Research Article

URBAN ENVIRONMENTAL PROBLEMS AND CONTROL MEASURES IN COIMBATORE CITY IN TAMIL NADU

Sundar I

Department of Economics, Directorate of Distance Education, Annamalai University

A R T I C L E   I N F O

A B S T R A C T

The growth of urban population leads to congestion of cities. This congestion leads to various stresses on civic amenities like air, water, transport, electricity and health services. The pollution of air and water are the starting points of many diseases. This paper deals with urban environmental problems and control measures in Coimbatore city in Tamil Nadu. It outlines the various indicators on urban environmental problems and control measures and such indicators are quantified and measured on the basis of 5 point rating scale. This paper concludes with some interesting findings along with policy suggestions.

INTRODUCTION

Many social and economic benefits have been brought out by urbanization, however, there are also urban environmental problems. Cities comprise less than 3% of the Earth's surface, but there is an extraordinary concentration of population, industry and energy use, leading to a massive local pollution and environmental degradation. In the cities, approximately 78% of carbon emissions are due to human activities. The ecological footprints of cities go through emissions, consumption and other human activities far beyond their urban boundaries to forests, agriculture, water and other surfaces, which supply their residents so that they have an enormous impact on the surrounding rural, regional and global ecosystem.

Cities are therefore centers of consumption (energy, materials, ...), greenhouse gas production, waste and emissions of pollutants in water and air. Ecological and sociological footprints of cities have expanded over increasingly large areas and created urban - rural continuum of communities, who share similar aspects of individual lifestyles. There are less and less areas in the world which are not under the influence of the dynamics of cities. The world faces enormous environmental challenges in terms of climate change, resource use and protection of the natural environment.

Corresponding author: **Sundar I**
Department of Economics, Directorate of Distance Education, Annamalai University

Urban areas have a high environmental impact that can be felt globally, as well as within its own borders. Urban urban environmental problems are mostly inadequate water supply, wastewater, solid waste, energy, loss of green and natural spaces, urban sprawl, pollution of soil, air, traffic, noise, etc. All these problems are particularly serious in developing countries and countries with economic transition, where there is a conflict between the short-term economic plan and the protection of the environment. Pollution of the urban environment and its components is the total resultant of an excessive burden on the environment and the self-cleaning capacity. Urban environmental problems in urban areas are growing especially in cities in developing countries. Of greatest concern are the state of air quality, noise, and congestion. In cities of economically developed countries, the urban environmental problems related to industrial production, lodging, and basic infrastructure are reduced, however, the problems of consumption (increasing waste) and traffic problems have increased. Cities consume increasing amounts of natural resources, produce more and more waste and emissions, and this entire have an impact on the regional and planetary environment. Air and water pollution and waste are the main urban environmental problems in most cities. The underlying causes of air pollution of the city are the processes that are associated with the burning of fossil fuels (production and consumption of energy for heating buildings, industrial activities, traffic). Noise is also a special form of pollution, which burdens the urban population. Urbanization causes numerous effects on water resources; these effects can change the hydrology, water quality and availability of aquatic

Habitats. Deterioration in the quality of ground and river water in the cities is mainly due to the water consumption of the population and industry. Contamination is usually caused by industrial activity as well as the disposal of waste, so in cities is dominated water pollution from municipal and industrial wastewater. The city is marked by large inputs of energy, water, food and a variety of raw materials, resulting in large quantities of goods, as well as waste, which means a huge loss of natural resources in the form of raw materials and energy. Urban ecosystems are indicated by a very high energy consumption and large amounts of solid waste that accumulate in certain places. In this way, they represent landscape degradation factor and adversely affect the quality of water resources and urban air.

Urban environmental problem scenario

In most cities, a man transformed nature, vegetation was replaced with concrete, asphalt, and other surfaces, transformed or buried riverbeds, caused city climate and created huge artificial transfers of energy, water, and various substances. Growing cities are changing hydrological relationships and thereby influence the size and frequency of floods. Knowledge of urban hydrology and geomorphology is not only a key to good urban planning but should be available to each resident.

Climate

Cities have little direct impact on the global balance of radiation, but inside urban climate, generated by absorption and subsequent re-radiation of heat from built-up areas and emissions of artificial heat through combustion, creates the effect of the urban heat island. Cities are warmer at night than the surrounding countryside and often, especially in the higher latitudes, even during the day. In Tokyo, anthropogenically generated heat increases the temperature of the urban surface by about 1.5 ° C in summer and 2.5 ° C in winter, the effect of urban land-use raises the temperature by about 1 ° C in both halves of the year.

Water

Even the hydrological cycle is increasingly under the influence of a man who uses water for different purposes and returns it to the water cycle contaminated. These changes are in urban areas so profound that we can speak of urban hydrology. Built-up areas create artificial impervious surfaces that reduce surface water supplies, infiltration is gone, surface flow, permeability, and erosion are increased, evaporation is reduced. In a wider range, it comes not only to qualitative but also quantitative consequences (regulation, dams, ...). However, human activity is reflected in the quality of water resources. The major problem present urban waste water and residues of pesticides and biocides, which pass through the surface and groundwater. Freshwater resources in urban areas are also threatened by the waste from transport, tourism, military activities.

Soil

Human activities have a negative impact on pedosphere; this is reflected in the increasing chemisation and mechanization of agriculture and in the cities, however, especially as poisoning the soil through contaminated air and precipitation and changes in the quality of land use for sealing.

Review on the subject

Patricia Romero-Lankao, et.al. (2013) explored the health risks related to air pollution and temperature extremes within three Latin American cities: Bogota, Colombia, Mexico City, Mexico, and Santiago, Chile. Duo Qin (2010) examined the long-run relationship between industrial pollution and income in China using provincial panel data. Katja Coneus and Christa Katharina Spie (2010) examined the impact of outdoor and indoor pollution on children's health from birth until the age of three years in Germany. Sunil Chandrasiri (2006) estimated the health costs of particulate emissions from diesel-powered vehicles in Colombo City, Sri Lanka. Budy P. Resosudarmo and Lucentezza Napitupulu (2004) estimated the health cost of Jakarta's air pollution. It is found that in 1999 reached $US220 million. In 2001 the government planned to launch a program to control vehicle emissions.Hercules Haralambides and Girish Gujar (2012) applied data model to evaluate dry port efficiency, while taking into account the CO2 emissions caused by the transport of containers from dry ports, located in the North Capital Region of India. Amit Garg (2011) reported about the human health impacts from urban air pollution in India. M.N. Murty (2010) examined the possibility of using economic instruments, especially pollution taxes and bargaining approaches, as a means to encourage people's participation in environmental management in India.

Ramakrishna B. M and Jayasheela (2010) reported that in India, rapid growth of population, poverty, urbanization, industrialization and several related factors are responsible for the rapid degradation of the environment. Kakali Mukhopadhyay (2008) estimated the emissions related to fossil fuel combustion in India and also identified the factors responsible for changes in those emissions during the 1980s and 1990s. Prakash Nelliyat (2007) discussed the textile industrial growth in Tiruppur in the context of global diversification of textile manufacturing and trade with emphasis on employment, income and foreign exchange in regional economy perspective such activities lead to urban environmental pollution. M. Narsimha Murty, et.al. (2007) found that there is a significant variation in marginal cost of pollution abatement or shadow prices of bad outputs across the firms and an increasing marginal cost of pollution abatement with respect to pollution reduction by the firms.

