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DOES INDIA NEED JUST SMART CITY! NOT ECO CITY? HYPOTHETICAL ANALYSIS OF ECOLOGICAL MODERNISATION OF SMAECO CITY (SMART + ECOLOGICAL) MODEL.

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ABSTRACT

Government of India introduces the Smart City project having aim to not just provide the basic amenities and quality infrastructure to make the people's life better but also to robust IT connectivity and digitalisation. However, Government of India doesn't specify the meaning and distinctiveness of Smart City. Government only conceptualise the Smart City and clarify the definition varies from city to city and country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city residents. The present article aims to find the relevance for possibilities to implement model of Eco-City as architecting the Smart City with conceptual understanding of Ecological Modernisation theory by Hajer; 1995 and Mol, Arthur PJ and Sonnenfeld; 200 and Spaargaren Gert et al; 2000. The locale of this study is Magarpatta City near Pune in Maharashtra which is current replica to Smart City and Eco-City. Environmental ethos wholesome considered and preserved during planning and developing the Magarpatta City. This is model of SmaEco (Smart + Ecological) City and attempted to analysed through the theory of Ecological Modernisation. This theory reflects the process of institutionalization of environmental concerns in terms of the need refine the existing models to analyze processes of Modernisation and rationalization in the neo liberalisation. It's articulated that, Magarpatta City SEZ is an encouraging example to preserve the ecology and carry out environment-friendly practices. It is amazing to see that Pune Municipal Corporation (PMC) appreciated the Magarpatta City an ecological light house and decide to



awarded 10% wave off on the property and other taxes. Magarpatta City preserve ecology and protects environment sustainability through certain unique practices like segregate and safely dispose off solid waste, treatment of sewage waste water, bio-composting of decomposable waste, preserve and maintain of eco-system, use of waste fly ash in the cement bricks for construction, generation of bio-gas from drainage waster, harvesting of rain water, use of renewable energy sources for every household needs are few of them. These ecological practices are ascertains the bonding Ecological Modernization framework. Therefore, before to planning the policy of Smart City, government notes such Eco City which are not just the model of

Modernisation with Ecological sense as we refer SmaEco (Smart+Ecological) City is sustainable way for development.

KEYWORDS :smart city, eco city, SmaEco city, ecological modernisation, India, Magarpatta city.

INTRODUCTION

Majority of Indian are don't meet the demands of their resident. There are under tremendous stress on public amenities like water supply, public transportation, sanitation, space management as well as natural resources. Nearly 31% of India's current population lives in urban areas and contributes 63% of India's GDP (Census, 2011). The pace of urbanisation leads to rise upto 40% of India's population and contribute 75% of India's GDP by 2030(Smart City Mission Statement and Guidelines, 2015). Government launched Smart City Project in year 2015 to improve the quality of life as well as attract the investments.

In the Smart City Mission Statement and Guidelines definition of Smart City is not specified because of constraint to fit this to all cities. Smart City definition is not universal therefore this report says that it may be varies from cities to cities and countries to countries. However, this guideline report defines Smart City through the people perspective. 'Smart City contains a wish list of infrastructure and services that describes his or her level of aspiration. To provide for the aspirations and needs of the citizens, urban planners ideally aim at developing the entire urban eco-system, which is represented by the four pillars of comprehensive development — institutional, physical, social and economic infrastructure.' (Smart City Mission Statement and Guidelines, 2015). This report also listed the infrastructural elements of Smart City project. They are as follows

- i) adequate water supply,
- ii) assured electricity supply,
- iii) sanitation, including solid waste management,
- iv) efficient urban mobility and public transport,
- v) affordable housing, especially for the poor,
- vi) robust IT connectivity and digitalization,
- vii) good governance, especially e-Governance and citizen participation,
- viii) sustainable environment,
- ix) safety and security of citizens, particularly women, children and the elderly, and
- x) health and education.

Picture No.1 Hypothetical model of Smart City.



Source- Smart City Mission Statement Guidelines, 2015.

Nevertheless, environmental concerns are not seen in this statement and guidelines since it are very significant aspect of the health and hygiene not only affects health of the people as well as balancing the ecosystem of this city. Therefore, it is necessitate studying the replicable model not only provide the smart solutions to the resident as well as it is ecological sound and which act like a light house to Smart City project in India. This article aim to provide the Smart as well Eco City (SmaEco City) model to overcome from the challenges of sustainable urbanization. Study of Magarpatta City in Pune City has potential to reciprocal the future SmaEco Cities are inspect to develop the SmaEco city model. The unique ecological practices within the Magarpatta City is tested on the conceptual setting of Ecological Modernisation.

