



Figure.2. double dickered bus.

Whereas, coming to the means of transportation, petrol and CNG have to be replaced with any non-conventional energy sources. Electric or hybrid cars are being encouraged by manufacturers across the world these days. Though they are not accepted hugely in India, there is a rising acceptance of them among the buyers. The government of India has put forth an idea to manufacture all electric car fleet by 2030. The advantages of this means over the conventional methods is that there would be very less pollution evolved. In order to refill the batteries or engines, there will be battery charging stations instead of petrol bunks. The electricity required to charge these vehicles can from either solar energy or hydro power. There can be vehicles running on solar energy directly as well. A solar panel is installed on the head of the vehicle and it gets charged as it moves on the roads during the day time. This method is already in practice in Delhi in our country. There can be another method of transportation where the movement can be caused due to magnetic energy and fields. This kind of mobility means works on the principle of magnetic levitation. According to this concept, the vehicle travels on a guide way that provides lift and propulsion simultaneously. They have a very high speed movement compared to conventional vehicles and there is a very less amount of energy consumed which is also required to just start the vehicle. This concept of magnetic levitation is applied to trains vastly. Maglev trains are widely in trend in the countries like Japan, Germany, France etc. Smart driven and driverless cars are also being developed, this technology reduces the number of accidents occurred. The following picture shows the design of a maglev train that works on the principle of magnetic levitation.



Figure.3. magnetic levitation

Smart mobility is achieved only when there is a reduced congestion on roads, reduced sound pollution and transportation time is faster. These requirements can be achieved by employing ICT and IoT technologies interlinking the smart phones, vehicles, control rooms and satellites, which

can enable the drivers aware of the traffic, routes and time consumption to travel. This can also reduce the number of accidents occurring on roads.

Smart electricity:

Electricity is the basic and foremost requirement for any device to work and without electricity there can be no system working properly and no smart city can be built without electricity. For building smart city, there should also be smart electricity. Smart electricity can be generated by using the technology of smart grid system. The figure 4 shows a representative picture of how a smart grid is installed.



Figure.4. A smart grid is installed

This smart grid manages electricity demand in a sustainable, reliable and economic manner, built on advanced infrastructure to facilitate integration of the supply. Here, the grid means a network of transmission lines, substations, transformers and other elements that help in generation of electricity integrated and compacted in a small area. This system works more effectively in a range of (114-130)V. They can increase the reliability and quality of power and decrease the energy costs. It also integrates low carbon energy resources into power networks and reduces the emission of CO₂ and other pollutants.

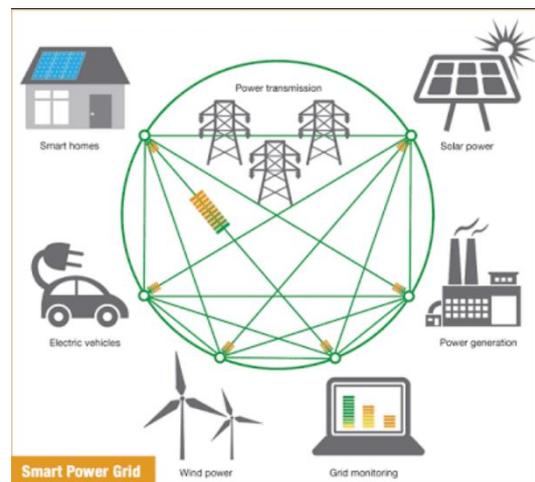


Figure.5. Schematic diagram of how a smart grid works

Smart buildings:

Smart building is a building in which all the processes are automatically controlled or automated by any electronic device using digital technology. As we already know, there are biometric, sensors systems of opening or

closing the gates. This allows for the security, safety and time saving. A smart building goes far beyond saving energy and other resources and ultimately achieving sustainability to the maximum. They are the key components to the future where IT and human ingenuity combine to produce a low-carbon economy and high reliability envisioned for the future. Construction of green buildings can result in the smartness of a particular area. Green buildings are the ones which highly concentrate on the environmental friendly culture and sustainability. These buildings have an efficient usage of energy and water. They emphasise on the reduction of carbon footprint, reduction of waste and pollution. More number of trees are planted around a green building and the construction materials are selected such that they maintain the temperatures around it.



