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A REVIEW

The global warming : An urbanization effects

■ **Forum Dave**

SUMMARY

"Access of anything is bad" Mahatam Gandhi suggested to store only the basic required goods and services. To avoid the excess. Global warming and ozone depletion are clear examples of "Excess" exploitation of nature. These are times of great volatility and anxiety from the melting of polar ice caps to the meltdown of financial markets, numerous common challenges compete for the attendance of the human race. However, the major question for the survival of humans is the challenge of a sustainable environment. As the world is facing issues like climate change, global warming, and ozone depletion. Now, we have reached at the times when sustainable development should be the sole mission for all the nation. If different countries of the world will not change their current patterns of consumption and production, the negative consequences will outweigh the economic benefits soon. To achieve a sustainable environment on must adopt Green Growth Strategy. Green Growth approach aims to put environmental issues at the forefront of policy decisions, which, in line with current issues and challenges, cannot be overstated. That is why the Green Growth strategy is extremely pertinent. The extent and rate of global environmental changes are driven largely by rapid population growth, uncontrolled urbanization, and unplanned industrialization. According to 2011, Gujarat is a highly urbanized state with 42 percent of the population resides in the urban region of the state. The case study of Ahmedabad- now mega-city and Financial hub of Gujarat, cultural city Baroda and the rapidly growing Surat will help to throw some light on the current scenario of Environmental Issues and probable solution. Although on 31st August 2009, Gujarat Government makes a very important announcement *i.e.* "PLASTIC FREE GUJARAT" which surely is a step towards Sustainable Development. The current epidemic of COVID-19 is also result of the exploitation of natural resources.

Key Words : Environmental issues, Urbanisation, Administration

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Let us assume, it is 2050. A warming climate and accelerated snowmelt have reduced the dry season flow in the Indus to a trickle. Pakistan backs out from the Indus Waters Treaty and demands international intervention against India to increase its share of water flow. The tension between the two nations is rising. The government is struggling to find land for resettling several lakh of refugees from Bangladesh, Maldives, Lakshadweep and other islands. The other security risks created by global warming need to be taken into account in long-term strategic planning. Expolitation of natural resources also leads to epidemics as observed in COVID-19.

AUTHOR FOR CORRESPONDENCE

Forum Dave, Sardar Patel institutes of Economic and Social Research, Ahmedabad (Gujarat) India
Email : daveforum@gmail.com

Global warming, an increase in the average temperature of the earth's atmosphere (especially a sustained increase that causes climatic changes). Global Warming is a result of "Green House Gases" (GHG) which leads to the greenhouse effect. Children during school days provided information on how sunlight warms the earth's surface during day time and the earth's surface radiates heat back to space, certain gases in the atmosphere absorb this radiant energy.

Gas	Sources	% of contribution to global warming
CO_2	Fossil, deforestation, production, fuel	49
CH_4	Bacterial activity in paddy fields, digestive tracts of ruminative	18
CFCs	Refrigeration, insulation, foam and other industrial purpose	14
N_2O	Fertilizer, land clearing, biomass burning, combustion of fossil fuels	6

There are two major effects of global warming :

– Increase of temperature on the earth by about 3° to 5°C (5.4° to 9° Fahrenheit) by the year 2100.

– Rise of sea levels by at least 25 meters (82 feet) by the year 2100.

CFCs might contribute only 14 percentage to Global warming but it is one of the major reasons for depletion in the ozone layer. Ozone, a pure form of oxygen, found in the stratosphere, ten to thirty miles above the earth's surface, acts like a big umbrella to protect earth from the dangerous ultraviolet rays of the sun. Satellite measurements in September 2000 revealed that the stratospheric ozone "hole" over the Antarctic had reached a record 28.3 million square kilometers (more than the previous record, in 1998). Earlier in the year15, ozone depletion over northern latitudes also reached record levels, leading to predictions of a second ozone hole over the Arctic; such an event would expose many millions of people to dangerous doses of ultraviolet-B radiation. Although the reduction and elimination of production of many ozone-depleting substances in industrialized countries under the 'Montreal Protocol' to protect the ozone layer is a major international environmental accomplishment. The various communities at the world level should be well aware of the environmental hazards and their effects. The adverse effect of Changing climate is well known and still we-the most intelligent being failed to achieve sustainable development.