Sacchidananda Mukherjee and Prakash Nelliyat (2006) examined the environmental and socio-economic impacts of industrial effluent on irrigation water in different industrial locations at Mettupalayam taluk through primary surveys and secondary information. Ramprasad Sengupta and Subrata Mandal (2005) estimated the health damage cost of urban air pollution for 35 major urban agglomerations of India arising from automotive emissions and the savings that can be achieved by the regulation of fuel quality so as to conform to the Euro norms.

METHODS AND MATERIALS

This paper deals with urban residents rating on urban environmental problems and measures to control urban environmental problems in Coimbatore city. The researcher has selected the 300 households representing various occupation groups in different parts of the city under stratified random sampling method. The relevant data are collected from the respondents with the help of interview schedule method.

The collected data are classified and tabulated with the help of computer programming. Cross tabulation has been done by putting independent variables and dependent variables. The collected qualitative data are converted into quantitative data with the help of 5 point rating scale. The data analysis has been carried out with the help of mean, ANOVA two way test and t test.

RESULTS AND DISCUSSION

This section deals with respondents' rating on urban environmental problems. It can be assessed with the help of 38 factors on a 5 point rating scale. These include acid rain, broken glass, building on green space, carbon footprint, changes in weather in terms of flooding, cyclone and heavy rainfall, stagnation of garbage waste, global warming, accumulation of solid waste, accumulation of liquid waste, consumption and wasting natural resources, damage to ozone layer, difficulty in travelling by means other than car, discarded needles and syringes, dog fouling, heavy traffic, household waste disposal, illegally dumped broken cars and other vehicles, lack of joined-up approach to tackle environment problems, presence of illegal landfill sites, mobile phone mast, noise and smell from factories, textile industries release toxic chemicals, oil spills, occurrence of grooves on the road side, pollution from air travel, pollution from factories, pollution from road traffic, pollution of rivers and seas, pollution of seashore and beaches, destruction of urban wild life species, growth of unhygienic slums, lack of recycling system, unregulated common property resource management , unregulated sewage system, spraying of crops and fields by the way of using insecticides and fertilizers, dangerous pavements, overgrowing waste land and vacant and derelict buildings.

Table 1 OccupationWise Respondents' Rating on Urban Urban environmental problems

Variables	Wage labor	Business	Private employees	Government employees	Professionals	Mean
Acid rain	3.67	3.97	4.13	4.20	4.28	4.05
Broken glass	1.55	1.81	2.17	2.30	2.62	2.09
Building on green space	2.98	3.24	3.60	3.73	4.05	3.52
Carbon footprint	3.86	4.18	4.25	4.28	4.30	4.20
Changes in weather in terms of flooding, cyclone and heavy rainfall	2.60	2.86	3.22	3.35	3.67	3.14
Stagnation of garbage waste	3.38	3.84	4.00	4.13	4.25	3.92
Global warming	2.17	2.43	2.79	2.92	3.24	2.71
Accumulation of solid waste	3.05	3.31	3.67	3.80	4.12	3.59
Accumulation of liquid waste	2.22	2.48	2.84	2.97	3.29	2.76
Consumption and wasting natural resources	2.68	2.94	3.30	3.43	3.75	3.22
Damage to ozone layer	3.76	4.12	4.18	4.21	4.23	4.10
Difficulty in travelling by means other than car	2.09	2.35	2.71	2.84	3.16	2.63
Discarded needles and syringes	2.64	2.90	3.26	3.39	3.71	3.18
Dog fouling	1.61	1.87	2.23	2.36	2.68	2.15
Heavy traffic	3.49	3.92	4.18	4.18	4.23	4.00
Household waste disposal	1.47	1.73	2.09	2.22	2.54	2.01
Illegally dumped broken cars and other vehicles	3.13	3.39	3.75	3.88	4.20	3.67
Lack of joined-up approach to tackle environment problems	2.31	2.57	2.93	3.06	3.38	2.85
Presence of illegal landfill sites	2.92	3.18	3.54	3.67	3.99	3.46
Mobile phone mast	1.96	2.22	2.58	2.71	3.03	2.50
Noise and smell from factories	3.32	3.78	3.94	4.07	4.19	3.86
Textile industries release toxic chemicals	2.77	3.03	3.39	3.52	3.84	3.31
Oil spills	1.68	1.94	2.30	2.43	2.75	2.22
Occurrence of grooves on the road side	1.90	2.16	2.52	2.65	2.97	2.44
Pollution from air travel	1.46	1.52	1.88	2.01	2.13	1.80
Pollution from factories	2.01	2.27	2.63	2.76	3.08	2.55
Pollution from road traffic	2.35	2.61	2.97	3.10	3.42	2.89
Pollution of rivers and seas	1.60	1.66	2.02	2.15	2.27	1.94
Pollution of parks and playgrounds	3.21	3.47	3.83	3.96	4.28	3.75
Destruction of urban wild life species	1.86	2.12	2.48	2.61	2.93	2.40
Growth of unhygienic slums	1.36	1.62	1.98	2.11	2.43	1.90
Lack of recycling system	2.84	3.10	3.46	3.59	3.91	3.38
Unregulated common property resource management	1.79	2.05	2.41	2.54	2.86	2.33
Unregulated sewage system	1.51	1.63	1.93	2.00	2.18	1.85
Spraying of crops and fields by the way of Using insecticides and fertilizers	1.75	2.01	2.37	2.50	2.82	2.29
Dangerous pavements	1.60	1.76	2.12	2.25	2.47	2.04
overgrowing waste land	2.39	2.65	3.01	3.14	3.46	2.93
Vacant and derelict buildings	2.50	2.76	3.12	3.25	3.57	3.04
Average	2.41	2.67	2.99	3.11	3.38	2.91

Source: Computed from primary data

ANOVA					
Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to urban environmental problems	98.59194	37	2.664647	369.9579	1.491491
Variation due to colleges	21.90374	4	5.475935	760.2754	2.432788
Error	1.06598	148	0.007203		
Total	121.5617	189			

Data presented in table 1 indicate the occupationwise respondents' rating on urban environmental problems. It could be noted that out of the 38 urban urban environmental problems, the respondents rate the carbon footprint is the first level environmental problem and it is evident from their secured a mean score of 4.20 on a 5 point rating scale. Damage to ozone layer is rated at second level environmental problem and it is estimated from the respondents' secured a mean score of 4.10 on a 5 point rating scale. The respondents rate the occurrence of acid rain is the third level indicator of environmental problem. It is evident from their secured a mean score of 4.05 on a 5 point rating scale. The respondents rank the fourth level reflection of environmental problem by citing the fact that presence of heavy traffic and it is observed from the respondents' secured a mean score of 4.00 on a 5 point rating scale. Stagnation of garbage waste is rated at fifth level indicator of environmental problem and it could be known from the respondents' secured a mean score of 3.92 on a 5 point rating scale.