Figure.6. Green Building

Smart buildings are built such that they occupy less space for a given volume so that more number of trees can be planted and proper roads and walkways can be allotted for different purposes.

Urban energy planning:

In planning sustainable urban energy resources, the urbanization rate and the environmental constraints are to be considered mainly. This makes the application of different technologies more efficient based upon the geography, climatic conditions and the people of that particular place. This can make a better industrial, product or energy structure which leads to increase in the energy saving rate and speed of economic development. The following picture shows the holistic approach to the urban energy planning of smart cities.

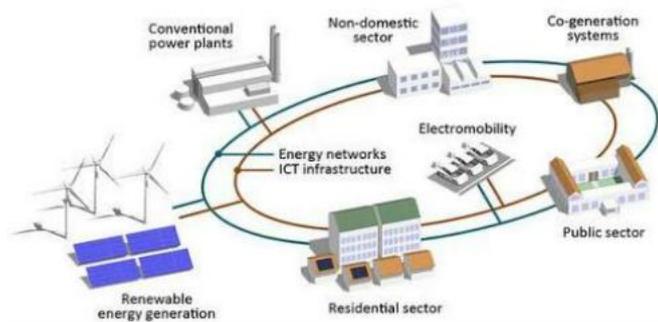


Figure .7. Planning of smart cities

Smart sanitation:

Even today, in the rural and semi-urban areas in developing countries like India, there is no proper sanitation or sewage system. Awareness programs are being progressed day-by-day, educating the backward classes about the importance of sanitation and hygiene. Though there is a proper sewage system in urban areas, a lot of threats to the environment is

being occurred. To avoid this, there has to be a proper containment and treatment of the sewage waste. Due to open air burning of the sewage waste which is a conventional practice, the levels of CO₂ and CO are increased and health hazards are caused. Clean drinking water and improved sanitation can only decrease the spreading of diseases and malnutrition. In order to improve the disposal system, treatment processes and health of the people may innovative ideas have been proposed and the bulk application of such innovative ideas can help in achieving smart sanitation. Some of these ideas are bio digester toilets, dry toilets, emergency sanitation operation system etc. Figure 8 shows how a bio digester toilet works and the sewage is treated.

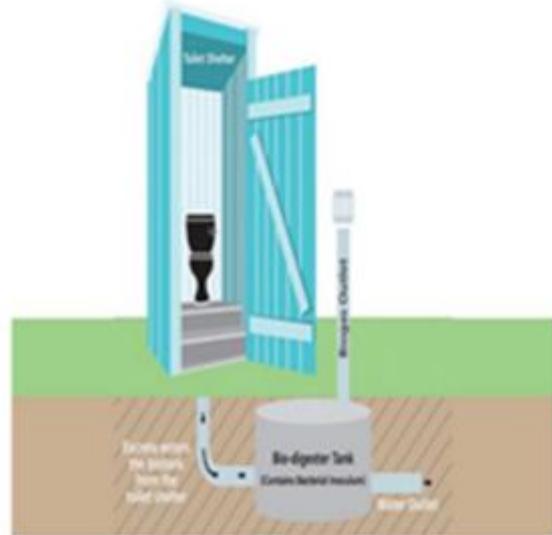


Figure.8. Bio Digester Toilet Works and the Sewage is Treated

There can be a technique developed in which the water from the wash basin or a sink can be sent to a tube connected to the flush tank, and the water can be filtered and disposed, and clean water can be sent to the flush tank. This results in the saving of water. Smart sanitation can be achieved by on-site septic tanks and shared or cluster systems. The working of an on-site septic tank can be understood by studying the following picture.