Indian philosophy of " – "A world as one family". When it comes to taking advantage of this philosophy in terms of globalization we unit but when the time comes to face the problem of Global Warming we start blaming each other. Changing climate is the harsh reality of today's' world, which we as one family have to handle. Green growth strategy - the development without happening the environment is the need of the time.

Unplanned Industrialization and Uncontrollable urbanization is the major reason for imbalanced nature. The world is rapidly urbanizing especially developing nations such as India. According to the 2001 census of India, 34 percent of the total population resides in the urban region of the nation. The absolute numbers are increasing rapidly as the daily migrants are excluded. These pollutions lead to various environmental hazards. Rapid urbanization is not an issue, the issues are unplanned and uncontrolled urbanization which leads to the question. Urbanization support the industrialization which gives birth to various pollution. Gujarat is a rapidly urbanizing state in India. According to 2011, Gujarat is a highly urbanized state with 42 percent of the population resides in the urban region of the state. The three major cities of the state have been observed to understand the patter of pollution generation activities. This research study will try to provide a plausible solution to the issues without halting the development. The case study of Ahmedabad, Surat and Vadodara have been examined.

Objectives :

In the backdrop of literature review presented, one may try to investigate the issues keeping in mind the below objectives :

– To analyze the effect of Urbanization on changing climate in selected urban center (Ahmedabad, Surat and Vadodara) of Gujarat.

– To analyze the role of selected urban local bodies to improve/handle the environmental issues in Gujarat.

The structural analysis :

Urbanization is one of the dimensions in the liberalization and globalization process of a society. Now-a-days urbanization has become a synonym of industrialization. A fresh outlook towards the trend of urbanization indicates a fastening pace in India. The percentage of urban to total population had increased from 25.2% in 1991 to 27.28% in 2001. One-third of such areas are concentrated in 35 metropolitan cities (Census of India, GOI, 2001). Among Indian states,

Gujarat, is the seventh-largest state in the country in terms of area (19, 6022 sq.km) and the tenth-largest in the country in terms of population (50.59 million as per 2001 census) has emerged as one of the most industrialized states over the past three decades. According to the 2001 census of India, Gujarat state with 37.35 per cent (as against 34.5% in 1991) urban population stood fifth highly urbanized state amongst the country. In 2011, the urban population further expanded and is 42 per cent of the total. Growth in urban populations in the state as elsewhere has been faster than the growth in infrastructure and services causing deterioration in the environment of urban areas.

Environmental deterioration has been caused by encroachment of land, lack of housing facilities, poor provision of basic services, and pollution of air, land, and water. A rapid increase in population usually – overwhelms the capacity of the local government to ensure adequate housing, water, sanitation, health care and also leads to deforestation due to increasing demand for land area for various purposes.

Population pressure leads to many environmental problems directly or indirectly which has long term adverse effect leads to Changing climate. "Many economic actions undertaken by producers and consumers exert external economic on other producers and consumers exert external economic on other producers and consumers which effects escape the price mechanism. Such nonmarket effects are commonly known as externalities."[11]

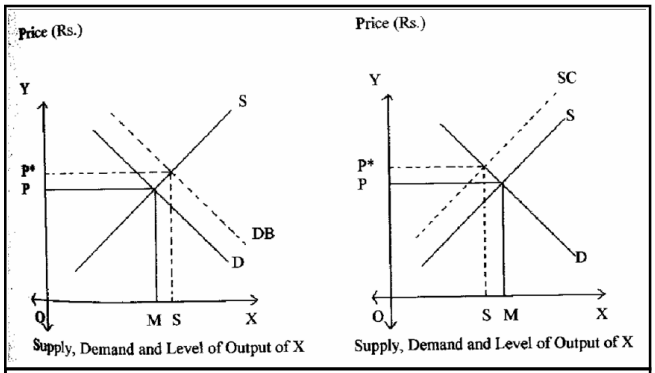

Fig. 1: (a) Spillover benefits (b) Spillover costs

In Diagram 1(a), D represents a market demand curve and S shows market supply, both are showing private benefits and private costs, respectively. P is the equilibrium price and OM is the level of output of X. Suppose the activity of the production of X generates spillover benefits. DB represents the demand curve that will get through internalizing the spillover benefits. In this context, a socially desirable optimal level of output should be OS. That means, when there are spillover benefits, market mechanism produces output less than what is socially desirable, (OM<OS). In diagram 1(b), S is a normal market supply curve. In this case, the production of X generates spillover costs. SC represents the supply condition when we internalize the spillover costs. In this case market pushes the level of output (OM) beyond the socially desirable level of output (OS). OM>OS. When it comes to spillover benefits the output is less than a socially desirable level but when it comes to cost it is more. Hence, the market has to operate according to spill over (benefit or cost).