The respondents' rate the noise and smell from factories is the sixth level environmental problem and it is revealed from their secured a mean score of 3.86 on a 5 point rating scale. Pollution of parks and playgrounds is rated at seventh level environmental problem and it is observed from the respondents' secured a mean score of 3.75 on a 5 point rating scale. The respondents' rate the presence of illegally dumped broken cars and other vehicles and it is their eighth level ranking. It is evident from their secured a mean score of 3.67

on a 5 point rating scale. The respondents rank the ninth level environmental problem by citing the fact that accumulation of solid wastes as per their secured a mean score of 3.59 on a 5 point rating scale. Building on green space is rated at tenth level environmental problem and it is evident from the respondents' secured a mean score of 3.52 on a 5 point rating scale. The respondents rate the illegal landfill sites is the eleventh level environmental problem and it could be known from their secured a mean score of 3.46 on a 5 point rating scale. Lack of recycling system is rated at twelfth level environmental problem and it is reflected from the respondents' secured a mean score of 3.38 on a 5 point rating scale. The respondents rank the thirteenth level indicator of environmental problem by citing the fact that textile industries release toxic chemicals. It is evident from their secured a mean score of 3.31 on a 5 point rating scale. The respondents rank the fourteenth level indicator of environmental problem by citing the fact that consumption and wasting natural resources and it is clear from their secured a mean score of 3.22 on a 5 point rating scale. Discarded needles and syringes is rated at fifteenth level indicator of environmental problem as per the respondents' secured a mean score of 3.18 on a 5 point rating scale. The respondents' rate the changes in weather in terms of flooding, cyclone and heavy rainfall and it is their sixteenth level ranking. It is evident from their secured a mean score of 3.14 on a 5 point rating scale. The respondents rank the seventeenth level environmental problem by citing the fact that presence of vacant and derelict buildings as per their secured a mean score of 3.04 on a 5 point rating scale. Overgrowing waste land is rated at eighteenth level indicator of environmental problem and it is evident from the respondents' secured a mean score of 2.93 on a 5 point rating scale. The respondents' rate pollution from road traffic is the nineteenth level indicator of environmental problem and it could be known from their secured a mean score of 2.89 on a 5 point rating scale. Lack of joined-up approach to tackle environmental issues is rated at twentieth level indicator of environmental problem and it is reflected from the respondents' secured a mean score of 2.85 on a 5 point rating scale. The respondents rank the twenty first level indicator of environmental problem by citing the fact that accumulation of liquid waste. It is evident from their secured a mean score of 2.76 on a 5 point rating scale. Global warming is rated at twenty second level indicator of environmental problem as per the respondents' secured a mean score of 2.71 on a 5 point rating scale. The respondents' rate the difficulty in travelling by means other than car and it is their twenty third level ranking. It is evident from their secured a mean score of 2.63 on a 5 point rating scale. The respondents rank the twenty fourth level indicator of environmental problem by citing the fact that pollution from factories as per their secured a mean score of 2.55 on a 5 point rating scale. Mobile phone mast is rated at twenty fifth level indicator of environmental problem and it is evident from the respondents' secured a mean score of 2.50 on a 5 point rating scale. The respondents rate the occurrence of grooves on the road side is the twenty sixth level indicator of environmental problem and it could be known from their secured a mean score of 2.44 on a 5 point rating scale. Destruction of urban wild life species is rated at twenty seventh level indicator of environmental problem and it is reflected from the respondents' secured a mean score of 2.40 on a 5 point rating scale.

The respondents rank the twenty eighth level indicator of environmental problem by citing the fact that unregulated common property resource management . It is evident from their secured a mean score of 2.33 on a 5 point rating scale. Spraying of crops and fields by the way of using insecticides and fertilizers is rated at twenty ninth level indicator of environmental problem and it is observed from the respondents' secured a mean score of 2.29 on a 5 point rating scale. The respondents' rate the oil spills and it is their thirtieth level ranking. It is evident from their secured a mean score of 2.22 on a 5 point rating scale. The respondents rank the thirty first level indicator of environmental problem by citing the fact that dog fouling as per their secured a mean score of 2.15 on a 5 point rating scale. Broken glass is rated at thirty second level environmental problem and it is evident from the respondents' secured a mean score of 2.09 on a 5 point rating scale. The respondents' rate the presence of dangerous pavements is the thirty third level indicator of environmental problem and it could be known from their secured a mean score of 2.04 on a 5 point rating scale. Household waste disposal is rated at thirty fourth level indicator of environmental problem and it is reflected from the respondents' secured a mean score of 2.01 on a 5 point rating scale. The respondents rank the thirty fifth level indicator of environmental problem by citing the fact that pollution of rivers and seas. It is evident from their secured a mean score of 1.94 on a 5 point rating scale. The respondents rank the thirty sixth level indicator of environmental problem by citing the fact that presence of Growth of unhygienic slums and it is clear from their secured a mean score of 1.90 on a 5 point rating scale.

Unregulated sewage system is rated at thirty seventh level indicator of environmental problem and it is reflected from the respondents' secured a mean score of 1.85 on a 5 point rating scale. The respondents rank the thirty eighth level indicator of environmental problem by citing the fact that pollution from air travel. It is evident from their secured a mean score of 1.80 on a 5 point rating scale.

The professionals group respondents rank the first position in their overall rated urban environmental problems as per their secured a mean score of 3.38 on a 5 point rating scale. The Government employee group respondents register the second position in their overall rated urban environmental problems as per their secured a mean score of 3.11 on a 5 point rating scale. The private employee group respondents occupy the third position in their overall rated urban environmental problems as per their secured a mean score of 2.99 on a 5 point rating scale. The business group respondents hold the fourth position in their overall rated urban environmental problems as per their secured a mean score of 2.67 on a 5 point rating scale. The wage labor group respondents turn down to last position in their overall rated urban environmental problems as per their secured a mean score of 2.41 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 369.95 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the urban environmental problems is statistically identified as significant. In another point, the computed anova value 760.27 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the occupational groups is statistically identified as significant as per the respondents rated urban environmental problems.

Table 2 Caste Wise OccupationStudent Respondents' Rating on Urban environmental problems

