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LOW CARBON CITY DEVELOPMENT FOR NASHIK CITY

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Abstract : The expanding Indian economy is posing numerous problems for urban areas, including slums and squatters, infrastructure overload, water supply and sanitation issues, an increase in vehicle traffic that contributes to air pollution, the depletion of groundwater, the lack of water recharge stations, and the depletion of non-renewable energy sources. The majority of Indian cities have these issues. Likewise, Nashik City has similar issues.
Concerns have been raised about rising carbon emissions. As Nashik city grows, its carbon footprint rises, contributing to issues like climate change, temperature rise, increased danger of floods, heat waves, etc.
The city is becoming unlivable due to all of the aforementioned factors. Therefore, a solution-finding strategy is required to make the city appropriate for habitation, with healthy conditions, low carbon emissions or decrease in greenhouse gases, reuse of waste water, recycling of water, etc.
This study looks at the existing situation in Nashik City and the significance of low carbon city development.
Additionally, it discusses the issues Nashik city inhabitants confront and suggests ways to solve them. suggestions and plans for reducing the city's carbon impact, starting with modest but important steps.

Keywords **- Low carbon city,carbon reduction,sustainable city,urban environment.**

I. INTRODUCTION

Cities are home to around half of the world's population. Nearly 60% of the world's population will reside in cities by 2030. On the other hand, the Indian economy is expanding at an average rate of 7-8%, which is posing many problems for the cities, including urbanization leading to migration, slums and squatters, load on infrastructure, water supply-sanitation issues, an increase in vehicle traffic leading to air pollution, the saturation of existing roads, ground water depletion, no water recharging, and the exhaustion of non-renewable energy sources.
Over 80 percent of the total worldwide urban expansion between 2010 and 2030 will take place in emerging countries, where urbanization is increasing most rapidly. Major contributors of greenhouse gases are urban areas (GHGs). They are more vulnerable to floods, heat waves, sea level rise, and other hazards that climate change is predicted to exacerbate because of the concentration of people, economic activity, and built environments there.
As stated above, comparable issues are encountered in Nashik. The challenges associated with carbon emission are highlighted and attempted to be resolved in this study.

A. What is Low Carbon City?

There is no universally definition associated with low-carbon cities. The term ‘low carbon’ (‘carbon’ here refers to the ‘carbon dioxide equivalent’) has evolved, historically refers to global greenhouse gas emissions (GHG) pathways that stabilize GHG concentration within the atmosphere at levels considered to not be ‘dangerous anthropomorphic interference with the climate system’. Using a low-carbon There are not many current indicator systems to gauge success, and Eco-cities are only lately becoming popular in China. "A city created aware of environmental effect, inhabited by people devoted to minimizing necessary inputs of energy, water, and food, and waste output of warmth, pollution - CO2, methane, and water pollution" is what is meant by a "sustainable city" (Ministry of Energy, Green Technology and Water, 2011). The Oxford English Dictionary’s definition of a sustainable city reflects the complex relationship between a city’s economy and its external effects: A city designed

or landscaped is to make sure that the continued conservation of natural resources and therefore the surrounding natural environment while providing the economic base needed to support its inhabitants.

In order to prevent the negative effects of global climate change, low carbon cities are sometimes characterized as ones that have societies that use sustainable green technology, green behaviour, and release relatively little carbon or GHG compared to current practices. The United Nations Framework Convention on Global Climate Change in 1992 and the Kyoto Protocol in 1997 pushes this new low-carbon economy model of economic development on to the stage of history. "Low carbon development" or "climate change mitigation" are terms which describe the transition towards reducing human interference with the climate system, and suggests reducing the discharge of greenhouse gases into the atmosphere from chemicals or fuel use. It also involves reducing emissions from changes in land use like deforestation. Further, low carbon development adaptation to global climate change is defined as action that's taken to regulate to the widespread implications of future climate change, including changes in seasonal weather patterns, variability and the frequency or intensity of natural disasters. Examples may include disaster preparedness, coastal defenses, flood protection and development of drought-resistant seeds.