We further will examine the status of various Pollution as one of the major sources of spillover cost for the society in the selected three major cities of Gujarat. The major sources of pollution namely Air Pollution, Water Pollution, and Waste Pollution/ management. The research study will explain the issues of each type of pollution in three major selected cities of Gujarat.

Air pollution :

The main reasons for Air pollution is Industries, fuel for heating (mostly applied to developed countries), electricity generated, solid waste mismanagement, motor vehicles. The common urban air pollutants are sulfur dioxide (SO_2), nitrogen dioxide (NO_2) suspended particulate matter (SPM), carbon monoxide (CO), and lead. Oxygen bar is a visible indication of deterioration of the quality of air.

Air pollution and transportation :

Motor vehicles are the major sources of Air pollution in selected cities. With a growing urban population, improving economy, easily available finance coupled with uncontrollable access to a busy area, and free parking

Table 1 : Decadal growth of two wheelers

Year	India		Gujarat	
	Total	Decadal growth	Total	Decadal growth
1961	665000		43230	
1971	1865000	180%	147967	242%
1981	5391000	189%	522451	253%
1991	2147400	298%	2052391	292%
2001	54991000	156%	5576040	172%

has led to a rapid increase in private vehicles in Gujarat - two-wheelers specifically. Automobiles which produce particularly burnt hydrocarbons and nitrogen oxides leading to smog formation and sunlight help to build troposphere ozone. The below table indicates the total number of vehicles registered and decade vehicular growth patterns in India and Gujarat.

Ahmedabad:

City of Ahmedabad has seen a rapid growth in the two-wheeler population in the last two decades, which has also resulted in a rising pollution level in the city. Vehicular pollution generally accounts for 60-70 per cent of the total pollution loads of a city. The root cause of air pollution in Ahmedabad is the two-stroke two-wheelers and auto-rickshaws, which contribute to the pollution load.

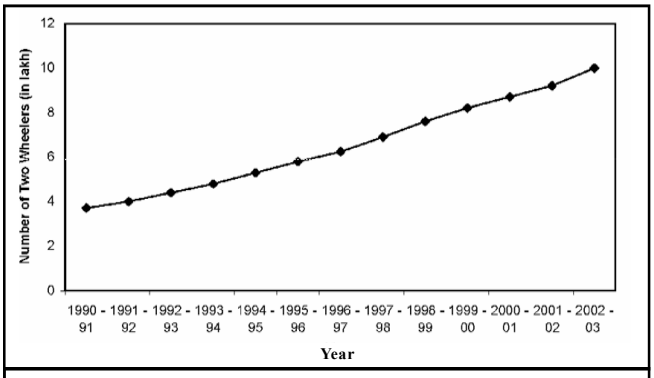

Fig. 2: Growth of two wheelers in Ahmedabad 1990-2003

The city has been identified as one of the worst concerning air pollution by the honourabole supreme court committee.

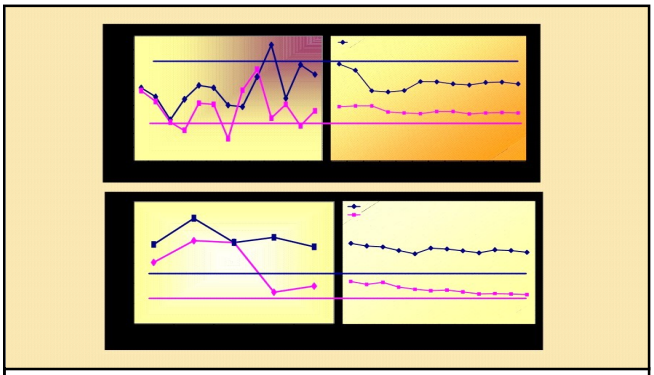

Fig. 3: Air quality

The above diagram indicates and RSPM level in the industrial level (blue) and residential level (Red). The loss due to high levels of air pollution in Ahmedabad is very high.

NIOH study highlighted that problem of air pollution at street junctions in the city of Ahmedabad is quite high. PPM, CO, and occasionally NOx have exceeded the ambient levels.