Magarpatta City : Magarpatta City SEZ is located at Pune-Solapur Highway in Pune City. Magarpatta City is also called as the peasant's City because 123 families together pooled their land to share the profit equally on the basis of the land holdings. Magarpatta City also houses a large industrial estate as well as several Information Technology (IT), Information Technology Enabled Services (ITES) and biotechnology companies. Magarpatta City SEZ has not only been financially profitable, it has also suggested that an alternative model of development is possible (Sami, 2013:157). About 40,000 people live in Magarpatta and 70,000 people who work at the special economic zone and information technology park housed here. Magarpatta City SEZ is laid with a vision of a progressive environmental outlook. This is unique for its pollution free and clean urban environment, where visitors are impressed by the look of the nature conservative practices (Dhere Amar M., 2014:26).

Ecological Modernization: Instead of viewing the modern society as a bane in helping out with the ecological crisis, it is possible to bring about changes within this modern society that would help in tackling the environmental situation.

“Ecological modernisation can be defined as the discourse that recognizes the structural

character of the environmental problematique but nonetheless assumes that existing political, economic, and social institutions can internalize the care of the environment” (Hajer; 1995:11).

The acceptance of ecological modernization as one of the mainstream environmental sociological perspectives, the pervasiveness of ecological modernization can be gauged by the fact that a broad range of environmental social scientists have found it necessary to address even if only to critically respond to the rising influence of this perspective (Mol, Aurther and Sonnenfeld ;2000:2). Furthermore the ecological modernization is employed is as a notion for depicting prevailing discourses of environmental policy (See Buttel F.H.;2000:57). The theory of ecological modernisation helps to analyse the ecological practices adopted by Magarpatta City.

MATERIAL AND METHODS

Research questions: This article is inquiring the vital research questions:

- 1) Why would India requires Smart City project.
- 2) Does Smart City planning and guidelines gives priority for environmental conservation.
- 3) What are unique ecological practices that make Magarpatta City as Eco City
- 4) How Magarpatta City becomes replica of Ecological Modernisation.
- 5) What things are consider to develop SmaEco City

Conceptual framework: Ecological Modernisation: Ecological modernization is often used as a synonym for strategic environmental management, industrial ecology, eco-restructuring, and so on (Hawken; 1993:24, Buttel; 2000:63). Indeed, the core literature on ecological modernization has tended to give primary emphasis to environmental improvements in the private sector, particularly in relation to the manufacturing industry and associated sectors. Social scientists from a variety of theoretical positions (Schnaiberg et al.; 1998:110, Andersen; 1994:12) now use the notion of Ecological Modernization to private sector behaviors and argue that it simultaneously increases the efficiency and minimizes pollution and waste.

Instead of viewing the modern society as a bane in helping out with the ecological crisis, it is possible to bring about changes within this modern society, that would help in tackling the environmental situation.

In this context, the theory of Ecological Modernisation has potential co-relevance to the Magarpatta City SEZ, which not only introduces environmental protection practices, but also includes this as one of the important objectives in their policy framework. Therefore, this feature could also be considered as one of the unique features of the Magarpatta City SEZ.

RESULTS AND DISCUSSION

In the 1980's in the western world, the emergence of ecological modernisation in the environmental policy making scenario, the idea of prevention of pollution was integrated into the environmental administrative policy making scheme (Raghavan;2010:324). This was done to avoid looking for solutions after the problem occurred. The Ecological Modernisation concept represents the active participation of actors in the process of environmental policymaking and it involves the merging of these policies into the economic decision making process as well (Hajer, 1995:24). The concept of Ecological Modernisation originated from the works of Huber and Janicke (1982:6). They are considered the founding fathers of Ecological Modernisation approach (Spaargaren Gert et al;2000:73, Langhelle;2000:303). Ecological Modernisation as a concept, consisted of some essential themes according to Mol, Authur and Sonnenfeld (2000:6).They are as:

- a) The news that science and technology offers in preventing environmental problems, initially being looked at from the perspective of damaging the environment, could now be seen in a different role, in that they were seen as a means in helping cure the environmental crisis.
- b) Dynamics of the market and actors like producers, consumers, environmental organizations etc, were seen as media in bringing about ecological restructuring.
- d) Restructuring the society for environmental decision-making process.
- e) Regarding the environment and economy as different entities was no longer valid. (In other words, disregard for the environment and separating the economy and environment as two different entities called for change. Ecological Modernisation revolved around these core presumptions.)
- f) At the end of the 1980s, and in the 1990s, the UK and the EU, began to be viewed as a technological solution to the environmental problems caused by urbanisation. There could be laws to regulate it as a part of regular economic trade. This development came later in India, which reacted, to the growing urbanisation in the West in the 1990s. It did this by deciding to regulate urbanisation in the year 2000.

