Impact of Population on Environment in Madurai District

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ABSTRACT

The world has changed greatly since the 1960s and 1970s, when there existed a virtual consensus among Western experts that rapid population growth in the developing world represented a serious global crisis. One of the primary causes of environmental degradation in a country could be attributed to rapid growth of population, which adversely affects the natural resources and environment. This study, in general, makes an endeavor to demonstrate how the population growth in Madurai district in Tamilnadu State of India has been conducive to the environmental degradation. In all the decades the decadal growth rate of population of Madurai district is higher than that of State except in the decade 1991-2001. It can be concluded from the present study that there is a pressure of population on the environment in Madurai district. Population is an important source of development, yet it is a major source of environmental degradation when it exceeds the threshold limits of the support systems. Unless the relationship between the multiplying population and the life support system can be stabilized, development programs, howsoever, innovative are not likely to yield desired results.

Key words: Madurai, Population, Environment.

Impact of Population on Environment in Madurai District - Tamilnadu, India

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Introduction

The world has changed greatly since the 1960s and 1970s, when there existed a virtual consensus among Western experts that rapid population growth in the developing world represented a serious global crisis. One of the primary causes of environmental degradation in a country could be attributed to rapid growth of population, which adversely affects the natural resources and environment. The uprising population and the environmental deterioration face the challenge of sustainable development. The existence or the absence of favorable natural resources can facilitate or retard the process of socio-economic development. The three basic demographic factors of births, deaths and human migration and immigration produce changes in population size, composition, distribution and these changes raise a number of important questions of cause and effect. Population growth and economic development are contributing to many serious environmental calamities in India. These include heavy pressure on land, land degradation, forests, habitat destruction and loss of biodiversity. Changing consumption pattern has led to rising demand for energy. The final outcomes of this are air pollution, global warming, climate change, water scarcity and water pollution.[1]

Objectives

This study, in general, makes an endeavor to demonstrate how the population growth in Madurai district in Tamilnadu State of India has been conducive to the environmental degradation. More specifically, this paper is intent on dealing with three objectives, viz.,

(i) to assess the trends in the population growth;
(ii) to assess the increasing pressure of growing population on the environmental resources;
(iii) to assess the impact of human practices on the environment.

Methodology

The present study is based on the secondary data only. Data were collected from the published and unpublished records from various departments like Assistant Directorate of Statistics, Regional Transport Office, Madurai Municipal Corporation, DIC, TNEB, TWAD, etc. The study period is from 2000-2001 to 2009-2010. Mostly simple percentage was used for analysis in the present study. Trend line was also fitted for the some selected variables.

Results and Discussion

This section deals with the analysis regarding the objectives of the present study.

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[1] Sarbapriya Ray, **Impact of Population Growth on Environmental Degradation: Case of India,** Journal of Economics and Sustainable Development, ISSN 2222-1700, Vol.2, No.8, 2011.

Population in Madurai District

This section examines the first objective. i.e. the growth in population and its major characteristics in Madurai district.

Population Growth

Table 1: Percentage Decadal Variation in Population for Madurai District

Census	Percentage Decadal Variation	
	Madurai	Tamilnadu
1951-61	12.68	**11.85**
1961-71	25.49	**22.3**
1971- 81	18.07	**17.5**
1981- 91	17.51	**15.39**
1991-01	7.41	**11.7**
2001-11	17.95	**15.60**

Source: Various Census records

Madurai is the second most populous district in Tamilnadu. The population growth of Madurai district from 1951-61 to 2001-2011 is presented in Table 1. The decadal growth rates of the population are irregular, as it increased from 12.68 percent in 1951-61 to 25.49 percent in 1961-71. It declined to 18.07 percent in 1971-1981, 17.51 percent in 1981-1991 and 7.41 percent in 1991- 2001. It again raised to 17.95 percent in the census 2011. In all the decades the decadal growth rate of population of Madurai district is higher than that of State except in the decade 1991-2001.