B. Scenario of GHG emissions

City greenhouse gas emissions reflect the structure of a city; its energy sources, its residents' lifestyles, resource use, water consumption, waste water production, toxic releases, and solid waste generation are all linked among themselves. The building sector is liable for 32 % of worldwide energy use and contributes about 30 % of worldwide GHG emissions. At the present pace, GHG emissions from buildings will quite double by 2050 (IEA, 2012). The per capita electricity consumption in India is 24 % of the World's average and 35 % and 28 % respectively that of China and Brazil (NEP, 2012). For the primary time, the country is integrated low carbon growth into the 12th Five Year Plan (2012 to 2017) document. Consistent with the IEA's World Energy Outlook (2011) estimates India's energy demand increases by a compound annual growth rate (CAGR) of 3.1 % from 2009 to 2035, this is often quite double the world's energy demand growth at a CAGR of 1.3 % for an equivalent period. In meanwhile, the transport sector contributes about 20 % of CO2 emissions worldwide and about 15 % of CO2 emissions in India, and this share has been increasing over time (Geetam Tiwari, 2013).

In terms of absolute emissions, India is the third biggest carbon dioxide (CO2) emitter in the world. These emissions will increase as the economy grows. As long as India continues to rely extensively on already finite fossil resources, its CO2 emissions will increase by a factor of five by 2050. Rising global emissions, India's heavy reliance on fossil fuels, and the resulting climate change will have a significant influence on many aspects of the Indian economy, including infrastructure, livelihoods, water supply, agriculture, and food production (British High Commission, 2012b, p. 8). For a GHG emissions forecast for Indian cities in 2008, see Figure 1.

Greenest of 'em All

Where Indian Citites Stand..

CITY	CURRENT POPULATION	PROJECTED POPULATION IN 2030
Mumbai	20 m	33 m
Delhi	19 m	26 m
Bangalore	8 m	10 m
Chennai	9 m	11 m
Hyderabad	7.7 m	9.8 m
Kolkata	14.1 m	23 m

Source: International Council for Local Environmental initiatives. Delhi emissions data is from city sponsored study. Population forecasts vary in different studies.

