

A Case Study In Environmental Constraints, Causes And Remedies Of Industrial Town Sivakasi

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ABSTRACT : *Nature and mankind are an inseparable part of life that includes land, water, air, space, energy, flora and fauna, which are interconnected, interrelated. Environmental changes may be driven by many factors including population, economic growth, industrialization, urbanization, transportation, poverty, waste management etc. The study area is Sivakasi Industrial town. This study focused on three important aspects as the major environment destroyers 1. Population 2. Pollution 3. Waste management. This paper gives a detailed scale analysis about the people's diseases and health costs. As population plays a major role it requires collection of base level and time series data on a number of aspects including land use of changes, infrastructure, transportation, housing, power and energy, materials used, drinking water, sewage, waste disposal and management, public health and sanitation, pollution control and municipal administration. It advises to prepare an environmental atlas under which pollution data for air, noise, population and solid waste disposal are marked using recent methodologies, which create public awareness.*

KEY WORDS: Population, Air pollution, Noise pollution, Solid waste management, Environmental constraints, Industrialization, Transportation.

I. INTRODUCTION

Many developing countries in recent years have witnessed rising concern about environmental constraints, which will limit development, and it will cause serious environmental damages impairing the quality of life of present and future generations. In these countries existing environmental problems are already very serious which needs urgent attention. Environmental damage can undermine future productivity. Environmental problems vary across regions in a country and each regional issue to be assessed carefully. Indian environment has been deteriorated remarkably in the past 65 years due to rapid decline in natural resources and rapid increase in pollution level. Depletion of forests, population growth, vehicular emission, use of hazardous chemicals, urbanization, industrialization and various other undesirable changes in human activities are mainly responsible for the degraded scenario of environmental quality in India. It is thus resulted in considerable economic loss in the country. This paper deal with the environmental constraints in Sivakasi region, the dimension of environmental threats in Sivakasi and to suggest possible remedial measures for eco conservation in Sivakasi.

