Chapter X
Findings, Suggestions and Conclusion
FINDINGS, SUGGESTIONS AND CONCLUSION

Urbanisation is the trend of modern era. The industrial revolution and agriculture revolution of last two centuries, the IT revolution and New Economic Policy of Liberalisation, Privatisation and Globalisation of last three decades have led to concentration of industry, business, education, tourism, entertainment, health, transport, finance and other infrastructural facilities in urban areas. Increased population and better urban opportunities for enhanced standard of living attracted migration of people from rural to urban areas. While contributing maximum share to GDP (Gross Domestic Product), the urban centers despite occupying a microscopic land area are also major consumers of electricity and water. The urban people enjoying better standard of living due to better education, employment and income have fallen prey to reckless consumerism resulting in environmental degradations and pollutions and also global warming with adverse consequences. So, there is a need for environmental revolution i.e, eco economic department with sustainable and responsible consumerism for the benefit of present generation and also survival of future generations to come.

Chennai the capital of Tamil Nadu in India is one such city with high density population consuming water and electricity leading to the scarcity and pollutions. The women empowered by education, employment and income play a decisive role in decision making in the city households. The youth female consumers with higher education and mandatory environmental studies education can play a vital role in water and electricity conservations and impart their awareness to their children for the generation to come. Therefore, there is a need for present study on Household Water and Electricity Management (A Study based on General Environmental Awareness and Water and Electricity Conservations of Household Female Consumers in Chennai).

The study is based on primary data collected from female consumers of 500 households in Chennai city using survey method. In each household, a Young Female Consumer with higher education and her mother respondent to a well structured
questionnaire on their profiles, environmental awareness, source and uses of water and electricity and water and electricity conservation practices followed by them.

The primary objectives are to study and measure water and electricity conservation measures and identify the dominant and latent dimensions of them, to identify the factors which significantly influence water and electricity conservation measures, to suggest ways and means to enhance the water and electricity conservations measures in Chennai.

The secondary objectives are to study about factors influencing water and electricity conservations, to examine personal and family profiles of household female consumers, to identify the extent of the different normal purposes for which water is used out of normal sources of water, 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), to find out the gaps between water and electricity conservation awareness and practices.

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 data, especially from print media, published books and articles on different environmental issues and websites.

Percentage Analysis, Descriptive Statistical Analysis, Factor Analysis, General Linear Model (GLM), Cronbach Alpha Reliability test, t test, Paired ‘t’- test, and Structural Equation Model are the statistical tools applied to analysis the primary data using version 23 of SPSS.
10.1 **FINDINGS**

The findings of the study are as follows:

I. **Personal Profiles of Young Female Consumers (YFC)**

1. The mean age of the YFC is 19.61 years with the lower standard deviation of 1.830 years and is a robust measure. 18 years, 19 years and 20 years are the first quartile, median and also mode and the third quartile of their ages respectively. The age distribution has a slight positive skewness. The minimum and maximum ages of the YFC are 17 and 27 respectively.

2. Majority of the young female respondents (92.2%) have college education.

3. Majority of the young female respondents (81.8%) belong to the other category (students).

II. **Personal Profiles of Mothers of Young Female Consumers (MYFC)**

1. The mean age of the mother is 43.328 years with the standard deviation of 4.466 years and is a robust measure. 40 years, 43 years and 46 years are the first quartile and mode, median and the third quartile of their ages respectively. The age distribution has a slight positive skewness. The minimum and maximum ages of the mother respondents are 32 and 57 respectively.

2. Maximum numbers of mothers have obtained school education only (39.4%).

3. Majority of mother respondents are others namely homemakers (69%).

III. **Family Profiles of Household Female Consumers (HFC)**

1. The mean of the family size is 3.674 members with the standard deviation of 1.216 members and is a robust measure. 3 members and 4 members are the first quartile and median, mode and the third quartile of
their family size respectively. The family size distribution has a slight positive skewness. The minimum and maximum numbers of the family size are 1 and 10 respectively.

2. The mean of the family members employed is 1.676 members with the standard deviation of 0.856 members and is a robust measure. 1 member, 2 members and 2 members are the first quartile and also mode, median and the third quartile of their family members employed. The incidence of multiple employment distribution has a slight positive skewness. The minimum and maximum numbers of the family member employed are 1 and 6 respectively.