'Ecological modernisation demonstrates that capitalism can serve the goal of environmental protection' (Berger G. et al; 2001). The relationship between environmental protection and economic growth has frequently been thought to be antithetical. As currently practised, capitalism provides for both short run and long run economic growth when ecological modernisation policy making is utilised. (Robyn Eckersley; 2006) This implies that the proactive, rather than reactive, approaches to environmental legislation, such as the subsidisation for environmentally friendly industrial practises which currently occurs in market systems, can provide constant improvements in eco-efficiency in the short run. Switching from the belief that "environmental protection increases cost, to the notion that 'pollution prevention pays" (Peter Christoff;2000) means that the general economic principles of capitalism can allow for ecological modernisation to occur in the long run. As growth is seen as a valuable goal for both industry and society, market forces and measures of economic growth allow for profit to result from eco-friendly practices and therefore, it is economically and environmentally beneficial to be sustainable and as these benefits are open to both sides of the economy, they are democratically desired and experienced.

The following practices illustrate that how Magarpatta City SEZ has been playing an important role in this regard.

A) Oxygen Zone: mist fountain in the entrance with very colorful lotus and lillies at the entry of the Magarpatta City SEZ provides a soothing feeling to one and all. This pond accentuates the five key elements of nature along with the concept of Rutuchakra, the basis around which the Magarpatta City SEZ is planned. Rituchakra is the technique in which flowers, bushes and trees are planted in such a way that city blooms all around year and visual Vasant, Grishma, Varsha, Shrad, Hemant and Shishir become a reality. This concept contributed towards a cooler, more pleasant and green surrounding (Apurva;2006). A big hoarding titled 'Welcome to Oxygen Zone' can be seen the entry point of Magarpatta City SEZ. The message of nature preservation is one of the key components of the Magarpatta City SEZ. 'One of the most important features of this city is that the built-up area is merely 20%. The 15-20% has been left to amenities such as clubs, courts, amphitheatre, stadium, fountains, traffic circles, biomass plants, transformers and 35% to gardens', says Mr. Zuber Shaikh an junior architect and planning firm partner of Magarpatta City SEZ. For every 100 square meter, one tree is to be planted. This is a requirement by the Pune Municipal Corporation, but Magarpatta City SEZ plants one tree for every 50 square meter area. (Pande;2011;6)

Out of the more than 400 acres of land, 120 acres are allocated for gardens. In the Magarpatta

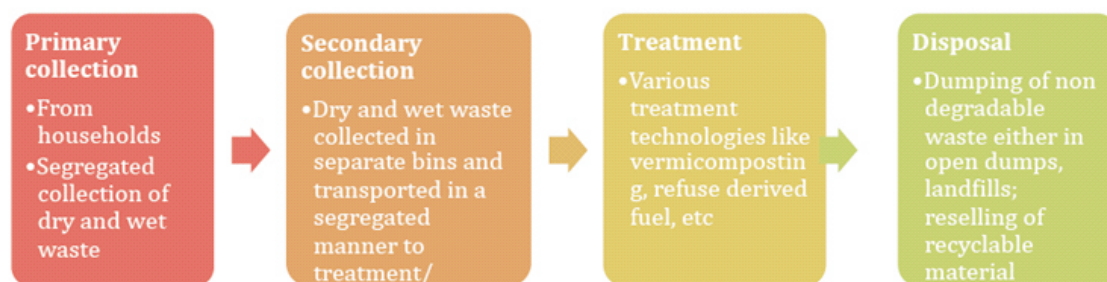
City, lawn are extended over 20 lakh square feet with 32,000 trees and bushes occupied area 1.5 lakh square feet. The well designed Aditi garden recreates the experience of a mini forest. There are another 28 small gardens, which adds to the beauty to Magarpatta City SEZ. One of the most serene and significant location in the Aditi garden is the artificial lake body. This lake effectively recharges and raises the ground water levels around here. In the Aditi garden, the colorful flora and fauna enlighten the mind and so many flowering plant species are selected to maintain the flowering in every season. Some of the plant species are Pink Tabebuia, Yellow Tabebuia, Amaltaj, Gulmohor, Copper Pod Tree, Pagoda tree etc. Evergreen Bamboo groves are developed to provide a cool shady retreat, even in the hottest summer months. Thus, the Magarpatta City SEZ has appellation of the true 'Oxygen Zone' (Magarpatta City Update;2011:7).