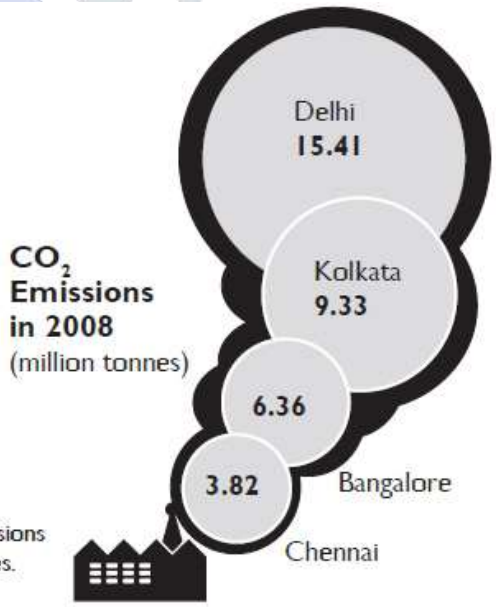

Fig. 1. *The scenario of Indian cities in 2008 in GHG emissions.*

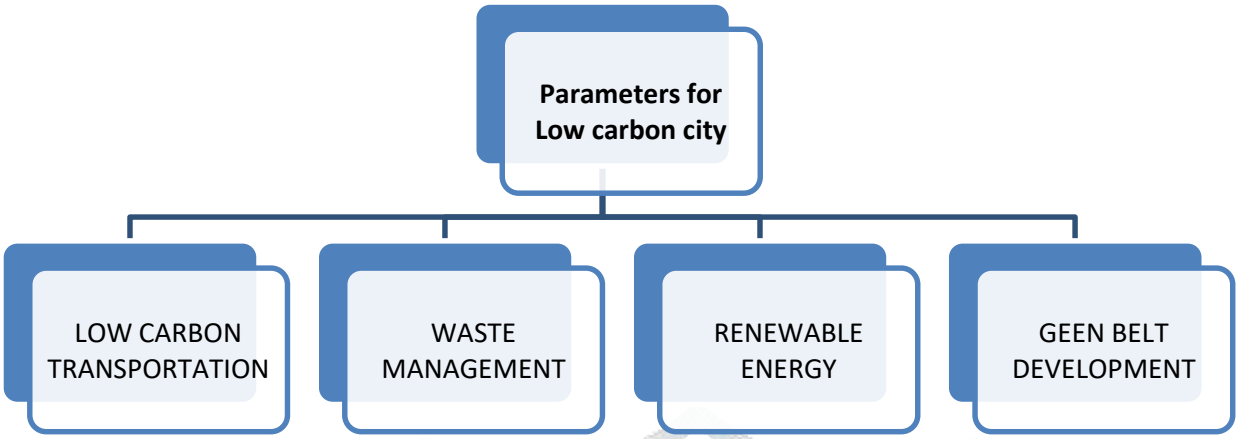

Fig 2 Ref: Towards low carbon cities in Taiwan (EPA), 2009.

C. Low Carbon Initiatives in India

The National Mission on Sustainable Habitat (NMSH) is one among the eight missions under the National Action Plan on Global Climate Change (NAPCC) that aims to form cities sustainable through improvements in building energy efficiency, urban waste management and shift to conveyance. The Committee has listed eight primary principles to make sure sustainable approach to urban transport planning, of which first two are 'Walk' and 'Cycle' (NMSH, 2011). The pilot Emission Trading System (ETS) mechanism was launched by India's Ministry of Environment, Forest and Climate Change (MOEF) alongside the country's Central Pollution Control Board (CPCB) and relevant State Pollution Control Boards (SPCBs). The seven national missions, aside from energy efficiency, stipulated by the NAPCC center on solar technology, sustainable habitat, water, Himalayan ecosystem, Green India, agriculture, and strategic knowledge. The Ministry for Housing and Urban Affairs (MoHUA) has initiated the Sustainable Urban Transport Project with support of worldwide Environment Facility (GEF), the United Nations Development Program (UNDP), the International Bank for Reconstruction and Development (WB) and Participating States and Cities. Under this initiative MoHUA has selected four demo cities, i.e. Pimpri-Chinchwad in Maharashtra State, Naya Raipur in Chhattisgarh State, Indore in Madhya Pradesh State and Mysuru in Karnataka State. The Government of India has also launched the National Electric Mobility Mission Plan (NEMMP) 2020 with an aim to deal with the difficulty of rising vehicular pollution, and increasing concerns over the energy security of the country.

II. OBJECTIVE AND METHODOLOGY

THE MAIN OBJECTIVES OF THE STUDY ARE:

- To study the concept and necessity of low carbon city.
- To study parameters of low carbon city.
- To study how Nashik city can reduce its carbon reduction.

There are different stages in the methodology for conducting this project mentioned below:
The methodology is divided into five stages, Introduction with problem definition and identification of study area, literature review, Study area profile, data collection& analysis, suggestion and conclusions.

The first step is to define the study area's problem, purpose, objectives, and identification of the study area.A detail study from literature available is carried out to understand what is low carbon city, its need in today's time, parameters of low carbon city. Both primary and secondary sources are used for data collection. Primary data is collected through online survey while secondary data is is through government official websites, Government reports, etc. Online surveys are conducted via google forms. The suggestions for development of nashik city as low

carbon city are drawn based on the analysis of primary and secondary data , at the end to summarize the work that has been done during the present study.