Variables	Forward caste	Backward caste	Most backward caste	Scheduled caste	Mean
Acid rain	4.20	4.18	4.02	3.80	4.05
Broken glass	2.54	2.22	1.96	1.64	2.09
Building on green space	3.97	3.65	3.39	3.07	3.52
Carbon footprint	4.25	4.22	4.20	4.13	4.20
Changes in weather in terms of flooding, cyclone and heavy rainfall	3.59	3.27	3.01	2.69	3.14
Stagnation of garbage waste	4.27	4.05	3.79	3.57	3.92
global warming	3.16	2.84	2.58	2.26	2.71
Accumulation of solid waste	4.04	3.72	3.46	3.14	3.59
Accumulation of liquid waste	3.21	2.89	2.63	2.31	2.76
Consumption and wasting natural resources	3.67	3.35	3.09	2.77	3.22
Damage to ozone layer	4.25	4.13	3.97	3.95	4.10
Difficulty in travelling by means other than car	3.08	2.76	2.50	2.18	2.63
Discarded needles and syringes	3.63	3.31	3.05	2.73	3.18
Dog fouling	2.60	2.28	2.02	1.70	2.15
Heavy traffic	4.25	4.13	3.97	3.65	4.00
Household waste disposal	2.36	2.14	1.88	1.66	2.01
Illegally dumped broken cars and other vehicles	4.12	3.80	3.54	3.22	3.67
Lack of joined-up approach to tackle environment problems	3.30	2.98	2.72	2.40	2.85
Presence of illegal landfill sites	3.91	3.59	3.33	3.01	3.46
Mobile phone mast	2.95	2.63	2.37	2.05	2.50
Noise and smell from factories	4.21	3.99	3.73	3.51	3.86
Textile industries release toxic chemicals	3.76	3.44	3.18	2.86	3.31
Oil spills	2.67	2.35	2.09	1.77	2.22
Occurrence of grooves on the road side	2.89	2.57	2.31	1.99	2.44
Pollution from air travel	2.25	1.93	1.67	1.35	1.80
Pollution from factories	3.00	2.68	2.42	2.10	2.55
Pollution from road traffic	3.34	3.02	2.76	2.44	2.89
Pollution of rivers and seas	2.29	2.07	1.81	1.59	1.94
Pollution of parks and playgrounds	4.20	3.88	3.62	3.30	3.75
Destruction of urban wild life species	2.85	2.53	2.27	1.95	2.40
Growth of unhygienic slums	2.25	2.03	1.77	1.55	1.90
Lack of recycling system	3.83	3.51	3.25	2.93	3.38
Unregulated common property resource management	2.78	2.46	2.20	1.88	2.33
Unregulated sewage system	2.15	1.98	1.72	1.55	1.85
Spraying of crops and fields by the way of Using insecticides and fertilizers	2.74	2.42	2.16	1.84	2.29
Dangerous pavements	2.39	2.17	1.91	1.69	2.04
overgrowing waste land	3.38	3.06	2.80	2.48	2.93
Vacant and derelict buildings	3.49	3.17	2.91	2.59	3.04
Average	3.31	3.04	2.79	2.51	2.91

Source: Computed from primary data

ANOVA

Source of Variation	SS	df	MS	F	F crit
Variation due to urban environmental problems	78.90366	37	2.132531	336.6613	1.518116
Variation due to caste status	13.40479	3	4.468262	705.4016	2.686384
Error	0.703113	111	0.006334		
Total	93.01156	151			

Data presented in table 2 indicate the caste wise respondents' rating on urban environmental problems. The forward caste respondents rank the first position in their overall rated urban environmental problems as per their secured a mean score of 3.31 on a 5 point rating scale. The backward caste respondents

record the second position in their overall rated urban environmental problems as per their secured a mean score of 3.04 on a 5 point rating scale. The most backward caste respondents register the third position in their overall rated urban environmental problems as per their secured a mean score of 2.79 on a 5 point rating scale. The scheduled caste respondents turn down to last position in their overall rated urban environmental problems as per their secured a mean score of 2.51 on a 5 point rating scale.

The anova two ways model is applied for further discussion. The computed anova value 336.66 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the urban environmental problems is statistically identified as significant. In another point, the computed anova value 705.40 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the caste groups is statistically identified as significant as per the respondents rated urban environmental problems.

Table 3 Sex Wise OccupationStudent Respondents' Rating on Urban Environmental Problems

Variables	Male	Female	Mean
Acid rain	3.86	4.24	4.05
Broken glass	1.80	2.38	2.09
Building on green space	3.13	3.91	3.52
Carbon footprint	4.01	4.29	4.20
Changes in weather in terms of flooding, cyclone and heavy rainfall	2.75	3.53	3.14
Stagnation of garbage waste	3.63	4.21	3.92
global warming	2.32	3.10	2.71
Accumulation of solid waste	3.20	3.98	3.59
Accumulation of liquid waste	2.37	3.15	2.76
Consumption and wasting natural resources	2.83	3.61	3.22
Damage to ozone layer	3.91	4.29	4.10
Difficulty in travelling by means other than car	2.24	3.02	2.63
Discarded needles and syringes	2.79	3.57	3.18
Dog fouling	1.76	2.54	2.15
Heavy traffic	3.81	4.19	4.00
Household waste disposal	1.62	2.40	2.01
Illegally dumped broken cars and other vehicles	3.28	4.06	3.67
Lack of joined-up approach to tackle environment problems	2.46	3.24	2.85
Presence of illegal landfill sites	3.07	3.85	3.46
Mobile phone mast	2.11	2.89	2.50
Noise and smell from factories	3.57	4.15	3.86
Textile industries release toxic chemicals	2.92	3.70	3.31
Oil spills	1.93	2.51	2.22
Occurrence of grooves on the road side	2.05	2.83	2.44
Pollution from air travel	1.51	2.09	1.80
Pollution from factories	2.16	2.94	2.55
Pollution from road traffic	2.50	3.28	2.89
Pollution of rivers and seas	1.85	2.03	1.94
Pollution of parks and playgrounds	3.36	4.14	3.75
Destruction of urban wild life species	2.01	2.79	2.40
Growth of unhygienic slums	1.71	2.09	1.90
Lack of recycling system	2.99	3.77	3.38
Unregulated common property resource management	1.94	2.72	2.33
Unregulated sewage system	1.56	2.14	1.85
Spraying of crops and fields by the way of using insecticides and fertilizers	1.90	2.68	2.29
Dangerous pavements	1.75	2.33	2.04
overgrowing waste land	2.54	3.32	2.93
Vacant and derelict buildings	2.65	3.43	3.04
Average	2.58	3.25	2.91

Source: Computed from primary data
t statistical value 24.16, df 37, t critical value 1.68

Data presented in table 3 indicate the sex wise respondents' rating on urban environmental problems. The female respondents' rank the first positions in their overall rated urban

environmental problems as per their secured a mean score of 3.25 on a 5 point rating scale. The male respondents' hold the second position in their overall rated urban environmental problems and it is estimated from their secured a mean score of 2.58 on a 5 point rating scale.

The t test is applied for further discussion. The computed t value 24.16 is greater than its tabulated value at 5 per cent level significance. Hence, there is a significant difference between male respondents' and female respondents' in their overall rated urban environmental problems.

Control Measures on Urban environmental problems

This section deals with respondents' rating on control measures on urban environmental problems. It can be assessed with the help of 27 factors on a 5 point rating scale. These include stringent standards for auto emissions and energy waste, stringent standards regulating discharge of gas, water, and waste from factories, offices and homes, energy conservation standards for city buildings and structures by the way of insulation of walls, roofs, windows and greening of roofs, incentives for energy conservation products and construction, labeling energy conservation products, urban greening in roofs, walls and train tracks, optimization of transportation networks and transportation information systems, improvements in electricity infrastructure, improvements in waste and waste water treatment infrastructure, urban planning that strongly incorporates environmental protection, strengthening environmental education with respect to energy, resource conservation, and pollution prevention, recovering exhaust heat from water and gas emissions from factory, office and home, recovering resources from waste from factory, office and home, recyclable energy technology, utilization of low pollution automotive engines, automotive transportation management systems, mass utilization of public transportation systems, energy conservation products, home energy storage technology, smart grid systems, insulation technologies, permeable pavement technologies, construction of urban infrastructure by the way of urban planning for environmental improvement and implementation of environmental technologies, education on urban environmental problems and sharing in the recognition of problems, active participation and cooperation of multiple stakeholders including government agencies, citizens, nonprofit organizations, researchers and corporations in environmental conservation activities, regulations by city government's promulgation, enforcement, and implementation of environmental regulations and financial incentives by city governments in the form of subsidies for the purchase of ecologically friendly products.

