of latent and dominant dimensions in the variables of Electricity Conservation Awareness (ECA) and Electricity Conservation Practice (ECP) and their
relative importance. It also identifies Household Female Consumer (HFC) profiles, environmental awareness factors of General Environmental Awareness (GEA), Environmental Awareness Creators (EAC) Personal Environmental Awareness and Practice (PEAP) and Ideal Consumption for Human Development (ICHD), Environmental Degradation Severity (EDS), Polluting Asset Usage (PAU) and Electricity Conservation Awareness (ECA) which significantly influence total ECP and also ECP factors. The gap analysis between ECA and ECP has also been carried out.

Chapter VIII – WATER AND ELECTRICITY MANAGEMENT (WEM) chapter deals with the identification Household Female Consumer (HFC) profiles, environmental awareness factors of General Environmental Awareness (GEA), Environmental Awareness Creators (EAC) Personal Environmental Awareness and Practice (PEAP) and Ideal Consumption for Human Development (ICHD), Environmental Degradation Severity (EDS) Polluting Asset Usage (PAU) Water Conservation Awareness (WCA) and Electricity Conservation Awareness (ECA) that simultaneously influence both total Water Conservation Practice (WCP) and Electricity Conservation Practice (ECP) and the factors of WCP and ECP.

Chapter IX - COMPARATIVE STUDY BETWEEN HOUSEHOLD FEMALE CONSUMERS (HFC) examines the significance of difference in not only the ages, but also in various environmental awareness levels and water and electricity conservation practices between the mothers and daughters of the households in Chennai.

Chapter X - THE CONCLUSION chapter lists out the major findings of the study, scope for future research and constructive suggestions for Water and Electricity Conservation for enhancement of environment in future.
END NOTES