IV. Dominant Dimensions of Incidence of Personal Habits (IPH) Variables

Two independent factors have been extracted out of 5 IPH variables of which the Social Health Habits Factor (SHH) is the most dominant one, followed by Personal Health Habits Factor (PHH).

V. Dominant Dimensions of General Environmental Awareness (GEA) Variables

Fifteen independent factors have been extracted out of 60 GEA variables of which the Human Health Problems Factor (HHP) is the most dominant one, followed by Land Pollution Factor (LP), 3R Factor (3R), Energy Conservation Factor (EC), Water Pollution Factor (WP), Ripple Effect Factor (RE), Energy Utilisation Factor (EU), Plastic Eradication Factor (PE), Climate Change Factor (CC), Government Measures Factor (GM), Junk Management Factor (JM), Global Warming Aftermath Factor (GWA), Environmental Repercussion Factor (ER), Global Warming Factor (GW) and Law Enforcement Factor (LE).

VI. Dominant Dimensions of Environmental Awareness Creators (EAC) Variables

Three independent factors have been extracted out of 12 EAC variables of which the Service Statutory Factor (SS) is the most dominant one, followed by Social Influence Factor (SI) and followed by Mass Media Factor (MM).
VII. Dominant Dimensions of Personal Environmental Awareness and Practices (PEAP) Variables

Two independent factors have been extracted out of 5 PEAP variables of which the Mutual Personal Appreciation Factor (MPA) is the most dominant one, followed by Social Activist Factor (SA).

VIII. Dominant Dimensions of Ideal Consumption for Human Development (ICHD) Variables

Three independent factors have been extracted out of 8 ICHD variables of which the Eco-Friendly Consumer Pressure Factor (EFCP) is the most dominant one, followed by Eco-Friendly Development Factor (EFD) and Eco-Friendly Business Response Factor (EFBR).

IX. Dominant Dimensions of Environmental Degradation Severity (EDS) Variables

Three independent factors have been extracted out of 15 EDS variables of which the Natural Reaction Factor (NR) is the most dominant one, followed by Man Made Problem Factor (MMP) and Health Deteriorating Factor (HD).

X. Normal Sources of Water used for Different Normal Purposes

1. For drinking propose without purification/ boiling, can water suppliers are the most common source followed by open well/ bore well and corporation.

2. For drinking after purification/ boiling, can water suppliers are the most common source followed by the corporation and open wells/ bore wells.

3. For cooking food, the corporation is the most common source of supply followed by open wells/ bore wells, can water suppliers and water tanker suppliers.

4. For the remaining purposes of washing faces, hands, feet etc, bathing, washing clothes, utensils floors, sink sets etc, bathing and watering plants and gardens, open wells/ bore wells are the most common source of water followed by the corporation and water tanker suppliers.
XI. **Descriptive Statistics of Average Monthly Water and Electricity Expenditure**

1. The Average Monthly Water Expenditure is Rs.475.79 and has wider variation with the higher standard deviation of Rs.603.487. Rs.150, Rs.300 and Rs.500 are the first quartile, median and the third quartile of their monthly water expenditure respectively. The mode is Rs.500. The monthly water expenditure distribution has significantly higher positive skewness and therefore, more families have lower average monthly water expenditures. The minimum and maximum monthly electricity expenditures of the respondents are Rs.0.000 and Rs.7,000 respectively.

2. The average monthly electricity expenditure is Rs.1,656.55 with the higher standard deviation of Rs.1,615.279 and therefore, it has wider variation. Rs.650, Rs.1,000 and Rs.2,000 are the first quartile, median and also mode, and the third quartile of monthly electricity expenditure respectively. The monthly electricity expenditure distribution has significantly higher positive skewness and therefore, more families have lower average monthly electricity expenditure. The minimum and maximum monthly electricity expenditure of the respondents are Rs.100 and Rs.10,000 respectively.

XII. **Dominant Dimensions of Polluting Assets usage (PAU) Variables**

Two independent factors have been extracted out of 12 PAU variables of which the Polluting Assets More Usage Factor (PAMU) is the most dominant one and followed by Polluting Assets The Most Usage Factor (PATMU).

XIII. **Difference in Average Monthly Electricity and Water Expenditures of Household Female Consumers**

There is a significant difference between average monthly electricity expenditure and average monthly water expenditure. The monthly average electricity expenditure is significantly higher than the monthly average water expenditure.
XIV. Dominant Dimensions of Water Conservation Awareness (WCA) Variables

1. Six independent factors have been extracted out of 30 WCA variables of which the Economical Utility Awareness Factor (EUA) is the most dominant one and followed by Sensible Applicability Awareness Factor (SEAA), Conservative Usage Awareness Factor (CUA), Curbing Lavish Usage Awareness Factor (CLUA), Water Habitude Awareness Factor (WHA) and Foresight Approach Awareness Factor (FAA).