Trend in Urbanisation

Table 2: Trend in Urbanisation in Madurai District

Census	Madurai		Tamilnadu	
	Rural Population (in %)	Urban population (in %)	Rural Population (in %)	Urban population (in %)
1981-1991	51.86	48.14	65.85	34.15
1991-2001	44.07	55.93	56.14	43.86
2001-2011	40.83	59.17	51.04	49.96

Source: Various Census records

It is evident from the table-2 that the share of rural population to the total population is reducing consecutively from 1981-91 to 2001-2011 and the share of urban population is rising

tremendously and it accounts nearly 59 % in Madurai district and the same trend was happened at the state level also. Yet the rate of urbanization of Madurai
district is higher than Tamilnadu. Several push and pull factors are presumed to be operative towards distress out migration from rural to urban areas. This might be due to the declining resource availability per capita and shrinking economic opportunities in rural areas, and better economic opportunities, health and educational facilities etc. in urban areas, providing opportunities for higher level of human capital development could be the underlying factors for rural out migration.

Density of Population

Table 3: Density of Population in Madurai district

	Density of population	
Census	Madurai	Tamilnadu
1981- 91	686	429
1991-01	733	478
2001-11	823	524

Source: Census Records

The density of population has gone up from 686 in the decade 1981-91 to 823 persons in 2001-2011 and it always shows an increasing trend over the census years in persons per square kilometer. It has to be noted that in all the decades the density of population in Madurai district is higher than that of Tamilnadu at the incremental change in the density of population was also higher than that of Tamilnadu.

Pressure on Environmental Resources in Madurai District

This section deals with the second objective i.e. the pressure on population on the environmental resources in Madurai district.

Forest Cover

It is evident from the table 4 that the percentage of reserved forests in the total forest cover is increased by 1.48% from 2000-2001 to 2009-2010. The share of reserve land is reduced from 11.51 percent to 3.38 percent. Though the reserved forest area is increased, on the whole the forest cover in Madurai District is less than 1/3 rd of the total geographical area.

Table 4: Forest Cover in Madurai District

Year	Forest Cover (in Hc.)		
	Reserved forests	Reserve lands	Un classified forests
2000-2001	41279 (87.36)	5440 (11.51)	534 (1.13)
2001-2002	41279 (87.34)	5442 (11.52)	539 (1.14)
2002-2003	42049 (83.34)	4664 (9.24)	3739 (7.41)
2003-2004	42048.51 (88.9)	5002.79 (10.59)	200 (0.42)
2004-2005	42048.51 (88.9)	5002.79 (10.59)	200 (0.42)
2005-2006	42058.51 (89.01)	5002.79 (10.59)	200 (0.42)
2006-2007	42084 (87.2)	6180 (12.8)	——
2007-2008	42876.15 (88.4)	1632 (3.38)	——
2008-2009	42876.15 (88.4)	1632 (3.38)	——
2009-2010	42876.15 (88.84)	1632 (3.38)	——

Source: Forest Survey of India

Table 5: Land Utilization Patterns in Madurai District

Land Pattern	Land Utilisation (in %)									
	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Forest	13.48	13.48	13.48	12.63	12.63	12.63	12.95	12.95	12.95	12.95
Barren and uncultivable uses	4.22	3.53	3.53	3.53	3.53	3.52	3.52	3.52	3.48	3.48
Land put to non agricultural uses	17.33	17.53	18.51	18.57	18.58	19.89	20.02	20.10	20.12	20.14
Cultivable waste	1.43	1.52	1.52	1.52	1.52	1.90	1.83	1.74	1.63	1.63
Permanent Pastures and other grazing land	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Land under miscellaneous tree crops and groves not included in net area sown	0.34	0.56	0.54	1.12	1.15	1.07	1.10	0.81	0.83	0.79
current fallows	13.24	3.46	4.55	5.20	0.41	1.97	2.76	5.50	5.43	6.22
Other fallow land	10.13	22.26	25.23	28.48	24.77	17.72	19.17	17.42	18.31	2.12
Net area sown	39.57	36.61	32.58	28.57	37.03	40.91	38.58	37.90	37.19	33.48

Source: Statistical Hand Book of Madurai District.