B) Eco-Ethics by Magarpatta City SEZ: Magarpatta City SEZ is laid with a vision of a progressive environmental outlook. This is unique for its pollution free and clean urban environment, where visitors are impressed by the look of the nature conservative practices. The design of the Magarpatta City SEZ is based on five fundamental principles of the human beings. These are Jal, Vayu, Pruthvi, Agni, Akash (Water, Wind, Earth, Fire and Sky). The five windows on the main entrance gate represent the Vedic message for the conservation of nature and environment (Magarpatta City Update;2011:7).

C) Garbage collection and disposal: Every day, the refuse is gathered and treated on the SEZ premises and next to no waste is conveyed to landfills. The waste is isolated and after that utilized for either vermin-treating the soil or nourished to the natural waste converter or the biogas plant for power era of force. The non-biodegradable waste is arranged securely and reusable scrap is sold. The township offers whole strong refuse to sellers and wins 20,000 a week. Mr.Seema Suryakant Bhosale, who runs the Waste Management Center (WMC) at Magarpatta City SEZ give the points of interest, that day by day 15 tons of waste is nourished into the natural waste converter to make compost. Magarpatta City SEZ produces 3 tones of vermin-fertilizer in a month. A major vermin-compost plant arranged behind the private plots. The vermin-fertilizer and vermin-wash are utilized as a part of the patio nurseries and the Aditi nursery.

The Eco-accommodating routine of isolation of more than 400 tons of family and business refuse, junk and waste every month is done at wellspring of which, 280 tons of bio-degradable waste is utilized for vermin-culture and bio-treating the soil. More than 120 tons of non-biodegradable waste is reused as it were, which is not risky to nature, arranged off securely and the re-usable scrap is sold. Inhabitants are urged to isolate refuse at source, in two separate rubbish canisters (wet and dry trash) (Friestedt and Sjovall;2006:12, Magarpatta City Update;2013:8)

Figure No. 1 : Sustainable Solid Waste management by Magarpatta City SEZ.



D) Bio-Gas Plant: Magarpatta City SEZ has a two tons limit bio-gas plant, where bio-degradable waste experiences a procedure and non contaminating biogas is created. The non-contaminating biogas is utilized to create energy to work a noteworthy rate of the garden pumps. This recovers unnecessary power necessities proportional to 118 business gas barrels of 19 kilograms limit for every month. In a matter of seconds, this bio-gas every day creates 80-100 cubic meters gas, which is changed over into more than 270 units of power. This power is utilized to work plant pumps and runs fans and tube lights in the wash room house (Magarpatta City Update;2013:8).

E) Solar system at Magarpatta City SEZ: More than 7,000 solar water heater system in the Magarpatta City SEZ, supply hot water to residents, Cyber City, Pantry house, Gymnasium, Hospital, Deccan Harvest hotel and School and Colleges. Magarpatta City SEZ's solar water heating system is Asia's largest solar system runs by a single organisation (Magarpatta City Update;2013:8, Carrie;2012:5). This project is collaborated with Bipin Engineers Pvt. Ltd., which is one of the leading companies in manufacturing and installation of solar water heating systems. The solar system is installed on the terrace of all apartments, buildings, row houses and bungalows. The system is designed in such a way so as to blend it with gardens and landscapes of the project and personify the complex projected as an Oxygen Zone by Magarpatta City SEZ. A total of 7,160 collectors are installed with a cumulative capacity of 7,75,000 lpd. These systems are installed in such a manner that each unit is connected to only one wing of the building. This helps in equitable distribution of hot water. It also ensures reduction in distribution piping and by extension, heat losses during usage. The saving in Magarpatta City SEZ in terms of electricity as per installed capacity to date is approximately 1,45,48,447 KWH annually and saving in terms of money would be amount to 5 Crore annually (US \$ 850000) (Carrie;2012:5, Pande;2011:8).