Table 4 Occupation Wise Respondents' Rating on Control Measures on Urban environmental problems

Variables	Wage labor	Business	Private employees	Government employees	Professionals	Mean
Stringent standards for auto emissions and energy waste	1.50	1.61	1.92	2.17	2.45	1.93
Stringent standards regulating discharge of gas, water, and waste from factories, offices and homes	2.34	2.85	3.16	3.31	3.69	3.07
Energy conservation standards for city buildings and structures by the way of insulation of walls, roofs, windows and greening of roofs	3.10	3.61	3.92	4.07	4.45	3.83
Incentives for energy conservation products and construction	1.52	1.63	1.84	1.99	2.27	1.85
Labeling energy conservation products	3.49	4.00	4.21	4.16	4.24	4.02
Urban greening in roofs, walls and train tracks	2.21	2.72	3.03	3.18	3.56	2.94
Optimization of transportation networks and transportation information systems	2.41	2.92	3.23	3.38	3.76	3.14
Improvements in electricity infrastructure	3.23	3.54	3.85	4.00	4.18	3.76
Improvements in waste and waste water treatment infrastructure	3.46	3.67	3.98	4.13	4.21	3.89
Urban planning that strongly incorporates environmental protection	1.56	1.77	2.08	2.23	2.31	1.99
Strengthening environmental education with respect to energy, resource conservation, and pollution prevention	1.98	2.49	2.80	2.95	3.33	2.71
Recovering exhaust heat from water and gas emissions from factory, office and home	2.52	3.03	3.34	3.49	3.87	3.25
Recovering resources from waste from factory, office and home	3.01	3.42	3.73	3.88	4.16	3.64
Recyclable energy technology	2.59	3.10	3.41	3.56	3.94	3.32
Utilization of low pollution automotive engines	1.73	1.84	2.15	2.30	2.28	2.06
Automotive transportation management systems	3.85	4.15	4.22	4.24	4.26	4.14
Mass utilization of public transportation systems	2.06	2.57	2.88	3.03	3.41	2.79
Energy conservation products	3.86	4.07	4.18	4.13	4.21	4.09
Home energy storage technology	2.66	3.17	3.48	3.63	4.01	3.39
Smart grid systems	1.53	2.04	2.35	2.50	2.88	2.26
Insulation technologies	3.43	3.84	4.05	4.20	4.28	3.96
Permeable pavement technologies	1.72	2.13	2.44	2.59	2.87	2.35
The construction of urban infrastructure by the way of urban planning for environmental improvement and implementation of environmental technologies	1.91	2.42	2.73	2.88	3.26	2.64
Education on urban environmental problems and sharing in the recognition of problems	2.72	3.23	3.54	3.69	4.07	3.45
Active participation and cooperation of multiple stakeholders including government agencies, citizens, nonprofit organizations, researchers and corporations in environmental conservation activities	1.79	2.20	2.51	2.66	2.94	2.42
Regulations by city government's promulgation, enforcement, and implementation of environmental regulations.	2.79	3.30	3.61	3.76	4.14	3.52
Financial incentives by city governments in the form of subsidies for the purchase of ecologically friendly	1.78	2.29	2.60	2.75	3.13	2.51

products, etc.

Average	2.47	2.87	3.16	3.29	3.56	3.07

Source: Computed from primary data

ANOVA

Source of Variation	SS	df	MS	F	F crit
Variation due to control measures on urban urban environmental problems	68.91717	26	2.65066	160.9897	1.602379
Variation due to colleges	18.72698	4	4.681746	284.349	2.459057
Error	1.712338	104	0.016465		
Total	89.35649	134			

Data presented in table 4 indicate the occupation wise respondents' rating on urban control measures on urban environmental problems. It could be noted that out of the 27 control measures on urban environmental problems, the respondents rate the introduction of automotive transportation management system is the first level control measure on environmental problem and it is evident from their secured a mean score of 4.14 on a 5 point rating scale. Utilization of energy conservation products is rated at second level control measure on urban environmental problem and it is estimated from the respondents' secured a mean score of 4.09 on a 5 point rating scale. The respondents rate the labeling energy conservation products is the third level indicator of urban environmental problem control. It is evident from their secured a mean score of 4.02 on a 5 point rating scale. The respondents rank the fourth level control measure on urban environmental problem by citing the fact that utilization of insulation technologies and it is observed from the respondents' secured a mean score of 3.96 on a 5 point rating scale. Improvements in waste and waste water treatment infrastructure is rated at fifth level indicator on environmental problem control and it could be known from the respondents' secured a mean score of 3.89 on a 5 point rating scale.

The respondents' rate the energy conservation standards for city buildings and structures by the way of insulation of walls, roofs, windows and greening of roofs is the rated sixth level control measure on urban environmental problem and it is revealed from their secured a mean score of 3.83 on a 5 point rating scale. Improvements in electricity infrastructure is rated at seventh level control measure on urban environmental problem and it is observed from the respondents' secured a mean score of 3.76 on a 5 point rating scale. The respondents' rate the recovering resources from waste from factory, office and home and it is their eighth level ranking. It is evident from their secured a mean score of 3.64 on a 5 point rating scale. The respondents rank the ninth level control measure on urban environmental problem by citing the need that regulations by city government's promulgation, enforcement, and implementation of environmental regulations as per their secured a mean score of 3.52 on a 5 point rating scale. Education on urban urban environmental problems and sharing in the recognition of problems is rated at tenth level control measure on urban environmental problem and it is evident from the respondents' secured a mean score of 3.45 on a 5 point rating scale. The respondents rate the application of home energy storage technology is the eleventh level control measure on urban environmental problem and it could be known from their secured a mean score of 3.39 on a 5 point rating scale. Application of recyclable energy technology is rated at twelfth level measure on urban environmental problem