Rajklot :

The principal source of air-pollution in Rajkot is Rajkot are from vehicular emissions, industrial emissions, construction related activities. Uses of Kerosene as fuel by Auto- rickshaw, pollution from emission of Chhakada and relatively more numbers of the two-wheelers are sources of vehicular emissions The number of road vehicles in Rajkot city was about 500,000 in the year 2005 out of which about 80.3%- two-wheelers 1.4% - three-wheelers, 10.6%- four-wheelers, 3.6% -more than four-wheelers and 4.1% miscellaneous vehicles. It was found that major sources of vehicular emissions and causes of air pollution are from three-wheeler rickshaws (and Chagada) running with petrol mixed with kerosene. The vehicle registration in Rajkot increases 8.9% per annum[5]

Surat :

Ambient air quality is being monitored by Gujarat Pollution Control Board (GPCB) regularly at three main locations: Air India Building, SVR engineering college, BRS Udhna (industrial) as SO_2 and SPM level in these areas noted to be extremely high.

Table 3: Levels of suspended particular mix and sulphur dioxide

SO_2	Location	I=industrial R= residential
59	BRS Udhna	I
53	Air India Building	R
48	SVRE college	R
559 (SPM)	Air India building	I

Source: The citizen's 5th Report, State of India's Environment, National Centre for Science and Environment, New Delhi

SPM levels have always remained above-prescribed limits for residential and rural areas. This can be mainly attributed to the high concentrations of dust and other construction materials in most parts of the city. Though the city is cleaned almost twice a day.

The climatic conditions of the city generally cause these exhausts to remain suspended in the air. The small number of air quality monitoring stations in the city with an area of 112.28 sq.km and a population of above 25lakhs do not generate the true picture of air pollution

in the city[7].

Inadequate traffic management measures have reduced the average speed of vehicles on the roads thereby increasing the travel time and hence the vehicular pollution. Chaotic movements at junctions have increased the dimension of the problem.

Plausible solution :

Gujarat is lucy to use CNG and LPG. Surat, Ahmedabad, and Rajkot the selected case study also have LPG and CNG usage vehicles. With LPG pipeline in Hazira and Ankleshwwar and proposed CNG from Dahej. The issues of appropriate pricing become critical. At present, the advantage seems to emerge out of the availability of relatively cheaper prices of CNG to the distribution agency once the prices are plugged at the international level this initial advantage may be lost.

The Ahmedabad Rapid Transport Service (ARTS) is a diesel base as operated in the first phase. However, for the second and third phases, the tender for CNG will soon be announced. So, in the future, it will be shifting to pure CNG. ARTS surely helps to reduce the private-owned vehicles and thus, Air pollution. Ahmedabad Municipal Corporation (AMC) has also planned to open the oxygen center by developing Public Gardens. Even tree plantation nearby roads to reduce vehicle pollution.

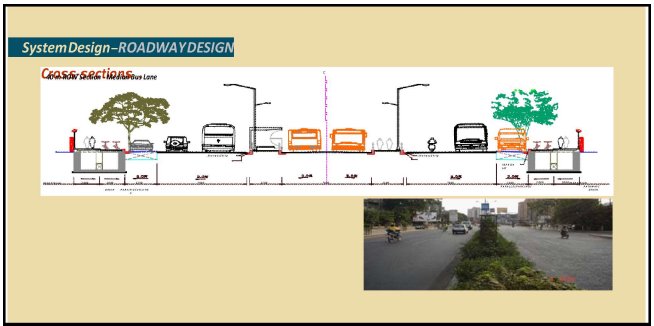

Fig. 4: Air pollution and industry

Air pollution and industry :

The rapid rate of industrialization has resulted in more and more air pollution. Some industries like cement, iron, steel and fertilizer, petrochemical are a great concern because of the difficulties in controlling the emission of pollutants from them. Due to the presence of hydrocarbons in these materials, air pollution is caused which is dangerous for health. Similarly, a spray of pesticides in agriculture is responsible for air pollution even in rural areas.

Ahmedabad :

Historically Ahmedabad has been one of the most important centres of trade and commerce in western India. The city was once famous as the 'Manchester of India' on account of its textile industry. It had as many as 66 mills employing a workforce of over one hundred thousand persons. It lies in the cotton belt of Gujarat, 552 km north of Mumbai, and 96 km from the Gulf of Cambay. It has three major industrial estates within its municipal limits.