III. STUDY AREA

A. NASHIK CITY: LOCATION

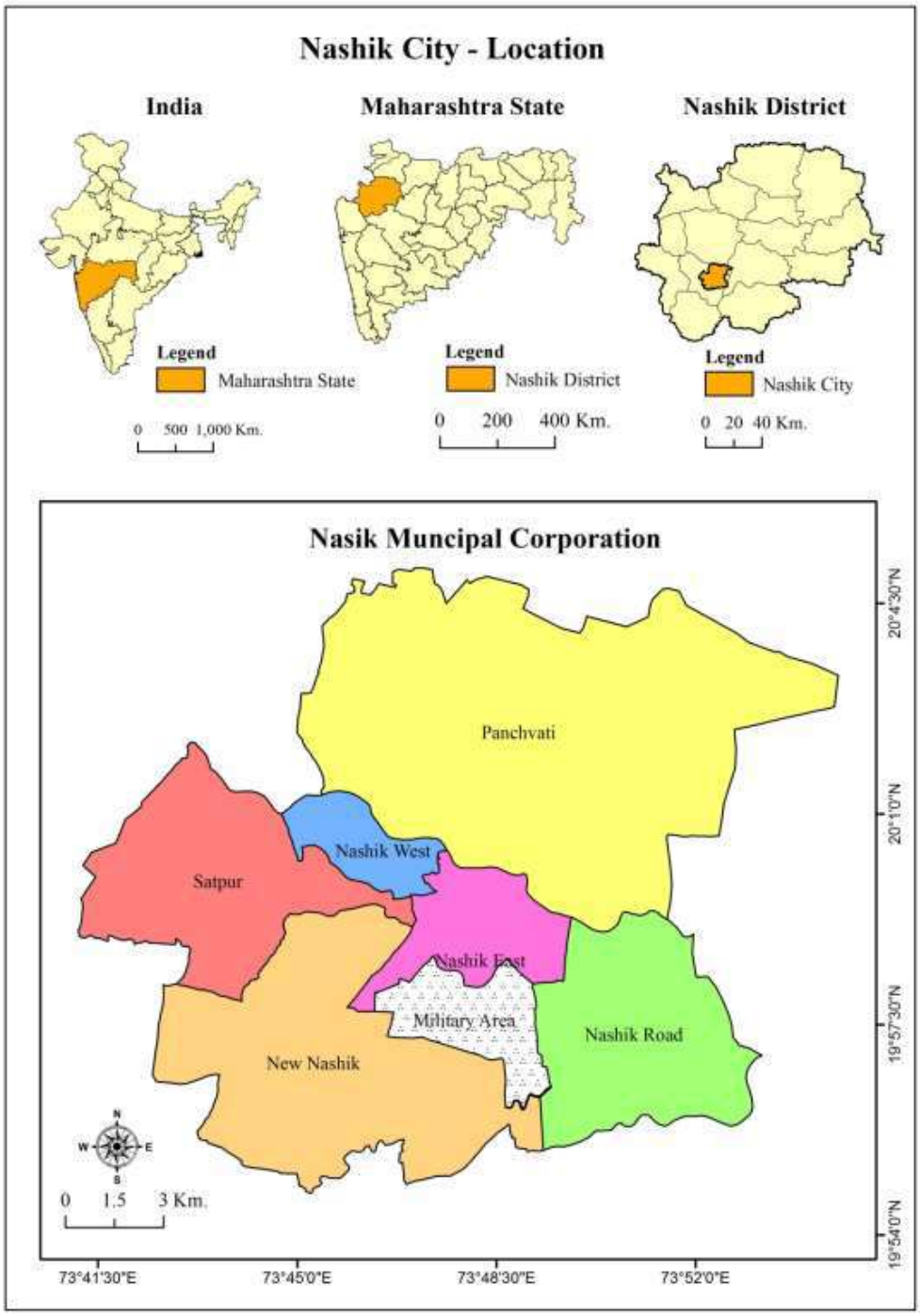

Fig. 3 map of Nashik city

Source :Causes and Consequences of changing urbanization patterns in Nashik Municipal Corporation, Maharashtra

Maharashtra state, with area of 3.08 lakh square kilometers and occupying 9.4 per cent of India's geographical area, is located in western India. It has seven Divisions – Amravati, Aurangabad, Kokan, Mumbai, Nagpur, Nashik, and Pune. The Nashik Division has five Districts – Nashik, Jalgaon, Nandurbar, Ahmednagar and Dhule. The administrative centre of the Nashik district and Nashik division is located at Nashik city. (CDP of NMC) Nashik city is situated in the State of Maharashtra, Northwest region on Latitude coordinate 19° 58' 59" North to 20° 04' 30" North Latitude and Longitude coordinate 73° 41' 30" East to 73° 52' 0" East longitude (as shown in fig. 4.1). It is connected by road to Pune (220kms) and Mumbai (185kms). Rail connectivity is through the central railway, attached with Mumbai. Air connection is with Mumbai, and the air service is not consistent and proper Airport does not exist. In this geographical location, the city naturally started growing westward between the two main rivers, the Godavari and the Nasardi, towards Anandvalli, Gangapur and Satpur area.