2. Out of maximum value of 150 (30x5) in WCA variables, WCA values range from 71 to 150 and its median and mode values are 119 and 120 respectively. The mean value of 117.196 is a robust measure of WCA as the standard deviation is lower. The WCA distribution has a slight negative skewness.

3. Out of maximum value of 150 (30x5) in WCP variables, WCP values range from 75 to 149 and its median and mode values are 118 and 120 respectively. The mean value of 115.744 is a robust measure of WCP as the standard deviation is lower. The WCP distribution has a slight negative skewness.

XV. Difference between Water Conservation Awareness and Practice

There are significant differences in Economical Utility Factor, Conservative Usage Factor, Curbing Lavish Usage Factor and Water Habitude Factor. Despite higher levels, their practice levels are significantly falling short of their awareness levels. In case of Sensible Applicability Factor and Foresight Approach Factor, its practice levels not only at higher levels, but also at par with their awareness levels as there is no difference or difference if any is not significant. Despite higher levels, the Total Water Conservation Practice is significantly falling short of the Total Water Conservation Awareness.

XVI. Dominant Dimensions of Electricity Conservation Awareness (ECA) Variables

1. Five independent factors have been extracted out of 30 ECA variables of which the Human Intervention Awareness Factor (HIA) is the most
dominant one and followed by Praxis Usage Awareness Factor (PUA), Diligent Practice Awareness Factor (DPA), Frugal Consumption Awareness Factor (FCA) and Safety Practice Awareness Factor (SPA).

2. Out of maximum value of 150 (30x5) in ECA variables, ECA values range from 40 to 150 and its median and mode values are 120 and 120 respectively. The mean value of 118.329 is a robust measure of ECA as the standard deviation is lower. The ECA distribution has a slight negative skewness.

3. Out of maximum value of 150 (30x5) in ECP variables, ECP values range from 68 to 150 and its median and mode values are 120 and 120 respectively. The mean value of 118.022 is a robust measure of ECP as the standard deviation is lower. The ECP distribution has a slight negative skewness.

**XVII. Difference between Electricity Conservation Awareness and Practice**

In each of the EC factors, there is no significant difference between Awareness and Practice levels. The practice level is not only on higher level but also at par with the awareness level. Similarly Total Electricity Conservation Practice is also at higher level and is at par with higher Total Electricity Conservation Awareness as the difference between them is not significant.

**XVIII. Impact of Determinants of WEM Factors (DWEMF’S)**

Occupation, Monthly Family Income, Monthly Electricity Bill, Monthly Water Expenditure, Number of Family Members (Adults), Number of Family Members (Children), Social Health Habits factor (SHH), Eco-Friendly Business Response factor (EFBR), Social Activist factor (SA), Human Health Problems factor (HHP), 3 R factor, Water Pollution factor (WP), Climate Change factor (CC), Junk Management factor (JM), Law Enforcement factor (LE), Total Water Conservation Awareness and Total Electricity Conservation Awareness have a significant simultaneous impact on eleven WCP and ECP factors.
XIX. Impact of DWEMFS on each WEM Factor

1. Impact of DWEMFS on Difference in Economical Utility Practice Factor

There are significant differences in Economical Utility Practice factor in groups of Monthly family income, number of family members (Adults), water pollution factor, plastic eradication factor, Government measures factor, Law Enforcement factor, Eco-Friendly Consumer pressure factor, Polluting Assets More Usage factor, Social Activist factor and Total Water Conservation Awareness factor.

2. Impact of DWEMFS on Sensible Applicability Practice Factor

There are significant differences in Sensible Applicability Practice factor in groups of monthly family income, monthly Electricity Expenditure, monthly water expenditure, Energy Utilisation factor, Eco-Friendly Development factor, Total Water Conservation Awareness factor and Total Electricity Conservation Awareness factor.

3. Impact of DWEMFS on Conservative Usage Practice Factor

There are significant differences in Conservative Usage Practice factor in groups of monthly family income, monthly water expenditure, 3R factor, Climate Change factor, Environmental Repercussion factor, Personal Health Habits factor, Service Statutory factor and Total Water Conservation Awareness factor.