Given that Pune's climate means a requirement of hot bathing water throughout the year, this amounts to huge savings collectively. With every 3 KW of energy saved, it adds up to lessening of around 1 ton on the green house gasses, that would have generally been transmitted. Each private unit has boards raised on the porch, which are associated with water stockpiling tanks in this manner guaranteeing boiling hot water in every single home. Magarpatta City SEZ has introduced near 7,160 Solar Water Heating Panels, normally warming 900 Kilo Liters for every day, which will appear into a yearly sparing of 14548447 KwH bringing about sparing 13,483 tons of carbon discharges every year (NMSH, Govt. of India, 2010:20).

F) Recycling of Fly ash: Fly powder is an ecological perilous waste created by warm power plants (Pande;2011:9). It can be utilized as a piece of substitution of bond and five totals, is an embed material and spares vitality required for the creation of concrete. For each ton of fly slag utilized as a part of development, around 1 tone of CO₂ discharge in environment is lessened. Be that as it may, the Magarpatta City SEZ utilizes 1.5 lakh ton of fly powder inside every one of its developments and makes an interpretation of it into a colossal sparing over the same, i.e. 150000 tons of carbon emanations. Here, fly powder blocks are fabricated mechanically by utilizing concrete with fly fiery remains, which is superior to conventional blocks due to different reasons like controlling of contamination, cost, breakage, wastage, uniformity, finish (Carrie;2012:7). Manufacturing authority of Magarpatta City SEZ inspects the strength of bricks and it is found to be heavier than traditional bricks. One more benefit to use these fly ash bricks is that it absorbs less water and gives a good surface finish.

G) Rain Water Harvesting

Rain Water Harvesting, an eco-friendly method, is extensively practiced at Magarpatta City,

wherein rainwater is collected, recharging the ground water, increasing the water table and the use of water that would otherwise have gone down the drainage system, into the ground or been lost to the atmosphere through evaporation.

Before the township was established, Magarpatta had 8 wells and 75 tube wells to irrigate the land. The rain water harvesting systems are designed to recharge the well water, which is further supplied to this SEZ. Some part of the collected rain water is stored in artificial lake at Aditi garden, with the major quantity of collected rain water is injected into the 515 recharging bore wells. Because of the rain water harvesting in a summer season, Magarpatta City SEZ has even enough water to maintain their greenery and landscape. Pune's largest mist fountain enhances the microclimatology in the Magarpatta City SEZ. (Magarpatta City Update;2012:5)

H) Charging of Ground Water Level and STP Plant

Footpath and landscaping pavers are designed with cutouts, which aid in absorbing the water into the ground. Mounds are created out of the earth and excavated to increase the surface area leading to more water retention. Even the compound got interlocking blocks installed instead of concretising to enable rain water to be absorbed instead of being drained away. This goes longly by helping the drenching up activity of earth, avoiding flooding circumstances and raising the ground water table, which by and by helps the vegetation with sufficient common water supply, upgrading the greenery and keeps the temperatures cooler in the Magarpatta City SEZ.

Over 20-lakh litres per day of potable water is supplied through a water treatment plant. This plant has the capacity to treat 40 lakh litres per day. The Water is used in the ratio of approximately 40% for flushing, 30% for domestic use and 30% for kitchen use. The Sewage Treatment plant, processes 0.5 million litres per day, with another 3 million-litre capacity per day is on the verge of completion and another 1.5 million litres per day in the near future. The water here is used for gardening (Magarpatta City Update;2012:6, Pande;2011:10).

I) Sewage Treatment Plant

Waste water released by apartments, pent houses, row houses, Cyber city, latrines and pantry house, hotels and recreational units undergoes scientific treatment in Magarpatta City SEZ. There are four sewage total treatment plants, which treats 2 Million Liter per Day waste water. Treated water is recycled to horticulture and gardening within the Magarpatta City SEZ.

J) Passive Design Considerations to Reduce Energy Loads of Buildings

The parking below the Cyber City Magarpatta SEZ is semi-raised to assist natural ventilation and to enable exhaust from vehicles to be removed naturally without the help of any mechanical aids. Also, a space between the glass cladding and internal windows is provided in all the IT buildings to enable heat built up to be dissipated naturally – by creating air insulation. (CSE;2012:6, Magarpatta City Update;2010:4)

The residential neighborhoods are built on the traditional Puneri 'Wada' concept to enable natural light and breeze to flow through. Sincere attempts are made to provide cross ventilation in the apartments. All around the compound walls, thousands of trees and shrubs have been planted to reduce the impact of noise and dust from the roads. (Magarpatta City Update;2010:5)