B. Nashik city : Population

In 2011, there were 14,86,053 people living in the city. According to the Development Plan, 34,00,000 people would live there in 2036.

The number of homes needed to accommodate the population in 2011—3,71,743 as opposed to the current 3,25,235—is based on the average family size of four. The population of 2011 requires 46,508 fewer houses than are now available. Additionally, a sizable housing supply will be needed to accommodate the population needs through 2036. Families residing in temporary housing and outdated, crumbling structures will also require new housing. This necessitates initiatives to increase the housing supply as well as more urban land for housing, all of which are covered in the present development plan.

It also shows that old areas need rapid attention for renovation in order to bring them up to par with the surroundings due of the state of the structures. In order to regulate the redevelopment of core areas, which will ultimately result in correct development and an increase in the quality of facilities in core areas, this Development Plan also includes that provision.

C. Nashik city : Modes of transportation

According to the Nashik report, the initial action plan for emissions control
Currently, the Maharashtra State Road Transportation Corporation provides buses as the primary mode of public transportation in Nashik (MSRTC). For the remaining journeys, shared auto rickshaws are privately owned and operated.
The city's public transportation is of poor quality. Due to traffic congestion, buses are crammed during rush hours and are becoming slower by the day.
The outcome is a 7% annual growth in the number of personal motor vehicles.

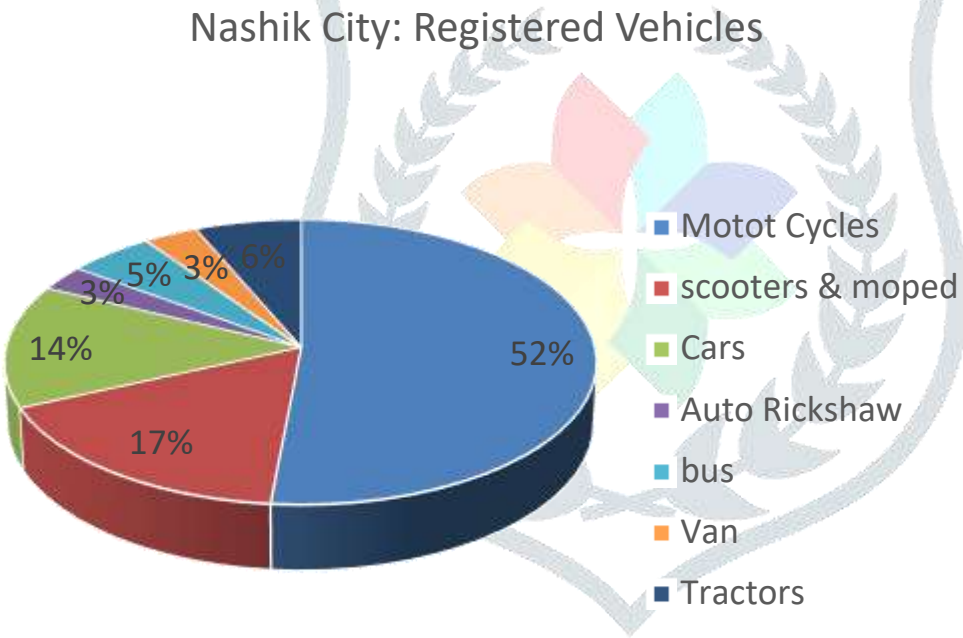

Fig. 4 Nashik city Registered vehicles
Ref : Nashik - Draft Action Plan for Emission Control

D. Nashik city : Energy consumption

Energy consumption in various buildings like residential, commercial and industrial is causing highest amount of GHG emissions, contributing to about 58% to the total city emissions. Energy consumption in Residential buildings is highest followed by Industrial buildings.