4. Impact of DWEMFS on Curbing Lavish Usage Practice Factor

There are significant differences in Curbing Lavish Usage Practice factor in groups of Climate Change factor, Government measures factor, Social Health Habits factor, Total Water Conservation Awareness factor and Total Electricity Conservation Awareness factor.

5. Impact of DWEMFS on Water Habitude Practice Factor

There are significant differences in Water Habitude Practice factor in groups of occupation, monthly electricity expenditure, monthly water expenditure, water pollution factor, Ripple Effect factor, Government measures factor, Environmental Repercussion factor, Law Enforcement factor, Eco-Friendly Business Response factor and Total Water Conservation Awareness factor.
6. **Impact of DWEMFS on Foresight Approach Practice Factor**

There are significant differences in Foresight Approach Practice factor in groups of monthly water expenditure, number of family members employed, Human Health Problems factor, Service Statutory factor, Social Activist factor, Total Water Conservation Awareness factor and Total Electricity Conservation Awareness factor.

7. **Impact of DWEMFS on Human Intervention Practice Factor**

There are significant differences in Human Intervention Practice Factor in groups of monthly family income, monthly Electricity Expenditure, Energy Conservation factor, Law Enforcement factor, Service Statutory factor, Global Warming Aftermath factor, Total Water Conservation Awareness factor and Total Electricity Conservation Awareness factor.

8. **Impact of DWEMFS on Praxis Usage Practice Factor**

There are significant differences in Praxis Usage Practice Factor in groups of occupation, monthly family income, monthly Electricity Expenditure, 3R factor, Polluting Assets More Usage factor, Natural Reaction factor and Total Water Conservation Awareness factor.

9. **Impact of DWEMFS on Diligent Practice Factor**

There are significant differences in Diligent Practice factor in groups of monthly family income, Total Water Conservation Awareness factor and Total Electricity Conservation Awareness factor.

10. **Impact of DWEMFS on Frugal Consumption Practice Factor**

There are significant differences in Frugal Consumption Practice factor in groups of Monthly family income, monthly water expenditure, Mass Media factor, Social Activist factor, Total Water Conservation Awareness factor and Total Electricity Conservation Awareness factor.

11. **Impact of DWEMFS on Safety Practice Factor**

There are significant differences in Safety Practice Factor in groups of education, monthly family income, number of family members (Children), Water Pollution factor, Junk Management factor, Polluting Assets The Most Usage factor and Total Electricity Conservation Awareness factor.
SEM ANALYSIS OF THE IMPACT OF DETERMINANTS OF WATER AND ELECTRICITY MANAGEMENT (WEM) BY HOUSEHOLD FEMALE CONSUMERS (HFC)

IPH, ICHD, EAC, PEAP are the determinants significantly influence GEA, explaining 24% of the variance in it. GEA together with its predictors significantly influence WCA, explaining 47% of variance in it and also WCA, explaining 38% of variance in it. WCA and ECA together with their predictors significantly influence WEM, explaining 71% of variance in it. WEM together with its predictors significantly influence WCP, explaining 80% of variance in it and also ECP, explaining 71% of variance in it. In other words, 80% and 71% of variance in WCP and ECP respectively have been significantly influenced by WEM together with its predictors. To conclude, to a large significant extent WCP and ECP have been influenced by WEM with its predictors.

XX. Comparative Study between HFC Groups about their Environmental Awareness and Practices

While both YFC and MYFC have higher levels of environmental awareness and practices, the YFCs have significantly higher levels than their mothers in LP, 3R, SS, FCA and FCP and MYFCs have significantly higher levels than their daughters in GM, GWA, SA, Total PEAP, EFCP, EDS and also its all factors and WHA. In the other environmental awareness and practices, there are no significant differences between them, despite higher for both the groups.

10.2 SUGGESTIONS FOR WATER AND ELECTRICITY CONSERVATION TO GOVERNMENT

As water and electricity conservations are not only environmental issues but also common public issues they have to be dealt jointly by Government, NGOs and public (consumers). The Governments, central, state and local bodies, should set an example for the people (consumers) by ensuring its buildings and public places (such as parks, roads, lamp post etc.) are water and energy efficient. Reducing operating costs, increasing dependency on renewable resources, upgrading environmental protection and banning plastic and thereby practice creating General Environmental Awareness in general and water and electricity conservation awareness in particular.
The following specific water and electricity conservations and practices in Government buildings and public places are suggested.