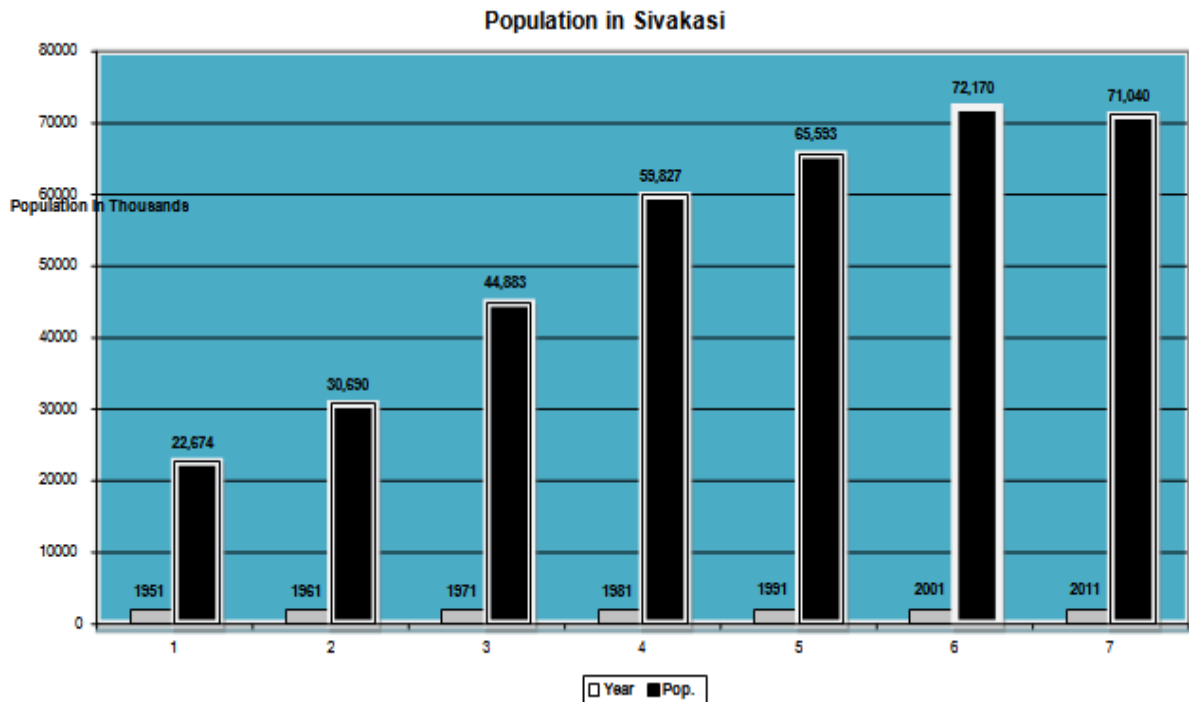
II. OVERVIEW: SIVAKASI TOWN

Sivakasi is a dry and hot region situated in Virudhunagar district of Tamilnadu state is an Industrial town. The town comprises of 6.89 square kilometer in extent. According to 2011 census, Sivakasi had a population of 71,040 with sex-ratio of 1,009 females for every 1,000 males, much above the national average of 929. A total of 6,963 were under the age of six, constituting 3,474 males and 3,489 females. Scheduled Castes and Scheduled Tribes accounted for 8.35% and .25% of the population respectively. The average literacy of the town was 79.62%, compared to the national average of 72.99%. The town had a total of 18952 households. There were a total of 29,342 workers, comprising 22 cultivators, 135 main agricultural labourers, 955 in house hold industries, 27,662 other workers, 568 marginal workers, 6 marginal cultivators, 3 marginal agricultural labourers, 79 marginal workers in household industries and 480 other marginal workers. The average percentage of increase is 7% every year. In 2001, 16 slums were identified in the town and a total of 34,029 people resided in the slums. The slum population increased from 42% to 47% during the period of 1991-2001. The high decadal growth of population during the 1961-71 periods is attributed to the high level of industrialization during the period. The density of population increased from 9,646 persons per km² in 1991 to 10,613 persons per km² in 2001. The wards along the Virudhunagar, Sattur, Srivilliputhur and Vembakottai corridors have registered increased commercial and residential activity.

Population in Sivakasi

| Year | Population | ±Percentage |
|------|------------|-------------|
| 1951 | 22,674 | - |
| 1961 | 30,690 | +35.4% |
| 1971 | 44,883 | +46.2% |
| 1981 | 59,827 | +33.3% |
| 1991 | 65,593 | +9.6% |
| 2001 | 72,170 | +10.0% |
| 2011 | 71,040 | -1.6% |

Source: “Area and population”, Sivakasi Municipality 2011 “Census Info 2011 Final Population totals – Sivakasi”.



The major effect of this population explosion is “Resource crisis” which impacts on the environment primarily through the use of natural resources and production of wastes and also associated with environmental constraints like air, water, noise pollution and solid waste. **Remedy:** It could be combated if proper urban planning is adapted in Sivakasi town. Development should lead towards sustainable eco houses and eco lives. Incentives and rewards for small families will help to control the rapid growing population. No wonder it is well known all over India and abroad for its trade mark products like, Fireworks, matches, printing, chemicals, metal powder, ginning, foundries, textiles, granite and quarries. There are about 3000 match works, 420-firework units 517 printing and other units and 24 quarries. 90% of India’s fireworks, 80% of India’s safety matches and 60% of India’s offset printing works are produced and loaded from this industrial town. About 50,000 people both male, female and children are directly employed in various concerns. Industries are yet another pollutant agent which increases public health risks.

III. POLLUTION:

Industrialization and population have resulted in a profound determination of Sivakasi air quality. Pollution and health go hand in hand. Clean air is essential for our survival. Due to the increasing pollutant aspects like vehicular emission untreated industrial smoke and waste the industrial town has really become a lethal gas chamber. With vehicle ownership rising along with population and income the town is jammed with more than 69,864 cars, trucks, buses, taxis and rickshaws already on the road. Vehicular pollution is the main cause of air pollution contributing 57% and industries contribute another 28%. Sivakasi is the most polluted

town in Tamilnadu. The air pollution level has considerably exceeded the normal air quality level of 10-28 micrograms. It has been estimated 2000 people die annually due to air pollution. Increase in average temperature (34⁰c), rain preventing acid over the town limit, firing wood, waste, chemicals are some other problems. Careless of raw material handling cause material impairment to the safety and health of the people engaged or connected there with or result in pollution of the general environment. Certain uncontrolled development carried out by factories like chemical, ginning, ink, foundries, spinning etc cause serious danger to workers employed in the factory and also to the people living nearby in addition to the adverse effect on environment.