and it is reflected from the respondents' secured a mean score of 3.32 on a 5 point rating scale. The respondents rank the thirteenth level indicator on urban environmental problem control by citing the need for recovering exhaust heat from water and gas emissions from factory, office and home. It is evident from their secured a mean score of 3.25 on a 5 point rating scale. The respondents rank the fourteenth level indicator on urban environmental problem control by citing the fact that optimization of transportation networks and transportation information systems and it is clear from their secured a mean score of 3.14 on a 5 point rating scale. Stringent standards regulating discharge of gas, water, and waste from factories, offices and homes is rated at fifteenth level control measure on urban environmental problem as per the respondents' secured a mean score of 3.07 on a 5 point rating scale. The respondents' rate the urban greening in roofs, walls and train tracks is their sixteenth level ranking. It is evident from their secured a mean score of 2.94 on a 5 point rating scale. The respondents rank the seventeenth level control measure on urban environmental problem by citing the fact that complete adoption of public transportation system as per their secured a mean score of 2.79 on a 5 point rating scale. Strengthening environmental education with respect to energy, resource conservation, and pollution prevention is rated at eighteenth level indicator on urban environmental problem control and it is evident from the respondents' secured a mean score of 2.71 on a 5 point rating scale. The respondents' view the construction of urban infrastructure by the way of urban planning for environmental improvement and implementation of environmental technologies is the nineteenth level indicator of environmental problem control and it could be known from their secured a mean score of 2.64 on a 5 point rating scale. Financial incentives by city governments in the form of subsidies for the purchase of ecologically friendly products is rated at twentieth level control measure on environmental problem and it is reflected from the respondents' secured a mean score of 2.51 on a 5 point rating scale. The respondents rank the twenty first level control measure on environmental problem by citing the fact that active participation and cooperation of multiple stakeholders including government agencies, citizens, nonprofit organizations, researchers and corporations in environmental conservation activities. It is evident from their secured a mean score of 2.42 on a 5 point rating scale. Application of permeable pavement technologies is rated at twenty second level control measure on urban environmental problem as per the respondents' secured a mean score of 2.35 on a 5 point rating scale. The respondents' rate the application of smart grid systems and it is their twenty third level ranking. It is evident from their secured a mean score of 2.26 on a 5 point rating scale. The respondents rank the twenty fourth level urban environmental problem prohibition by citing the fact that utilization of low pollution automotive engines as per their secured a mean score of 2.06 on a 5 point rating scale. Urban planning that strongly incorporates environmental protection is rated at twenty fifth level control measure on urban environmental problem and it is evident from the respondents' secured a mean score of 1.99 on a 5 point rating scale. The respondents rate the stringent standards for auto emissions and energy waste is the twenty sixth level control measure on urban environmental problem and it could be known from their secured a mean score of 1.93 on a 5 point rating scale. An incentive for energy conservation products and construction is rated at twenty seventh level

control measure on urban environmental problem and it is reflected from the respondents' secured a mean score of 1.85 on a 5 point rating scale.

The professional group respondents rank the first position in their overall rated control measures on urban environmental problems as per their secured a mean score of 3.56 on a 5 point rating scale. The government employee group respondents register the second position in their overall rated control measures on urban environmental problems as per their secured a mean score of 3.29 on a 5 point rating scale. The private employee group respondents occupy the third position in their overall rated control measures on urban environmental problems as per their secured a mean score of 3.16 on a 5 point rating scale. The business group respondents hold the fourth position in their overall rated control measures on urban environmental problems as per their secured a mean score of 2.87 on a 5 point rating scale. The wage labor group turn down to last position in their overall rated control measures on urban environmental problems as per their secured a mean score of 2.47 on a 5 point rating scale.

The anova two way model is applied for further discussion. The computed anova value 160.98 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the control measures on urban environmental problems is statistically identified as significant. In another point, the computed anova value 284.34 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the occupational groups is statistically identified as significant as per the respondents rated measures on urban environmental problem control.

Table 5 Caste Wise Respondents' Rating on Control Measures on Urban environmental problems

Variables	Forward caste	Backward caste	Most backward caste	Scheduled caste	Mean
Stringent standards for auto emissions and energy waste	2.21	2.10	1.76	1.65	1.93
Stringent standards regulating discharge of gas, water, and waste from factories, offices and homes	3.55	3.24	2.90	2.59	3.07
Energy conservation standards for city buildings and structures by the way of insulation of walls, roofs, windows and greening of roofs	4.21	4.00	3.66	3.45	3.83
Incentives for energy conservation products and construction	2.13	2.02	1.68	1.57	1.85
Labeling energy conservation products	4.20	4.19	4.05	3.64	4.02
Urban greening in roofs, walls and train tracks	3.42	3.11	2.77	2.46	2.94
Optimization of transportation networks and transportation information systems	3.62	3.31	2.97	2.66	3.14
Improvements in electricity infrastructure	4.14	3.93	3.59	3.38	3.76
Improvements in waste and waste water treatment infrastructure	4.17	4.06	3.82	3.51	3.89
. Urban planning that strongly incorporates environmental protection	2.27	2.16	1.82	1.71	1.99
Strengthening environmental education with respect to energy,	3.19	2.88	2.54	2.23	2.71
resource conservation, and pollution prevention					
Recovering exhaust heat from water and gas emissions from factory, office and home	3.73	3.42	3.08	2.77	3.25
Recovering resources from waste from factory, office and home	4.12	3.81	3.47	3.16	3.64
Recyclable energy technology	3.80	3.49	3.15	2.84	3.32
Utilization of low pollution automotive engines	2.44	2.23	1.89	1.68	2.06
Automotive transportation management systems	4.28	4.21	4.11	3.96	4.14
Mass utilization of public transportation systems	3.27	2.96	2.62	2.31	2.79
Energy conservation products	4.27	4.16	4.12	3.81	4.09
Home energy storage technology	3.87	3.56	3.22	2.91	3.39
Smart grid systems	2.64	2.43	2.09	1.88	2.26
Insulation technologies	4.24	4.13	3.79	3.58	3.96
Permeable pavement technologies	2.83	2.52	2.18	1.87	2.35
The construction of urban infrastructure by the way of urban planning for environmental improvement and implementation of environmental technologies	3.12	2.81	2.47	2.16	2.64
Education on urban environmental problems and sharing in the recognition of problems	3.93	3.62	3.28	2.97	3.45
Active participation and cooperation of multiple stakeholders including government agencies, citizens, nonprofit organizations, researchers and corporations in environmental conservation activities	2.90	2.59	2.25	1.94	2.42
Regulations by city government's promulgation, enforcement, and implementation of environmental regulations.	4.00	3.69	3.35	3.04	3.52
Financial incentives by city governments in the form of subsidies for the purchase of ecologically friendly products, etc.	2.99	2.68	2.34	2.03	2.51
Average	3.46	3.23	2.92	2.66	3.07

Source: Computed from primary data

ANOVA

Source of Variation	SS	df	MS	F	F crit
Variation due to control measures on urban environmental problems	54.9241	26	2.112465	256.1198	1.638019
Variation due to caste status	10.08156	3	3.36052	407.4366	2.721783
Error	0.643341	78	0.008248		
Total	65.649	107			

Data presented in table 5 indicate the caste wise respondents' rating on control measures on urban environmental problems. The forward caste respondents rank the first position in their overall rated control measures on urban environmental problems as per their secured a mean score of 3.46 on a 5 point rating scale. The backward caste respondents record the second position in their overall rated control measures on urban environmental problems as per their secured a mean score of 3.23 on a 5 point rating scale. The most backward caste respondents register the third position in their overall rated control measures on urban environmental problems as per their secured a mean score of 2.92 on a 5 point rating scale. The scheduled caste respondents turn down to last position in their overall rated control measures on urban environmental problems as per their secured a mean score of 2.66 on a 5 point rating scale.