Land Utilization Pattern

A change in land utilization pattern implies an increase or decrease in the proportion of area under different land uses at a point in two or more time periods. Table5 describes the land utilization pattern in Madurai District from 2000-2001 to 2009-2010. It shows variations in land use and a narrow range of fluctuations in the proportion of net sown area to total land in the country since 2000-2001 to 2009-2010. The land for non-agricultural uses (housing, industry and others) is increased from 17.33 % of total geographical area to 20.14% of that in 2009-2010. The total area under forests was 50452 hectares in 2000-01, which was about 13.48 percent of the total geographical area, and it declined to 48473 hectares or 12.95 percent in 2009-2010, as against the National Forest Policy 1988 stipulation of a target of 33 percent. The net sown area decreased from 39.5% of total geographical area in 2000-2001 to 28.37 percent in 2003-2004. After that it increased to 37.03 percent and again it is declined to 33.48 percent in the year 2009-2010, indicating that the private efforts have peaked and the intervention of the Government is required for further land reclamation.

Agriculture and Environment

The extent of agricultural intensification is characterized by increase in cropping and irrigation intensity and higher use of chemical fertilizers, pesticides and insecticides.

Table 6 : Area under Agriculture Cultivation

Year	Area under Agriculture (in Hec)			
	Area under Cultivation	Change in Area under Cultivation	Irrigated Area	Change in Irrigated Area
2000-2001	148950	---	90115	---
2001-2002	150704	1754	94545	4430
2002-2003	123929	-26775	68365	-26180
2003-2004	106891	-17038	48631	-19734
2004-2005	147499	40608	77206	28575
2005-2006	160808	13309	92245	15039
2006-2007	153519	-7289	85951	-6294
2007-2008	150983	-2536	83680	-2271
2008-2009	150524	-459	85152	1472
2009-2010	127525	-22999	79240	-5912

Source: Statistical Hand Book of Madurai District.

It seems that there was agriculture intensification during the study period in the Madurai District. The process of agricultural extensification and intensification is leading to land degradation, overexploitation of underground water resources. Agricultural intensification because of increasing cropping intensity, irrigation intensity and excessive use of chemical fertilizers resulting into water logging, salinization and alkalinization of croplands and eutrophication of water bodies and ill health of oceans and thus reductions in biodiversity.

Table 7: Electricity Consumption in Madurai District

Year	Electricity Consumption (in lakh of unit)					
	HT		LT		Total	
	Actual	Change	Actual	Change	Actual	Change
2000-2001	2413	---	2145.3	---	4558.3	---
2001-2002	2543	130	3344.6	1199.3	5887.6	1329.3
2002-2003	2510.8	-32.2	4429.9	1085.3	6940.7	1053.1
2003-2004	2374.8	-136	7973.3	3543.4	10348.1	3407.4
2004-2005	2159	-215.8	11543.6	3570.3	13702.6	3354.5
2005-2006	2792.59	633.59	12443.57	899.97	14236.16	533.56
2006-2007	2673.92	-118.67	13224.86	781.29	15898.8	1662.6
2007-2008	2978.77	304.85	13451.51	226.65	16430.3	531.5
2008-2009	2765.77	-213	13729.52	278.01	15495.3	-934.99
2009-2010	2892.59	126.82	16870.95	3141.4	18753.7	3258.4
Trend line Equation	**Y = 59.07X +2285**		**Y =1618.2X + 1016**		**Y =1573.2X + 3570**	

Source: Unpublished records of TNEB.

Electricity Consumption

It is revealed from the table that electricity consumption, both in hyper tension and lower tension are increasing every year. From the trend line equation, it is evident that annual increase in consumption of hyper tension electricity is 50.97 million units and annual increase in consumption of lower tension electricity is 1618.2 million units. Total electricity consumption is increased annually by 1573.2 million units. An increase in hyper tension electricity is due to the increase in the industrial activities and the commercial activities during the study period. An increase in the lower tension energy consumption may due to the increase in the electricity consumption of household sector.

Sector-wise Consumption of Electricity

Table 8 portrayed the sector-wise consumption of electricity. It is revealed from the table8 that the major consumer of electricity is industrial sector followed by the domestic and commercial sector stood at the next place in most of the years of the study period. The share of agriculture sector is very meager. As people are purchasing more comfort electrical goods in the recent years, the consumption of electricity by the domestic is increasing year after year.