Majority of the industries of Nashik are of engineering or manufacturing nature.

There is dire need for the identification of low cost and advanced cleaner technology for these industries.

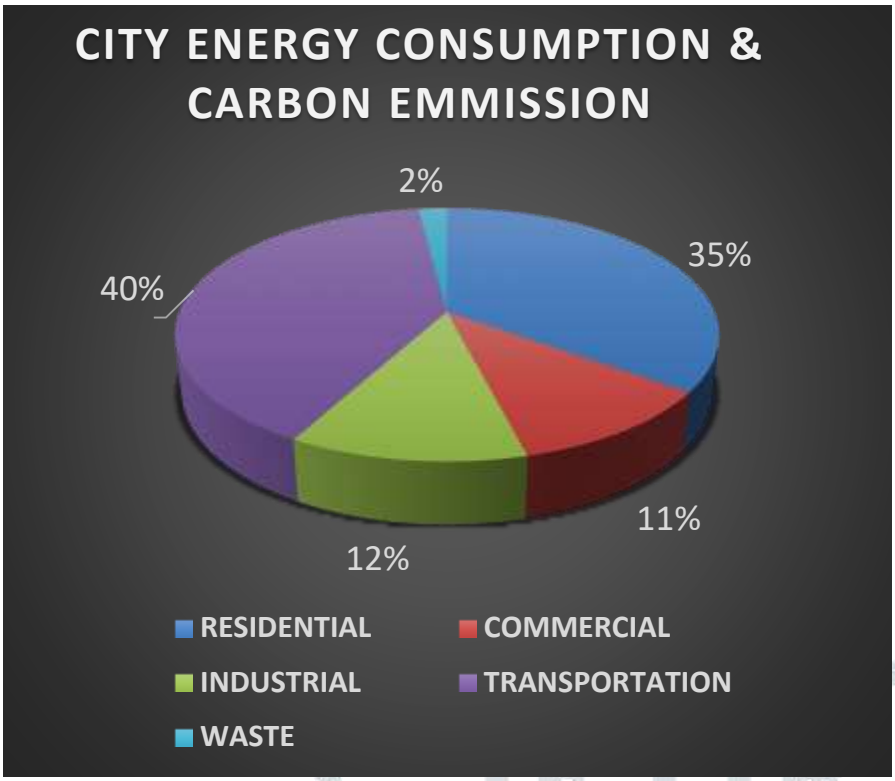

Fig 5 : Nashik city energy consumption and carbon emission

E. Nashik city : Waste Management

About 370 MT of municipal solid garbage are collected daily by the Nashik Municipal Corporation.
The MSW facility in Pathardi, which is 15 kilometers from the core region, receives all the trash from various locations and is transferred there.
An incinerating unit near Kannamwar Bridge treats the bio hazardous waste produced by the city's hospitals at 1000°C (near core area).
The efficiency of collecting should rise with improved collection and transportation methods.
By the year 2031, it is predicted that there would be 1200 TPD of municipal solid garbage generated.

For the city of Nashik, the percentage of greenhouse gas emissions attributable to waste water and solid waste management is around 0.21 percent and 0.06 percent, respectively.

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In Nashik, open trash burning is frequent, particularly during the winter. To end the practise of burning rubbish in the open within the city, NMC should implement the necessary regulatory measures.

IV. RESULTS AND SUGGESTIONS

The focus behind the recommendations and design proposals is to simplify future development in a more controlled manner, making it economically workable and without increasing pressure on existing infrastructure. The following are the recommendations and proposals for this research:

A. For transportation of Nashik city:

The cleanest burning fuel on the market right now is said to be CNG. Because CNG contains less carbon than petroleum-based goods, it burns cleaner than those items. Compared to other fuels, it emits the fewest emissions and has much less contaminants than gasoline. Compared to petroleum products, CNG emits 95 percent lower tailpipe emissions and 20 to 30 percent fewer greenhouse gas emissions. Additionally, since the fuel systems for CNG cars are totally sealed, they don't emit any evaporative pollutants.