AIR POLLUTION FROM FIREWORKS:The smoke released through firecrackers while testing, during festivals and functions are the worst ever. Everyone says how bad it is? For analysis sake air samples were tested. It showed much smoke 1413 micrograms of minute particles /m³ of air, where our towns normal reading is 10-28 micrograms. This high rating is highly dangerous for people to breathe comfortably, to be free of ear-splitting.

IV. DISEASE OCCURANCES:

Polluted air facing more degradation posing the danger of increasing afflictions of the lungs, eyes and skin. Sulphur content in crackers when burnt convert to sulphur dioxide and exceeds the limit of which creates and worsens asthma of people above 45. At least 38,000 severe asthmatics live in the town. Sulphur dioxide concentrations level limit – 30.5 (PPB) parts per billion .At Sivakasi this level varies from 65.9 to 106.3(ppb) Fire cracker contents comprises of potassium nitrate-75%; carbon-15%; sulphur-10%.When potassium nitrate (strong oxidizing agent) burns along with carbon and sulphur releases noxious gases such as carbon dioxide and sulphur dioxide. These cause irritation in the delicate or tissue like linings of the airways that carry oxygen to the lungs and leads to asthma attacks. Presence of highly toxic heavy metals like cadmium and lead along with copper, manganese, zinc, sodium, magnesium and potassium have more concentration than the prescribed limit. The mean level is given as

| S.NO | METALS | MEASUREMENT |
|------|---------------------------|------------------------|
| 1 | Cadmium | 5.2 mg / 100gm |
| 2 | Lead | 462 mg / 100gm |
| 3 | Magnesium | 2622 mg / 100gm |
| 4 | Copper | 744 mg / 100gm |
| 5 | Zinc | 324 mg / 100gm |
| 6 | Nitrite phosphateSulphate | 1160 to 1420 mg/ 100gm |
| 7 | Nitrates | 1624 mg /100 gm |

During seasons suspended particles in air gets increased which cause (ENT) problems. The suspended particulate matter when reaches 100ppm results in headache and reduced mental acuity, which leads to heart, lung or central nervous system diseases. Contraction of heart can restrict the breathing process. Nitrogen dioxide causes throat and chest congestion. As per our consultant chest physician and pulmonologist fireworks is one of the provoking factors for childhood bronchial asthma. Some of the common diseases of Sivakasi citizens he added as allergic bronchitis, ephysema [chronic obstructive pulmonary diseases] COPD, Allergic rhinitis, as sinusitis, pneumonia and common cold.

HARMFUL EFFECTS

- CADMIUM - Poisonous through inhalation, ingestion, intraperitoneal, sub-coetaneous, damage kidneys, cause anemia, increases blood pressure and make bones brittle.
- LEAD - Affects central nervous system, cause lung Cancer. This makes suffer young children due to mental retardation and semi-permanent brain damage.
- MAGNESIUM - Inhalation of magnesium dust and fumes cause Metal fume fever.
- COPPER - Inhalation of copper dust and fumes causes Irritation in the respiratory tract.
- ZINC - Irritates human skin and affects pulmonary system. It stimulates the sensation of vomiting. Less toxic
- NITRATE - Causes fatal effects (ie) dizziness, abdominal

| | | |
|---------|---|---|
| NITRATE | - | Cramps, bloody diarrhea, weakness convulsions and collapse. Large amounts taken by mouth produce nausea, Vomiting, cyanosis, collapse and coma. |
|---------|---|---|

REMEDIAL MEASURES : To regulate the pollution levels around industries, precipitators, scrubbers and filters must be compulsorily installed. Legal provisions under the Air (pollution, prevention and control) Act have to be properly and strictly made to sue the pollution industries and products. Banning in strict of firecrackers whose chemical composition is not to the prescribed limit. An appeal to the public to reduce cracker-related pollution by limiting their burning to open spaces. Avoid burning them in small lanes and passages. Finally a combination of political will and public support to limit health and environmental hazards is needed.