The anova two ways model is applied for further discussion. The computed anova value 256.11 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the control measures on urban environmental problems

is statistically identified as significant. In another point, the computed anova value 407.43 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the caste groups is statistically identified as significant as per the respondents rated control measures on urban environmental problems.

Table 6 Sex Wise Respondents' Rating on Control Measures on Urban environmental problems

Variables	Male	Female	Mean
Stringent standards for auto emissions and energy waste	2.35	1.51	1.93
Stringent standards regulating discharge of gas, water, and waste from factories, offices and homes	3.49	2.65	3.07
Energy conservation standards for city buildings and structures by the way of insulation of walls, roofs, windows and greening of roofs	4.15	3.51	3.83
Incentives for energy conservation products and construction	2.07	1.63	1.85
Labeling energy conservation products	4.24	3.80	4.02
Urban greening in roofs, walls and train tracks	3.36	2.52	2.94
Optimization of transportation networks and transportation information systems	3.56	2.72	3.14
Improvements in electricity infrastructure	4.18	3.34	3.76
Improvements in waste and waste water treatment infrastructure	4.21	3.57	3.89
. Urban planning that strongly incorporates environmental protection	2.31	1.67	1.99
Strengthening environmental education with respect to energy, resource conservation, and pollution prevention	3.13	2.29	2.71
Recovering exhaust heat from water and gas emissions from factory, office and home	3.67	2.83	3.25
Recovering resources from waste from factory, office and home	4.06	3.22	3.64
Recyclable energy technology	3.74	2.90	3.32
Utilization of low pollution automotive engines	2.48	1.64	2.06
Automotive transportation management systems	4.26	4.02	4.14
Mass utilization of public transportation systems	3.21	2.37	2.79
Energy conservation products	4.21	3.97	4.09
Home energy storage technology	3.81	2.97	3.39
Smart grid systems	2.68	1.84	2.26
Insulation technologies	4.18	3.74	3.96
Permeable pavement technologies	2.77	1.93	2.35
The construction of urban infrastructure by the way of urban planning for environmental improvement and implementation of environmental technologies	3.06	2.22	2.64
Education on urban environmental problems and sharing in the recognition of problems	3.87	3.03	3.45
Active participation and cooperation of multiple stakeholders including government agencies, citizens, nonprofit organizations, researchers and corporations in environmental conservation activities	2.84	2.00	2.42
Regulations by city government's promulgation, enforcement, and implementation of environmental regulations.	3.94	3.10	3.52
Financial incentives by city governments in the form of subsidies for the purchase of ecologically friendly products, etc.	2.93	2.09	2.51
Average	3.44	2.71	3.07

Source: Computed from primary data

t statistical value 19.44, df 26, t critical value 1.70

Data presented in table 6 indicate the sex wise respondents' rating on control measures on urban environmental problems. The male respondents' rank the first positions in their overall rated control measures on urban environmental problems as per their secured a mean score of 3.25 on a 5 point rating scale.

The female respondents' hold the second position in their overall rated control measures on urban environmental problems and it is estimated from their secured a mean score of 2.58 on a 5 point rating scale.

The t test is applied for further discussion. The computed t value 19.44 is greater than its tabulated value at 5 per cent level significance. Hence, there is a significant difference between male respondents' and female respondents' in their overall rated control measures on urban environmental problems.'

CONCLUSION

It could be seen clearly from the above discussion that the respondents' rate the high level urban environmental problems by citing the facts that carbon footprint, damage to ozone layer, occurrence of acid rain, heavy traffic, stagnation of garbage waste, noise and smell from factories, pollution of parks and playgrounds, illegally dumped broken cars and other vehicles, accumulation of solid waste and building on green space as per their secured a mean score above 3.50 on a 5 point rating scale. The respondents' report the moderate level urban environmental problems by stating the facts that presence of illegal landfill sites, lack of recycling system, textile industries release toxic chemicals, consumption and wasting natural resources, discarded needles and syringes, changes in weather in terms of flooding, cyclone and heavy rainfall, vacant and derelict buildings, overgrowing waste land, pollution from road traffic, lack of joined-up approach to tackle environment problems, accumulation of solid waste, global warming, difficulty in travelling by means other than car, pollution from factories and mobile phone mast as per their secured a mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate low level urban environmental problems by citing the facts that occurrence of grooves on the road side, destruction of urban wild life species, unregulated common property resource management, spraying of crops and fields by the way of using insecticides and fertilizers, oil spills, dog fouling, broken glass, dangerous pavements, household waste disposal, pollution of rivers and seas, growth of unhygienic slums, unregulated sewage system and pollution from air travel as per their secured a mean score below 2.50 on a 5 point rating scale. It could be observed that the professional group respondents rank the first position in their overall rated urban environmental problems, government employee group respondents the second, private employee group respondents the third, business group respondents the fourth and wage labor group respondents the last.

The result of caste wise analysis reveals that the forward caste respondents rank the first position in their overall rated urban environmental problems, backward caste respondents the second, most backward caste the third and scheduled caste respondents the last. The result of gender wise analysis reveals that the male respondents lag behind the female respondents in their overall rated urban environmental problems.

The findings of respondents rating on urban environmental problem control measures reveal the following facts. The respondents' rate the high level control measures on urban environmental problems by citing the facts that introduction of automotive transportation management system, utilization of energy conservation products, labeling energy conservation products, application of insulation technologies, improvements in waste and waste water treatment

infrastructure, imposition of energy conservation standards for city buildings and structures by the way of insulation of walls, roofs, windows and greening of roofs, improvements in electricity infrastructure, recovering resources from waste from factory, office and home and regulations by city government's promulgation, enforcement, and implementation of environmental regulations as per their secured a mean score above 3.50 on a 5 point rating scale. The respondents' report the moderate level control measures on urban environmental problems by stating the facts that education on urban environmental problems and sharing in the recognition of problems, application of home energy storage technology, adoption of recyclable energy technology, recovering exhaust heat from water and gas emissions from factory, office and home, optimization of transportation networks and transportation information systems, imposition of stringent standards regulating discharge of gas, water, and waste from factories, offices and homes, urban greening in roofs, walls and train tracks, complete Mass utilization of public transportation systems, strengthening environmental education with respect to energy, resource conservation, and pollution prevention, construction of urban infrastructure by the way of urban planning for environmental improvement and implementation of environmental technologies and financial incentives by city governments in the form of subsidies for the purchase of ecologically friendly products as per their secured a mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate low level control measures on urban environmental problems by citing the facts that active participation and cooperation of multiple stakeholders including government agencies, citizens, nonprofit organizations, researchers and corporations in environmental conservation activities, application of permeable pavement technologies, smart grid systems, utilization of low pollution automotive engines, urban planning that strongly incorporates environmental protection, imposition of stringent standards for auto emissions and energy waste and incentives for energy conservation products and construction as per their secured a mean score below 2.50 on a 5 point rating scale. It could be observed that the professional group respondents rank the first position in their overall rated control measures on urban environmental problems, government employee group respondents the second, private employee group respondents the third, business group respondents the fourth and wage labor group respondents the last.

The result of caste wise analysis reveals that the forward caste respondents rank the first position in their overall rated control measures on urban environmental problems, backward caste respondents the second, most backward caste the third and scheduled caste respondents the last. The result of gender wise analysis reveals that the female respondents lag behind the male respondents in their overall rated control measures on urban environmental problems.