Table 8 : Sector-wise Electricity Consumption in Madurai District

Year	Sector-wise Consumption of Electricity(in Percentage)					
	Industries	Agriculture	Domestic	Commercial	Public Lighting	Miscellaneous
2000-2001	51.99	0.99	33.34	9.36	3.36	0.96
2001-2002	44.34	1.77	39.79	9.44	3.7	0.96
2002-2003	45.85	0.57	38.53	9.35	3.94	1.76
2003-2004	46.81	0.91	20.15	27.59	0.91	3.63
2004-2005	52.76	0.6	27.84	11.34	6.02	1.44
2005-2006	47.9	0.42	35.5	9.3	5.62	1.26
2006-2007	48.4	0.87	38.95	4.7	6.09	0.99
2007-2008	43.7	0.92	44.37	3.8	6.19	1.02
2008-2009	45.6	1.09	41.29	5.7	3.87	2.45
2009-2010	48.99	0.99	36.34	10.36	2.36	0.96

Source: Calculated from the secondary data

Water Supply

As population increases the demand for basic amenities will also increase and become resource. Like that, one of the important natural resource as well basic amenity is water which scarce in nature.

It is to be noted that in all the years there is a gap between quantity of water to be supplied and actual quantity supplied in all the three parts. The quantity to be supplied in the Municipal Corporation is 110 lpcd but this is not supplied at any year. The gap is very high in the case of town panchayaths followed by municipalities. Whatever the scarcity of water, municipal corporation people were benefited.

Table 9 : Water Supply in Madurai District

Year	Average Quantity of water supplied (in lpcd)		
	Municipal Corporation	Municipalities	Town Pachayats
2000-2001	89	46	44
2001-2002	87	48	45
2002-2003	90	42	42
2003-2004	70	45	38
2004-2005	73	74	65
2005-2006	91	69	52
2006-2007	84	49	58
2007-2008	67	59	52
2008-2009	70	57	49
2009-2010	69	58	52
Quantity to be supplied	**110**	**90**	**70**

Source: TWAD, Madurai

Consumption of Fertilizers and Pesticides

Table 10

Consumption of Fertilizers and Pesticides

Year	Fertilizers (in Metric Tonne)				Pesticides (in Metric Tonne)	
	Nitrogen	Phosphorus	Potassium	Total	Dust (kgs)	Liquid(lit)
2000-2001	25784	11176	19567	56527	6747	12784
2001-2002	26500	11300	20350	58150	9159	15484
2002-2003	24500	10010	8760	43270	2670	12449
2003-2004	23550	10090	12100	45740	6310	84165
2004-2005	22180	10100	11310	43590	18100	5393
2005-2006	19450	11958	11870	43278	120090	20350
2006-2007	21700	10350	11400	43450	28600	30050
2007-2008	18300	8000	10500	36800	162560	10889
2008-2009	13730	11500	5945	31175	28755	7393.25
2009-2010	44761	11436	17523	73720	79414	66635
CAGR	**0.06**	**0.003**	**-0.01**	**0.03**	**0.315**	**0.2**

Source: Joint Director of Agriculture, Madurai

An intensification of agriculture may lead to excessive use of the fertilizers and pesticides. Excessive use of chemical fertilizers is leading to eutrophication and water pollution. The percentage of fertilizers consumption has increased from just 2.87 percent and it was doubled by the previous year consumption in 2009-2010, recorded a yearly average increase of 3 percent. The growth in use of pesticides consumption is higher than the fertilizers consumption. Though the area under cultivation was not increasing, the use of fertilizers and pesticides are increasing. It seems that excessive use of pesticides and fertilizers per sq. km. of land.

Table 11 Working Factories in Madurai District

Year	Number of factories	
	Working Factories	Adding during the year
2000-2001	923	58
2001-2002	989	120
2002-2003	1338	88
2003-2004	938	26
2004-2005	1093	28
2005-2006	1202	9
2006-2007	1263	61
2007-2008	1295	52
2008-2009	1325	42
2009-2010	1370	136
Trend line equation Y =43.9X + 9321		**CAGR: 0.09**

Source: Statistical Hand Book of Madurai District

Growth of Working Factories

The working factories in Madurai district are increasing by approximately 44 units every y ear. The annual growth in the number of factories added every year is 9 percent. The increase in the number factories will contribute increase in the important air pollutants like residual suspended particulate matter (RSPM), suspended particulate matter (SPM), nitrogen dioxides (NO2), carbon monoxide (CO), lead, sulphur dioxide (SO2) etc and also lead to water pollution due to dumping of industrial effluents and industrial solid waste to the water sources.