Table 4: Worker employed in factories

Year	No. of working factories	Average no. of workers employed daily in working factories (Including estimated avg. no. of workers)	Workers per factory
1965	939	162104	173
1971	1129	152986	136
1975	1434	170522	119
1979	1981	184247	93
1983	2320	184246	79
1986	2169	139715	64
1988	3640	205498	56
1990	4114	220083	53
1993	3553	200652	56
1996	4481	193740	43
1999	4271	157568	37
2000	4243	152933	37
2001	4415	157486	36
2002	4689	168700	-36
2003	4859	175728	-36

Table 5: Types of industry

Industry type	No. of working factories	Employment
Metallurgy	1043	29863
Food and beverages	308	17262
Textile	613	44623
Wooden	243	2611
Paper	214	4751
Leather	12	218
Chemical and petro-chemical	1011	25104
Engineering product	1194	38549
Miscellaneous	221	12747
Total	4859	214277

Source: Statistical outline of Ahmedabad, 2004

The above tables indicate the number of working factories of chemical and petro-chemical is the second-

highest contributing to sulfur dioxide, hydrocarbons. The principal emissions given off by the chemical industry are gases and vapors of organic chemical compounds. According to The citizen's 5th Report, State of India's Environment, National Centre for Science and Environment, (New Delhi) SO_2 level of Cadila Narol, Ahmedabad (Residential area) is as high as that of 61.

Rajkot :

While sources of industrial emissions are mainly from the foundries, small scale industries, and bricks manufacturing kilns. As far as industrial pollution is concerned, it may be attributed because of 369 nos. of air polluting industrial units within the Municipal Limits of Rajkot. Small scale Industrial units, bakeries, units of roasting seeds, etc. and burning of dry leaves and other refuse by the Safai Kamdar also are causes of Air Pollution. Oil Engine and Machine Tools Rajkot has grown to be main centers for the production of Diesel Engine- 'Low speed Diesel Engines- Lister Type' Now the production of high-speed Diesel Engine-'Petter Type' is also increasing rapidly.

The SPM levels in Rajkot are found exceeding NASQS (Monthly Average) during both the years (2003-04), particularly in Industrial Area and 50% time in a year in residential area.[5]

Surat :

The city of diamonds and textiles may have earned the distinction of being one of the cleanest cities in the country, but it lags when it comes to keeping a check on industrial pollution. The economic base of Surat consists of textile manufacturing, trade, diamond cutting and polishing industries, intricate Zari works, chemical industries, and the petrochemical and natural gas based industries at Hazira established by leading industry houses such as ONGC, Reliance, ESSAR and Shell.

Table 6 : Various types of industry

Industry	Numbers
Power looms	0.4 millions
Process house	400
Zari units	6610
Dying and printing mills	326
Dyes and chemicals	130
Diamond units	0.1 millions
Plastic units	200

Source: City development plan of Surat, Surat Municipal Corporation, 2005

Plausible solution:

The industries around the major cities like Ahmedabad, Surat , and Rajkot are required to allocate the Corporate Social Responsibilities (CSR) activities such as tree plantation, create green region. They can also be allocated to the region in which air-purification can be developed by their funds.

The government can increase the tax rate if any industries are generating toxic chemicals in the air. The government can also strictly observed if they're having a worker welfare cell or not? The minimum wage rate is not enough as one is required to provide supportive infrastructure and services to the worker and their families.

Water pollution:

Water is essential for any living being and Hurble (Plants and Tress). Water pollution challenged the existence of both. Water pollution due to sewage, industrial effluents, storm, urban and agriculture runoff lead to a question that, one of the major resources required for a living being to survive.

Ahmedabad :

The history of organized water supply in Ahmedabad dates back to the year 1891, during which Dudheshwar waterworks were constructed on the eastern riverbank and piped water supply was given to the residential localities. The water supply needs of Ahmedabad city are presently met from three sources:

– Surface water from Raska

– French well in Sabarmati River

– By Intakewell constructed in River Sabarmati (Narmada canal water is released in River which is pumped through intake well).

Sardar Sarovar on Narmada has provided life to not only the agriculture sector but also the potable drinking water to many urban and rural regions of the state. Ahmedabad is one of them. The other achievement is the water treatment plants that help the city. A water treatment plant of capacity 650 MLD is installed at Kotarpur located in the north of the city. At present, Kotarpur treatment plant is getting water from Raska and Narmada canal through intake well in the Sabarmati River.