Regional Transport Officer should be instructed to provide information regarding the time-bound strategy to control vehicular pollution and traffic management for ULB, private entities, and PPP as follows:

- ✧ putting a 15-year age limit on old automobiles

- ✧ P.U.C. check of auto-rickshaws to be done periodically and ensure that adulterated fuel is not being used. Remote Sensing technology can be utilized for PUC monitoring.
- ✧ Concession by NMC for erection of CNG fuel. Conversion of existing public transport buses/tempos/mini buses to CNG fuel operation.
- ✧ The electrical countdown mechanism has to be implemented at major traffic intersections, which will help in switching on and off vehicles. Proper vehicle routing to prevent traffic.
- ✧ Management of Intermediate Public Transport - IPT (auto rickshaws / shared auto rickshaws / taxis) can be done considering the travel demand management. Widening of roads approaching towards mass transit stations.
- ✧ Promotion of non-motorized transport (NMT). Bicycle sharing schemes should be introduced in the city.
- ✧ Finally, awareness programme should be undertaken with no vehicle day and assessment for air pollution to share the benefits among the general population. Mass awareness should be done at local level by the way of advertisements on local TV channels and at public stations like bus stops, libraries etc. The public has to be promoted for using CNG pattern in vehicles.

B. For waste management of Nashik city:

According to carbon footprint quantification, improper management of municipal solid waste (lack of recovery and treatment of organic components) is the major cause of GHG emissions. Therefore, reducing the amount of garbage, separating the organic waste parts, and treating waste to recover resources (composting or anaerobic treatment) are all necessary to reduce GHG emissions (CH4 and CO2) from municipal solid waste. Reduced waste creation, source-level segregation, reuse, and waste recovery are all ways to minimize trash generation. Recycling is utilized to handle inorganic debris (15–18%), whilst composting and anaerobic digestion are treatment alternatives for organic waste (which makes up 70–75 percent of the total). Finally, landfills or disposal facilities are used to dispose of waste that cannot be recycled or processed. The amount of organic fractions entering disposal sites can be significantly reduced by segregating at the source and treating at the local (ward) level.

The recommendations for NMC to address these concerns and lower carbon emissions through waste are as follows:

- ✧ The creation of a special squad for the detection of open burning of trash or rubbish is part of a broad campaign against open burning of biomass, agricultural residue, garbage, leaves, and other waste.
- ✧ The installation of smoke detectors at various sites, combined with a firefighting system at the MSW treatment plant, allows for regular inspection and control of the burning of municipal solid waste.
- ✧ By using a separate collection system for all horticulture waste and windrow composting, proper horticulture waste collection and disposal may be accomplished.

C. For Renewable energy of Nashik city:

- ✧ Implementing grid-connected solar PV system deployment for all common utilities among the residential buildings sector
- ✧ Installing Solar PV systems in municipal schools in Nashik
- ✧ various municipal administrative buildings will have solar PV system installations
- ✧ The solar PV system will generate 3780 units of electricity per month (45,360 kWh per year), which has a potential to reduce 37 tCO2eq. GHG emissions per year.
- ✧ Encourage use of bio-diesel and bio-fuels by giving tax concession to the distributers

D. For Green Belt Development of Nashik city:

It is possible to develop the Green Belt along the banks of the Godavari, Nasardi, Vivaldi, and Dana Rivers. This belt will be used for recreation, a bike path, plantations, and other activities that will improve the environment and prevent riverbank erosion. Also following NMC can take following initiatives for green belt development :-

- ✧ Conservation of green belts.
- ✧ Improvements of Footpaths.
- ✧ Developments of Tree plantation on the road side in order to increase beauty.
- ✧ Periodic manicure of tree planted on roads.
- ✧ Prohibition of Spiting, peeing & throwing waste on the roads.
- ✧ Improvement of Traffic island & junctions.
- ✧ Slogans, messaging, media, etc. are used to raise public awareness to maintain the city clean.
- ✧ Maintenance of public utility buildings and Monuments.
- ✧ Total use of open land should be done for green belt development
- ✧ Arranging the seminar/awareness programme at school & college levels.

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