Table 12: Motor Vehicles in Madurai District

Year	Number of Vehicles					
	Commercial		Non-commercial		Total	
	Actual	Cumulative	Actual	Cumulative	Actual	Cumulative
2000-2001	1584	7086	5423	46874	9845	53960
2001-2002	2539	9625	9334	56208	11873	65833
2002-2003	1721	11346	22402	78610	24123	89956
2003-2004	8792	20144	23277	102788	32069	122932
2004-2005	7451	27595	29387	132175	36838	159770
2005-2006	9224	36569	23631	151405	32855	187974
2006-2007	15258	51827	35881	187286	51139	239113
2007-2008	6175	58002	31991	219277	38166	277279
2008-2009	8570	66572	31873	251150	40443	317722
2009-2010	18212	84784	39008	290158	57220	374942
Trend line Equation	**Y = 8698.3X + 10485**		**Y = 27456X + 586.1**		**Y = 36154X + 9899**	

Source: Unpublished records of Regional Transport Office, Madurai.

Growth of Motor Vehicles

Transport activities have a wide variety of effects on the environment such as air pollution, noise from road traffic. The percentage of motor vehicles was 22 percent in 2001-2002 and it was six fold of that in 2009-2010, recorded a yearly average increase of 8698. Non-commercial vehicles are increasing at higher rate than the commercial vehicles, as people don't want to rely upon the public transport they have their own motor vehicles. The environmental effects of fuels like oil and petroleum products are of growing concern owing to increasing consumption levels. The combustion of these fuels in vehicles has been a major source of pollution. With the increasing vehicles in district, the vehicular pollution has also increased and it accounts for a considerable share of air pollution in Madurai district. The different factors are the types of engines used, the age of the vehicles, poor road conditions and congested traffic.

Climatic condition

Climatic condition has to be considered when the environment is assessed. Temperature and rainfall in Madurai district in the last decade were taken at the present study.

Table 13 : Temperature in Madurai District

Year	Temperature in Celsius	
	Maximum	Minimum
2000-2001	36.9	19.8
2001-2002	37.7	20.7
2002-2003	38.7	21.0
2003-2004	38.7	26.8
2004-2005	38.5	21.3
2005-2006	38.2	14.3
2006-2007	38.5	21.1
2007-2008	37.5	29.7
2008-2009	37.8	20.9
2009-2010	38.7	21.9

Source: Statistical Hand Book of Madurai District

From the year 2000-2001 to 2009-2010, the maximum temperature in Celsius was increased by 1.8. and minimum temperature in Celsius was increased by 2.1. It seems that there is a rise in the normal temperature prevalence in Madurai district.

Table 14: Rainfall in Madurai District

Year	Rain fall (in m.m)		
	Actual	Normal	% of deviation
2000-2001	638.5	872.2	-26.9
2001-2002	588.3	874.5	-33.8
2002-2003	674.7	888.7	-19.7
2003-2004	736.7	839.0	-12.3
2004-2005	1010.7	839.8	+20.3
2005-2006	1177.8	840	+40.2
2006-2007	668	840	-20.5
2007-2008	988	840	+17.7
2008-2009	880.1	840	+4.8
2009-2010	713.3	840	-15.1

Source: Statistical Hand Book of Madurai District

It is revealed from the table that there is a higher variation in the rainfall over the year as well as there is a wide gap between actual rain fall and normal rain fall in most of the years. In the recent years, at the global level also, there is a high deviation from normal rainfall to actual rainfall. The same picture was revealed in this study also.

Suggested Measures

- To adapt pro-agriculture rural development programmes in order to control rural migration.

- To create awareness among the people about renewable sources of energy and try to get the projects through Clean Development Mechanism of Kyoto Protocal.
- To make perception among people to use public transport in order to cut down the CO_2 emissions.
- To inculcate the eco-friendly practices among people through effective propaganda.
- Local governments have to take steps to avoid environmental degradation.

Conclusion

It can be concluded from the present study that there is a pressure of population on the environment in Madurai district. Population is an important source of development, yet it is a major source of environmental degradation when it exceeds the threshold limits of the support systems. Unless the relationship between the multiplying population and the life support system can be stabilized, development programs, howsoever, innovative are not likely to yield desired results.

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