The Ahmedabad city has high soil permeability and to make the groundwater sustainable, it is imperative to replenish this source. With this idea, a Rain Water Harvesting Cell has been set up within Ahmedabad

Municipal Corporation. At present the major three task has been undertaken;

Utilizing defunct bores as recharge wells, recharge pits where aquifer depth is available and digging new percolation wells up to the first unconfined aquifer.

In the absence of a perennial water source, dependence on groundwater continues to be high in the periphery. This has seriously affected the groundwater level, which is depleting at the rate of 2 to 3m annually. Thus, the reliability and sustainability of the groundwater source is questionable.

There are two sewage treatment plants (aerated lagoons) at Pirana and Vasana having a Capacity of 180 MLD and 75 MLD respectively in the eastern and western parts of the city. In addition to above, recently two sewage treatment plants (UASB) of capacity 106 MLD and 126 MLD (36 MLD for city & 90 for periphery) at Pirana (old) and Vasana (old) respectively9 were commissioned as a part of Sabarmati river action plan.

Common effluent treatment plants (CETP) have been installed by the highly polluting Industries in Odhav, Naroda, and Vatwa GIDC estates. The treated effluent from CETP is Mixed with the treated sewage from STP at Pirana to lower the concentration of toxic and then discharged into river Sabarmati. The other industries in AMC and Behrampura (highly toxic waste) are connected to the main sewer line and the effluents from these are being discharged into River Sabarmati without any treatment Sabarmati receives 998 MLD of dirty water.

National River Conservation Plan (NRCP) is the project initiated by the Ministry of Environment and Forests for cleaning up the most polluted rivers of India. River Sabarmati has also been picked up under this project, which is highly polluted at a stretch of 80 km between Gandhinagar and Vautha. This stretch passes through Ahmedabad. The emphasis of this project is on arresting the river pollution due to the discharge of wastewater through 27- stormwater drains outlets.

Rajkot :

Rajkot city is situated on the bank of river Aji. The availability of water is arguably the greatest long-term problem facing. Rajkot Municipal Corporation is drawing water from various sources:

– Bhadra

– Aji-I

– Nyari-I, Nyari-II

– Lalpari

– Randarda Lake (and from Narmada canal-based pipeline).

The city lies in a water-deficit region; rains are irregular and there is no perennial source of water. The land is made of hard rock so it failed to absorb even rainwater. The main reason why the level of groundwater is limited. This leads to variation in the per capita availability of water in the Rajkot region. One more observation was found related to famous Ahi damn *i.e.* an analysis of different water bodies in the downstream of the Aji dam indicates the most water bodies within the city limit are contaminated. Pollution of under groundwater due to electroplating industries and sari-printing industries is also observed. The treatment of water is carried out at Ribda, Aji, Nyari, and Ghanteshwar. Total water treatment capacity of 199 MLD against total city supply of 140 MLD. This shows that about 1.5 times more filtering capacity[5]. A chemical analysis and bacteriological test are done daily. At intermediate levels, a residual chlorine content check is carried out in each supply. At the consumer end, the residual chlorine content check-in each supply area, and the bacteriological test is carried out as needed. Groundwater table lies more than 100 m. and depleting more and more. The current scenario is not promising as most of the area has been covered under the surface drainage temporarily so that hygiene problem may not arise. RMC drainage network is divided into 12 zones & spread over to 20 wards out of 23 wards. However, in a certain ward, some pockets are yet vacant which will be connected later on. A treatment plant of 44.5 MLD capacities is located 6kms away from Rajkot[5].

Surat :

Surat is well placed concerning water. The main source of surface water for the city is the river Tapi and the Ukai dam. It is important to note that water quality in the river Tapi continuous to be good. Although the level of 'TDS' are found to be quite high. The level of 'DO' levels are within reasonable limits. The drinking water is fetched from open wells or various water supply scheme implemented by GWSSB (Gujarat Water Supply and Sewerage Board).[10]

The general practice of using groundwater in addition to the municipal supply has led to the existence of bore wells in almost every dwelling unit of the city. In Chorasi taluka of Surat district, total groundwater recharge amounts to 330 MLD, out of which the allocation for

domestic and industrial requirements is about 50 MLD. This is far below the future requirement of the city. The treatment of water is carried out at Varachha, Katargam, Sarthana, and Rander Water Works. At the consumer end, the residual chlorine Content check in each supply area, and the bacteriological test are carried out as needed. The treatment constitutes of prechlorination, alum/PEC dosing mixing, clariflocculation, Filtration and post chlorination. Six sewerage treatment plants are serving each of the six zones of the city.