TECHNOLOGICAL TIPS : Monitoring : Hydrocarbon – analyzer instruments both portable and continuous, on-line stack monitoring, continuous ambient air monitoring, continuous gaseous emission monitors.

Special pollutant removal systems : Fluoride removal in phosphatic fertilizers, particulate emission in control in urea, control system for steel melting furnaces and sintering plants and small scale chemical industries.

Scrubbing system: Package scrubbers for small and medium scale units for fume abatement

- Technology for zero leakage in integrated iron and steel industry, i.e., air pollution control during coke pushing.
- Technology for dry air coke quenching for air pollution control.
- Coal washing technology for high ash coal and clean coal technology for pollution control.
- Technology for fugitive emission control from pot room of aluminium industry.
- Technology for air pollution control and heat recovery systems in foundries.

NOISE POLLUTION THROUGH FIREWORKS INDUSTRIES AND TRANSPORTATION

Noise pollution is another health hazard. The prescribed level from crackers is 60 decibels (dB). During seasons, testing and functions it reaches a maximum of 160 db. Most crackers used have more than 80 db noises. Industrial operations can also create noise pollution. Apparatus used in our day-to-day life can also produce.

| | | |
|------------------|---|-------|
| Vacuum cleaner | - | 75 db |
| Flushing toilet | - | 85 db |
| Garbage disposal | - | 80 db |
| Window AC | - | 55 db |

Transport activities have a wide variety of affects on the environment such as noise produced from road traffic; oil spills from old diesel vehicles. Transport infrastructure at Sivakasi has expanded considerably in terms of network and services. Thus it accounts for a major share of air, noise pollution. Gases like nitrogen oxides; Hydrocarbons, carbon monoxide, Sulphur oxides and lead are extremely dangerous for human health. Gases and particulate matter (pm) evolved from industries and vehicles are settled at a distance of 11 kilometer from ground level. These can easily damage and destroy the normal atmospheric conditions.

V. DISEASES AND OCCURRENCES

- ✓ High decibel level results in restlessness, anger, fidgetiness, impulsive behaviour and over-reaction to situation.
- ✓ Most crackers used can cause temporary hearing loss.
- ✓ Scientific data suggests that noise pollution can cause permanent hearing loss, high blood pressure, heart attack and sleep disturbances an increase of 10 db from that normal 60 db means double the noise volume and intensity.
- ✓ Children, pregnant women and those suffering from respiratory problems suffer the most due to excessive noise; it results in making them hyperactive or withdrawn.
- ✓ Continuous exposure to noise levels above 85 db results in tinnitus.
- ✓ On the whole it totally affects the human system.
- ✓ Noise produced in industries can upset the sense of balance; reduce the efficiency or certain tasks increases nervousness.

VI. REMEDIAL MEASURES

- ❖ Amendment on noise pollution should be severed (protection rules) such that manufacture, sale and use of firecrackers generating noise levels exceeding 125 db (AL) or 145 db (C) must be banned and imprisoned with high fine amount.

- ❖ Police authorities must make emergency control rooms so that public can easily lodge complaints on those who violate. The force and operation should be transparent.
- ❖ Industries must be provided with silencer, muffler for air control gas vents and noise suppression from equipments like compressor, pressure reducing valves etc.
- ❖ Technology needs for vehicular pollution should be expanded and implemented.
- ❖ Technology for emission control for two stroke engines.
- ❖ Technology for CNG converter kit for vehicles.
- ❖ Smoke particulate trap for diesel vehicles.
- ❖ Reducing emission per vehicle kilometer traveled and reducing total number of kilometer traveled.
- ❖ Suggestion on emission tax.
- ❖ Introducing vehicles designed to meet standard strictly.
- ❖ Implementing traffic management and demand management.

Traffic management: One-way system, closing streets, down town, exclusive pedestrian zone, provision of exclusive bus lanes

Demand management: Increased parking fees, road tolls, fuel taxes, etc.

- ❖ All 15-year-old diesel vehicles should be banned unless they own a proper fitness certificate from the authority.
- ❖ The high court on 20.12.2004 has asked the home secretary of Tamilnadu to implement compulsory smoke testing certificate on all vehicles.