References

Patricia Romero-Lankao, Hua Qin and Mercy Borbor-Cordova (2013), Exploration of health risks related to air pollution and temperature in three Latin American cities Social Science & Medicine, vol. 83, issue C, pages 110-118

Duo Qin (2010), Long-term Nexus of Industrial Pollution and Income in China No 659, Working Papers from Queen Mary, University of London, School of Economics and Finance

Katja Coneus and Christa Katharina Spie (2010), Pollution exposure and infant health: Evidence from Germany No 10-079, ZEW Discussion Papers from ZEW - Zentrum für Europäische Wirtschaftsforschung / Center for European Economic Research

Chunbo Ma (2010), Who bears the environmental burden in China--An analysis of the distribution of industrial pollution sources? Ecological Economics, vol. 69, issue 9, pages 1869-1876

Inge Mayeres and Denise Van Regemorter (2008), Modelling the Health Related Benefits of Environmental Policies and Their Feedback Effects: A CGE Analysis for the EU Countries with GEM-E3 The Energy Journal, vol. Volume 29, issue Number 1, pages 135-150

Xavier Pautrel (2007), Pollution, Health and Life Expectancy: How Environmental Policy Can Promote Growth No 2007.96, Working Papers from Fondazione Eni Enrico Mattei

Varaporn Punyawadee, Ratana Phothisuwan, Numpet Winichaikule and Kanitta Satienperakul (2007), Cost and Benefit of Flue Gas Desulfurization for Pollution Control at the Mae Moh Power Plant, Thailand No rr2007011, EEPSEA Research Report from Economy and Environment Program for Southeast Asia (EEPSEA)

Sunil Chandrasiri (2006), Health Impacts of Diesel Vehicle Emissions: The Case of Colombo No rr2006121, EEPSEA Research Report from Economy and Environment Program for Southeast Asia (EEPSEA)

Budy P. Resosudarmo and Lucentezza Napitupulu (2004), Health and Economic Impact of Air Pollution in Jakarta The Economic Record, vol. 80, issue s1, pages S65-S75

David Roland-Holst, G. Chris Rodrigo and Kenneth Reinert (2002), North American economic integration and industrial pollution in the Great Lakes region The Annals of Regional Science, vol. 36, issue 3, pages 483-495

Hua Wang and Yanhong H. Jin (2002), Ownership and Industrial Pollution Control: Evidence From China No 19671, Annual meeting, July 28-31, Long Beach, CA from American Agricultural Economics Association (New Name 2008: Agricultural and Applied Economics Association)

Hua Wang (2000), Pollution charges, community pressure, and abatement cost of industrial pollution in China No 2337, Policy Research Working Paper Series from The World Bank

Hercules Haralambides and Girish Gujar (2012), "On balancing supply chain efficiency and environmental impacts: An eco-DEA model applied to the dry port sector of India" Maritime Economics and Logistics, vol. 14, issue 1, pages 122-137

Rema Hanna and Michael Greenstone (2011), "Environmental Regulations, Air and Water Pollution, and Infant Mortality in India" Working Papers from social Sciences

Amit Garg (2011), "Pro-equity Effects of Ancillary Benefits of Climate Change Policies: A Case Study of Human Health Impacts of Outdoor Air Pollution in New Delhi" World Development, vol. 39, issue 6, pages 1002-1025

Michael Greenstone and Rema Hanna (2011) "Environmental Regulations, Air and Water Pollution, and Infant Mortality in India" Working Paper Series from Harvard University, John F. Kennedy School of Government

M.N. Murty (2010), Working Papers "Designing Economic Instruments and Participatory Institutions for Environmental Management in India" from eSocialSciences

Ramakrishna B. M and Jayasheela (2010), "Urban environmental problems and Sustainable Development: With Special Reference to India Issues and Challenges" Journal of Global Economy, vol. 6, issue 2, pages 95-104

Kakali Mukhopadhyay (2008), "Air pollution and income distribution in India" Asia-Pacific Development Journal, vol. 15, issue 1, pages 35-64

Prakash Nelliyat (2007), Industrial Growth and Environmental Degradation: A Case Study of Tiruppur Textile Cluster Prakash Nelliyat: MSE Development Economics Working Papers from East Asian Bureau of Economic Research

M. Narsimha Murty, Surender Kumar and Kishore Kumar Dhavala (2007) Measuring environmental efficiency of industry: a case study of thermal power generation in India Environmental & Resource Economics, vol. 38, issue 1, pages 31-50

Sacchidananda Mukherjee and Prakash Nelliyat (2006) "Ground Water Pollution and Emerging Environmental Challenges of Industrial Effluent Irrigation: A Case Study of Mettupalayam Taluk, Tamilnadu" Development Economics Working Papers from East Asian Bureau of Economic Research

Ramprasad Sengupta and Subrata Mandal (2005), Health damage cost of automotive air pollution: Cost benefit analysis of fuel quality upgradation for Indian cities Ramprasad Sengupta: Jawaharlal Nehru University

Subrata Mandal: National Institute of Public Finance and Policy Working Papers from National Institute of Public Finance and Policy

Shaman, David (1996), "India's Pollution Regulatory Structure and Back Ground" NIPR, the World Bank Group, http://wb.forumone.comlniprcd/indialindiaback.htm.

Kuik, 0., *et.al* (1997), "Pollution control in the South and North- A Comparative Assesment of Environmental Policy Approaches in India and the Netherlands." Sage Publications, new Delhi.

Sankar, Ulakanathan (1998), "Laws and Institutions Relating to Environmental protection in India" Paper presented at the Conference on the Role of Law and Legal Institutions in Asian Economic Development, Rotterdam.

Murty, M.N (2000), "Environmental Regulations and Economics of Developmental Policies" Working Paper, Institute of Economic Growth, New Delhi.

Parikh, S. Kirit., Jyoti K. Parikh., T. R. Muraleedharan and Nandini Hadkar (1994), "Economic Valuation of Air pollution in Chembu(, Bombay, India" IGIDR, Mumbai.

Abu backer, (1994), "Controlling Industrial Pollution," World Bank Policy Research Working Paper: 1672, World Bank, Washington D.e.

Cropper M., Simon., Alberini., Arora Seema and Sharma P.K (1997), "The Health Benefits of Air Pollution Control in Delhi". American Journal / Agricultural Economics, (79), No:5, pp: 1625-1629

Pigou, A.C (1920), "The Economics of Welfare" Mac Million, London Dorfman, Robert., and, S. Dorfman. (1972), "Economics of the Environment - Selected Readings" W.W. Norton and Company.Inc. New York.

Murthy M.N. and Surender Kumar (2002), Chapter 5, Environmental and Economic Accounting for industry, Oxford University Press, New Delhi.

US Department of Health, Education and Welfare, National Center for Health Statistics. 'Health procedure, Vital and Health Statistics programs and Collection Procedures" (1964), Series No.l, No:2

Freeman III Myrick, M. (1993), "The Measurement of Environmental and Resource Values; Theory and Methods". Page: 315, Resources for the Future, Washington D.C

****