Table 7: Water facility

	Ahmedabad	Surat	Rajkot
Transmission and distribution losses	15%	20%	10%
Water supply per capita per day (lpcd)	143	195	110
Population (%)	95	95	73
Area covered %	86	97	NA
Total supply storage	85	53	NA
Number of hours	2	3	2

Sources: City development plan of selected cities, 2004-05

Plausible solution:

Water is the main source of survival. Hence it is the responsibility of the government along with citizens to work towards the cleanliness of water sources and groundwater.

Sustainable water policy is the need of the time. The government requires to create an outline of polices concerned with various sources of water. It should also focus on increase the level of groundwater, which is rapidly depleting. The major sources of water are Himalayan regions which must be preserve.

The citizen is required to developed good habits to ensure to preserve the water sources. The water may be limited in nature but if utilized properly it may cover the maximum population.

Solid waste management :

Solid waste management is crucial and the most important aspect is the waste disposal site. Solid waste management is a part of health and sanitation, and according to the Indian Constitution, falls within the purview of the State list. Since this activity is non–exclusive, non – rivaled, and essential, the responsibility for providing the service lies within the public domain. The activity being of a local nature is entrusted to the Urban Local Bodies. The guideline has been drawn and distributed to all Urban Local Body for the permissible level of toxic chemicals separated from various types of waste dumped.

Under Nirmal Gujarat (Plastic-free Gujarat as part of this) Abhiyan Urban Local Bodies are working seriously in this direction.

Note: Picture 1) Logo, 2) Responsibilities of Citizen written at the entry of ULB's office, 3) waste collected from the area, 4) Special dustbin provided by ULBs 5) Night Scrapping.

Ahmedabad :

Solid Waste collection and disposal in Ahmedabad are being carried out by Ahmedabad Municipal Corporation as an obligatory function. The total waste generated in the city is of the order of 2100 tones per day. The waste recycling process and its network in Ahmedabad is well established. There are substantial numbers of formal/ informal actors involved in this activity. The waste materials from various sources reach the processing units via these actors. Among the major recyclable waste material in terms of its volume are scrap iron, paper waste, cardboard, and glass. Although the system of door to door collection of waste is to be made more effective. No waste segregation is done by AMC and only 36% of the wastes are processed.[8]

Pilot project of source segregation of recyclable and organic waste was implemented in 131 pockets in Ambawadi area with the support of Clean Ahmedabad.

Surat :

Efforts to improve solid waste management in the city of Surat were made by the health department after the havoc of the plague in 1994. The city has been divided into 7 zones for efficient management and the waste generated is collected throughout the city and dumped at the Khajod disposal site (200 ha). Source segregation of recyclable waste is practiced and a large percentage of households practice storage of waste at source. Recently there are 6 treatment plants with a capacity of 600 MLD.

Rajkot :

The sole responsibility of solid waste management (SWM) in the city goes to the Solid Waste Management

Department of RMC under the supervision of the Environment Engineer. Domestic waste consists of primarily food waste, paper, plastics, glass, metal, rags, and other packaging materials. RMC is having joint venture with Hanjer Biotech Energies (P) Ltd. (HBEPL).

Table 8: Solid waste management

	Ahmedabad	Surat	Rajkot
% of waste collected to generated	98%	98%	80%
% waste proceed	50%	NA	NA

Sources: City development plan of selected cities, 2005

Conclusion :

"Aati Sarvatre Varjyate"(" अति सर्वत्र वर्ज्यते ") As quoted by the famous Indian scholar, strategist, and Economist Chanakya during 300-250 century B.C. seems to be quite relevant even today like his other Shlokas. (Quatrains). The exploitation of natural resources leads to worldwide epidemics and the only solution is to regulate the development exercise which leads to destroy nature. We have also observed that due to the pause of development activities most of the water bodies, air pollution is clean now, as they have an auto-cleansing system. The same was reflected in Ricardo's theory of rent. In case of exploitation of fertile land, in the endless fertile land will be left which will provide less rent similarly it is applicable in the case of Environment. Also in the concept of Sustainable Development. Hence Green growth strategy is the only way out. Government alone will not be able to handle this issue corporate houses also have to extend their hands for this in terms of investing and encouraging Research and Development. Environmental protection and stimulate environmentally friendly technology, change, and improved technology, can reduce the pressure on resources while keeping the economic development going. So, industries must lead and innovate. With advance and improved technology, we can tap free and unlimited non-convention sources of energy. In few cities of Gujarat, solar street light has become mandatory. The optimal use of renewable resources is also essential.