K) Carbon Credits to Magarpatta City SEZ: Solar water system in the Magarpatta City SEZ has the potential to generate carbon credits value around 3.8 crore per year, for which it has to save 48,000

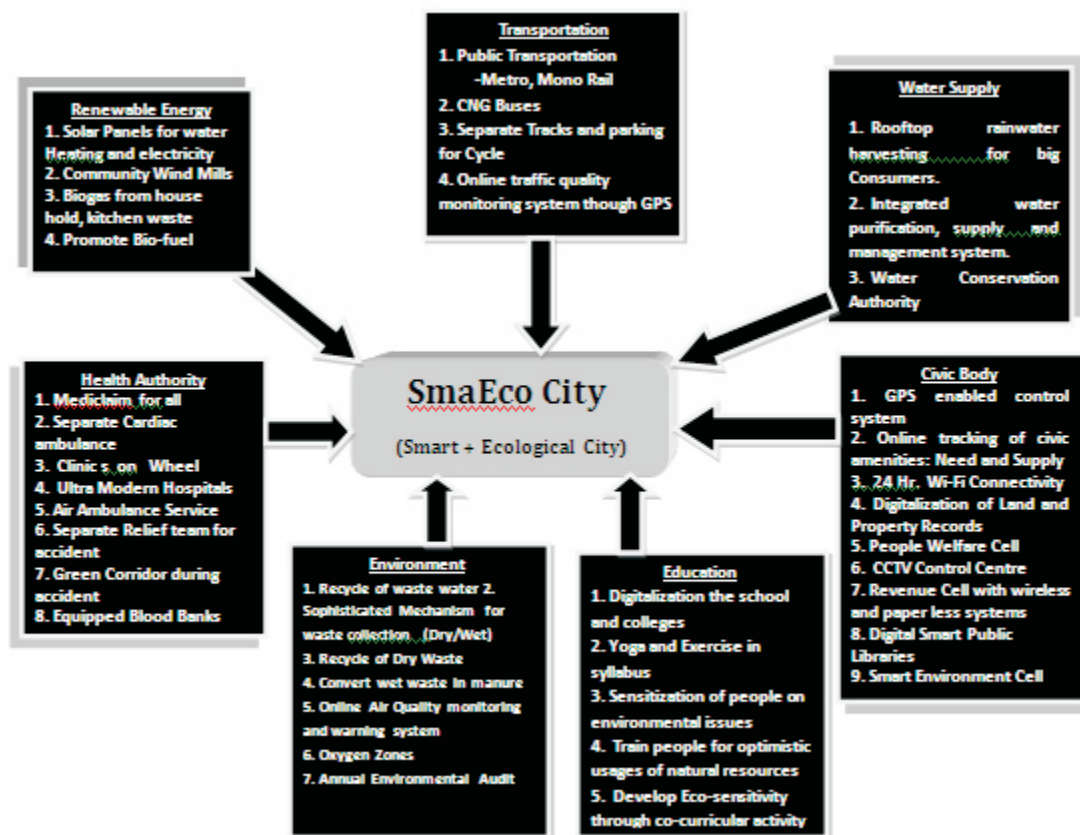
units of electricity per day and 12,000 tonnes of carbon dioxide emission a year (Down to Earth; 2009:44). This helps the customers who consume this water to save on their electricity bills.

Response by the Pune Municipal Corporation (PMC) over eco-initiative of Magarpatta City SEZ is very realistic. PMC gives 10% rebate on property tax to the residents of the Magarpatta City SEZ. This type of incentives spread messages to other land and SEZ developers. (Magarpatta City Update;2010:1)

CONCLUSION AND SUGGESTIONS

Despite the debates on the environmental related problems and SEZ in India, the case of Magarpatta City SEZ is somewhat an encouraging example to preserve the ecology and carry out environment-friendly practices. It is amazing to see that Pune Municipal Corporation (PMC) appreciated the SEZ’s ecological practices and awarded 10% wave off on property taxes. Magarpatta City SEZ maintains the ecology and preserves environment sustainability through certain unique practices, which also bonds with the ecological modernization. Another significant finding regarding the uniqueness of Magarpatta City SEZ is that it acts as a model of Smart City as well as Ecological City. This research suggest the model of SmaEco city. This SmaEco city explore the possibilities and future of sustainable urbanization.

Figure No. 2: Conceptual Model of SmaEco (Smart + Ecological) City.



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