1. Replace all lighting facilities with LED.

2. Replace all electrical equipments such as fans, air conditioners, fridges and other facilities with electricity efficient equipments.

3. Install solar power panels with net metering facility.

4. Replace all plumbings and fittings with water efficient ones.

5. Introduce periodical water and electricity efficiency audits system and carry out audit suggestions.

6. Construct Rain Water Harvesting systems such as rain water pits recharge, rain water recharge wells in all Government buildings and public places.

7. Amending statues for mandatory water efficiency audit and energy efficiency audit and enforcing them with proper follow-ups.

8. Installing and maintaining gray/black water recycling plants and ensuring their proper maintenance.

9. In future, constructing only green building for Government and public facilities with water efficient and energy efficient equipments and fittings.

10. Tree planting in public places and ensuring growth of saplings planted with the help of NGOs and neighborhood residential associations.

11. In the case of existing households, the Government incentives/subsidies can be extended to all existing households to go for replacement of all electrical and water equipments with energy efficient ones and installing solar power panels with net metering and rain water wells (recharging wells).

12. Refuse to buy water and electrical equipments and fittings without eco-labels.
10.3 SUGGESTIONS FOR HOUSEHOLD CONSUMERS ESPECIALLY FEMALE ONES

The government should be at continuous environmental awareness campaign not only at the time of natural disasters and scarcities but also at times of surplus resources available. The services of NGOs including Women Self Help Groups and also local bodies should be continuously striving for creating environmental awareness.

For conservation of water and energy:

1. Co-operation/participation with NGOs and Government measures on environmental issues especially water and electricity conservations in households.

2. Tree planting within their household precincts and neighborhood public places and taking care of growth of the saplings planted.

3. In future, doing construction/purchase of green buildings only with water and electricity efficiency, water recycling facilities, green solar power and rain water harvesting. (recharge pits and recharge wells)

4. Refuse to buy water and electricity equipments and fittings without eco-labels.

5. Proper segregation of household waste into bio degradable and non biodegradable one and proper disposal of latter waste

6. In case of households (whether individual or group residential ones) the following water and electricity conservation practices to be followed if they are not in use/operation already:
   a. Replace all lighting facilities with LED.
   b. Replace all electrical equipments such as fans, air conditioners, fridges and other facilities with electricity efficient equipments.
   c. Install solar power panels with net metering facility by taking advantage of Government incentives and the latest innovations.
d. Replace all plumbings and fittings with water efficient ones.

e. Introduce periodical water and electricity efficiency audits system and carry out audit suggestions.

f. Construct Rain Water Harvesting systems such as rain water pits and rain water wells.

g. Introduce water efficiency audit and energy efficiency audit and enforcing them with proper follow-ups.

h. Installing and maintaining gray/ black water recycling plants and ensuring their proper maintenance.

10.4 SCOPE FOR FUTURE STUDIES

1. A similar study can be conducted among male consumers or female consumers in Chennai city who have the opportunities of conserving water and electricity at both home and work places.

2. A similar study can be conducted at rural areas where water and electricity are utilised for agriculture in addition to domestic consumption.

3. A separate study of households water conservation practice alone with special emphasize on Rain Water Harvesting and water efficiency audit can be conducted in both rural and urban areas.

4. A separate study on household electricity conservation practice with special emphasize on household solar energy production, net metering and energy efficiency audit in both rural and urban areas can be conducted.

5. A comparative study between consumers living in water deficiency areas and those living in rain sufficient areas but monsoon failing often, may also be conducted. (For eg: Between Rajasthan and Andhra Pradesh.)
To conclude, in case of Chennai households, water and electricity management for preservation practices of female consumers, the determinants are water conservation awareness and electricity conservation awareness which in turn are determined by General Environmental Awareness which is significantly influenced by other environmental awareness of Personal Environmental Awareness and Practice (PEAP), Ideal Consumption for Human Development (ICHD) and Incidence of Personal Habits (IPH). Moreover, in addition to other environmental awareness, monthly family income, monthly water expenditure, monthly electricity expenditure and family size (adults and children) have simultaneous impact on Water Conservation Practice and Electricity Conservation Practice of household female consumers. With their decisive role in household management and household budget, the female consumers have significant role in water and electricity conservation and also in inculcation of water and electricity conservation awareness and practice among their children for generations to come.