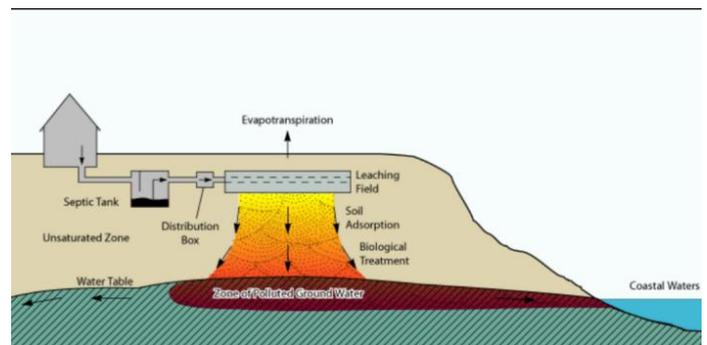


Figure.9. Septic Tank Can Be Understood By Studying

Smart waste management:

Waste management is one of the most important needs for building up a smart city. Managing the waste in the correct manner can make the re-usage of resources easy. The concept of the 3-R's (Reduce-Reuse-Recycle) has to be implemented more widely and generously. First of all, the waste has to be segregated into dry and wet from the ground level. Wastage of resources has to be cut down completely. Wet waste is the kind of waste in which there is a moisture content present.

Generally kitchen waste and some types of industrial waste come under this category. Instead of just burning this, it can be undergone with a process called composting. After the compost is formed, it is sent to a biogas plant from which gas is produced which can be stored and distributed to fulfil various purposes like cooking or any industrial need.



Figure.10. Cooking or Any Industrial Need

Compost bin

All the dry waste can be recycled and reused. If plastic is burnt for disposing, a lot of harmful gases are released causing great threats to the environment. If it is just dumped in the ground, soil is polluted and causes harm to the animals. So, the usage of plastic has to be prevented and the plastic has to be replaced with some eco-friendly materials depending upon the different purposes.

government also proposed the names of 100 smart cities to be built in the near future and make the country on par with the other developed nations.

III. REFERENCES:

[1]. An article by Sanchita Sharma, Hindustan times, January 18, 2015.
 [2]An article by Dr. Peter Vienchnicki, Abhijit Khuperkar, May 2018, 2015
 [3]Article by Jacob Kriss, LEED, August 2014
 [4]www.preservearticles.com, article by Pratik Daga

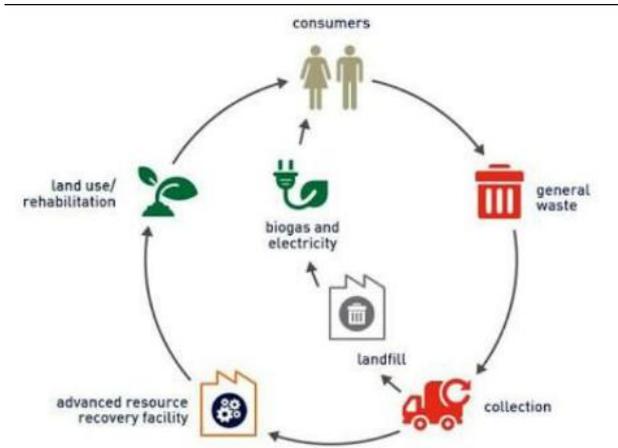


Figure.11. Eco-friendly materials

Solid waste treatment process

Many innovative technologies have been proposed for a better management of waste. One of them is the one making IoT as a tool. Different bins are attached with sensors that can detect the depth or type of the waste thrown away in it. These different bins at different places are connected to a single control server system and once the bin is full, these sensors ensure that that an alarm is rung or a light beeps at the control room and the waste can be collected and treated time to time.

II. CONCLUSION:

Hence, in order to preserve environment, resources for the future generations, to protect the earth and reduce the effort on human beings, smart cities should be constructed. The Indian