In both cases, situations (as shown in the first diagram) are sub-optimal in terms of Pareto-efficiency criteria and result in welfare loss for the community as a whole. In the case of spillover costs, *i.e.* pollution externality, Pigou suggests to levy tax the extent to increase the price of X up to OP. This will automatically correct the level of output of the firm. As against this, in the case of spillover benefits, he considered subsidy as the best instrument to correct the market failure. Population charges or taxes in the form effluent fees are even today, one of the most popular instruments of policy aiming at environment conservation. In France, water charges are levied on pollution by firms. Marketable pollution permits (i.e. quotas) are also alternative instruments of environmental policy12 Even Environmental cess is also one of the alternatives. The Coase theorem can be considered the polar case of the Pigouvian solution for the externalities. Ronald Coase has faith in free-market mechanisms and a perfectly competitive market. Through this theorem indicates that without government intervention, the free-market can efficiently manage the problem of social costs13. Victims of the population can compel the polluter firm to compensate for the loss by just threatening to sue the firm. Here the amount paid for compensation to the victims is nothing but the internalization of negative externality by reduction in the profit of the firm. Of course, this is subject to (i) the parties involved in bargaining (the victims and the firm) have exclusive private ownership rights and (ii) the transaction cost-the payment for compensation or transactions of buying and selling the property rights- tends to be zero. Following are the situations where Coase Theorem may fail to provide solutions:

– The market is imperfect due to the monopoly element of imperfect information.

– When victims are unable to 'come together for bargaining

– When victims are not existing today i.e. future generations

– Case of global environmental degradation-Ozone Layer depletion or Global Warming.

Green Growth is a globally relevant approach to sustainable economic growth developed. It is essential for countries in the Asia and Pacific region, where economic growth is the primary driver for poverty alleviation and social progress. The approach of long term green growth rather than short term Economic growth only has to be adopted. The Rio Declaration (especially agenda-21) set the stage for an international agreement that would respect the interest of all and protect the integrity of the global environment and development system. The water of the nation Mahatma Gandhi's quotation "The earth provides enough to satisfy every man's need, but not for every man's greed

REFERENCES

1. Transport Department of Gujarat, 2004.

2. Final Report of Bus Rapid Transport Services, Ahmedabad Municipal Corporation, 2006.

3.Centre for Environmental planning and technology university (CEPT), 2005.

4. City Development Plan of Rajkot, Rajkot Municipal Corporation,2004-05.

5. The citizen's 5th Report, State of India's Environment, National Centre for Science and Environment, New Delhi, India.

6. City Development plan of Surat, Surat Municipal Corporation, 2004-05.

7. Statistical Outline of Ahmedabad, 2004-05.

8. City Development Plan of Ahmedabad, Ahmedabad Municipal Corporation, 2004-05.

9. Report of Gujarat Ecological Commission, Vadodara,2005-06.

10. Herber Benard P. (1998): *Modern public finance,* 5th Ed., All India Traveler Book Seller, New Delhi, India, pp. 37.

11. Baumol, W. and Oats, W. (1998). *The theory of environmental policy*, (2nd Edition), Cambridge University Press, Cambridge.

12. Coas, R. (1960). The problem of social cost, *J. law & Economics*, **3**: 1-44.

13. All India Institute of local self-government, Reading material on Solid waste management, 2005.

14. Gujarat Urban Assessment Report, New Delhi, 1992.

15. Gujarat Urban Profile, Department of Urban Development and Housing, Government of Gujarat, 1997.

16. Seabright, P. (1992). Managing local commons; Theoretical issues in incentive design, *J. Economic Perspectives*, **7**:1992.

17. The Rio Declaration on Environment and Development, Agenda 21, *http://habitat.igc.org/agenda21/*

18. Ozone depletion,*http://earthwatch.unep.net/emerging issues/a tmosphere/o zonedepletion.php*