VII. MEASUREMENT OF WASTE

Waste is generally defined as something, which is not put into proper usage at a given time. As population increases the amount of waste generated also increases. The accumulation and improper disposal of waste leads to environmental pollution and accelerates the spread of communicable diseases. 40 tones of solid waste is been generated every day. But only 12 – 15 tons of waste gets to be treated (i.e., 1/3 of the total).

Recent survey justifies that the categorized wastes are :

| | | |
|------------------|---|--------------------------------------|
| Domestic waste | - | 34.283 tons per day (25,000 houses) |
| Industrial waste | - | 3.902 tons per day (3961 industries) |
| Hospital waste | - | 1.815 tons per day (30 Hospitals) |

Sivakasi being a Traditional Trade and industrial centre, domestic waste production is the main problem pertaining. During testing, season, function time an additional 2000 metric ton of garbage in the form of burnt paper and chemicals like phosphorous, sulphur and potassium chlorate are released. Unfortunately the municipality has provided only 160 dustbins and 2 dumb units. Each citizen of Sivakasi is generating 250 – 280 gm of waste per day at the most 4 tons per day.

Diseases and occurrence

Large quantities of industrial and hazardous wastes brought about by expansion of chemical based industries has compounded the waste management problem with serious environmental health implications. Improper disposal of waste results in diseases like diarrhea, malaria and even epidemics like plague. It also provides a good breeding ground for vectors which carry early fatal diseases.

Remedies (Purpose of Domestic and Industrial)

Design and execution of comprehensive solid waste handling, treatment technologies and disposal system.

1. Waste to Energy technologies.
2. Resource Recovery Technology from waste.
3. Appropriate technologies to improve industrial waste management practice particularly for fly ash, blast furnace slag, lime slag, phosphogypsum.
4. Aerobic / anaerobic or other treatment technologies for municipal solid waste.
5. Technologies / pollution control equipment for sludge treatment.
6. (Purpose of Hazardous / Hospital injections waste)
7. Hazardous waste treatment technologies for cyanide waste, Zinc waste, lead; copper waste, phenol wastes and tarry water and land fill management.
8. Stabilization of hazardous wastes.
9. Bio- filtration / oxidation technologies.
10. Incineration / pyrolysis technology for chemical and metal powder factories.

VIII. SUGGESTION

Waste management aims at curtailing the waste from the initial stage of production. Wastes could be managed by making the manufacturing process efficient, reusing the waste generated and by recycling the waste products.

- ❖ Keeping the organic materials out by collecting food scraps in a small bin and other yard wastes and any non-recyclable or soiled Paper or box board in a separate bin.
- ❖ The municipality in advised to empty every week.

IX. BENEFITS

- ❖ Combined with recycling 75% of house hold waste can be diverted from landfill.
 - ❖ Municipality's new landfill will be environmentally safe (i.e. without organic materials the liquid run – off known as leach ate will be substantially reduced).
 - ❖ The municipality will comply with the town-wide ban on the disposal of compost able organic material in landfills.
 - ❖ The municipality will comply with the township requirement of a 50% reduction in waste sent to land fill by the next few years.
 - ❖ Above all the most important benefit is by composting organic wastes we can give back to earth something of great value.
 - ❖ Compost gives soil-increased ability to retain water, support all forms of life etc.
- Above all sufficient and adequate design of sanitary landfills, which are effective in keeping the surface and ground water free from toxic leaching. Waste management will relieve the stress on the natural resources and can provide a clean and sustainable environment.

X. CONCLUSION

All efforts should be directed towards strengthening institutions scientifically, technologically, training the existing manpower, exchanging information and integrating knowledge by complementing the efforts of agencies dealing with environment. Each of us has a role to play in rehabilitating our Environment. Let us not forget that the environment is nothing but an extension of the individual. We belong to the earth; the earth does not belong to us. Land air and water are complex integrated systems. Even one is affected the effects are reflected on the others, and their constituents. Therefore proper – Resource utilization, conservation, following the rules and restrictions, cleanliness, maintenance and eco-balance is the need of the hour.

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