Evolution of Human Settlements
Lecture 16

City of the Future

When you actually discuss future cities we shall do so with an example- with Songdo , in south Korea. Now you will see how this was developed, and how this has grown for us to realize, how future city should be. And, what is it that our country can do for the same? This was built up from the ground up, from scratch in 2005, with over $40 billion invested into its creation, and it was opened in 2009. Songdo is one of the, one example of what a smart and a future cities is going to look like; and is perhaps on the very fore front of this very evolution. These new type of cities typically leverage new technologies, infrastructure, design, and planning technique to create, what can only be described as city which acts as a living, breathing organism that can communicate with its residents and within itself. Here is South Korea, Songdo the site area, total area and the master plan. You can see it was not done laid out on any other urban theory of; say the Rathbun lay out or anything else. It was meant to be done, such that it sat on the site. It had the purposes of mixed use. There was no residential area, no commercial area, no entertainment area. It is all been combined. It has a lead ND pilot programme. It has lot of other technical advancement incorporated in to the master plan. The total thing is about 10 square miles, the parameters if you look at it like we discussed - smart transportation, smart energy, smart building, smart waste and water management. This is the typical section through all the commercial and mixed-use zones. That's the term of the future literally, a Mixed- used zone. We shouldn't have a completely residential area; we shouldn't have a completely commercial area. Its only when you have a mixed-used zone, you can reduce traffic congestion and other such related activities, because it should have 5-10 km radius where no one should have to go beyond that. You can see these are the typical area zoned out. There is a height in play. The tall buildings are here; the shorter buildings are here. You can see an elevation, such that there is an adequate wind flow. When you make sure there is an adequate wind flow in the city. You can reduce your consumption of air conditioning. Similarly, over here you can see there is the shorter buildings in the forefronts, tall again in the centre; and again there a spillage on the other sides. So when you actually have this constant play in the height of buildings that is predesigned, you can actually make sure your city is better designed with better lighting & ventilation to ensure lesser consumption of resources.

Now here, if you look at it, you have the public transport, particularly laid out. The UTC bus stop, subway, bike path and water taxi because there is water body over there. But you can clearly see that road transportation, or cars are completely discouraged. Even if it's a car, it has to be a hybrid car or a battery charging car. You should have these battery charging points, bike racks & pedestrian walk ways. Now, all of this was completely encouraged. Buildings need to be smart too! Your Roof has to be smart. The roof has wind turbines. It has a ventilative skylight, motorized Helios slats. So, when you have these motorized slats, it actually, can moderate the kind of light that is going to come in, the kind of ventilation that is going to come in. Skylights, like everyone knows, are lot of day light comes in. So, when you have skylights you can reduce the consumption of electricity in office buildings through the day time. You need to have water harvesting channels and sediment roofs or green roofs. Sometimes the roofs could be performing that of an urban farm. The skylights every one, you can reduce consumption of electricity in daytime, and sedum roof or green roofs. Now, if you

actually look at this Songdo is over here, on the right you have other Asian cities. This is the master planned community; the city of synergy is Songdo. You can see the clear play of height of buildings. They are not against skyscrapers; there is nothing wrong in having skyscrapers. But the skyscrapers have to be strategically placed so that you do not have concrete jungle that is getting heated up. Here you have other Asian cities, which is pretty much a concrete jungle. Multimodal transportation, they are encouraged 10 minute walk to work versus it just takes 10 minute to get a parking spot in other cities. Here you have living clean and green; smog and pollution in other end. Residential unit's higher quality at significantly lower costs, not so in other parts of the Asia. Commercial office space- higher quality, lower cost, and better accessibility to open space. And finally open spaces such is so minimal in other Asian cities; versus 40% of Songdo is dedicated to green & open space. So, you can see a smart city is also a green city. This is where the thumb and finger analogy comes in. All green and smart cities need not be futuristic cities, but a future city has to be green and smart in saving up the resources and making sure that its building system, its transportation system are all smart. If you look at the education you have very good schools, universities all of that within Songdo itself. Quality of life you have international hospitals, arts centre, convention centre, exhibition halls and many other facilities. Entertainment & leisure again you don't need to go out. You have the 5- star Sheraton hotels, shopping town, shopping complexes, they have canal walk shops and Golf club. So, everything is self-contained and because of this, congestion or people going in & out, travelling in cars, all that is reduced. And even if you have to travel, the public transport system is quite advanced.

So, now to discuss, yes! Songdo has spent $40 billion, but how sustainable is it? It has 40% green spaces, zero energy building, the lack of emission of harmful gases and instant re-recycling plants. So, all of this does make a sustainable city. Now, all countries might not have $40 billion to invest, but that's exactly what they want to suggest. Look at the money as an investment, because you are going to get returns really soon versus an expenditure of the government. Because if you look at as an expenditure, you are going to think as - Oh! My God, where are we going to get these kind of funds! But if you look at it as the investment, you will have a lot of private sectors players coming in. public sector will be always be getting money from its tax payers; but definitely a model city has to be started on to see how sustainable it is for an Indian climatic situation.

Future of Cities

Now, we have seen one end of the spectrum, the city of the future. Now by just inter changing the words, we can change the entire meaning. What is you actually you think about the 'future of our cities'? The Cities of the future holds a lovely image of green spaces, open spaces, happy people in a clean background. But if you look at the current situation of a many urban centre & cities in our country, or across the world and if it continues to grow as it is in today's context where will it land us! There is actually a major difference in the outcome between the two. They can actually never be the same as already many cities in our country are already crowded and thriving cities, and they tend to change organically over period of time; rather than someone coming and starting something from scratch. It is true that urban policies and laws are laid to control the growth of a city in a regularized manner. But usually policies only provide direction and they don't do much anything else. They are not laws. The future of cities depends solely on its residents and their ways of life. For instance we have old cities

that have transformed enormously like Old Delhi to New Delhi; Madras to Chennai; Bombay to Mumbai. These cities have not only grown in size& Population -which has led to congestion, overcrowding, slums, disparity within the urban fabric- in terms of housing, facilities, and civic buildings. The future for such cities might be planned on a large and grand scale anticipating competition with other global cities but most often the poor people and their needs are ignored. Their basic necessities have to be accomplished before considering the future of cities. On one hand, we have skyscrapers, global offices, headquarters, posh malls, global brands, but very much in the same city a few hundred yards away you will find slums, with poor sanitation facilities, bad roads, and unemployed people living in squalor. Before we think of smart and sustainable cites we have to consider the needs of all the people in the city, towns and villages- living in a town or rural setting should not technically hamper the quality of life- this is where the first disparity in basic amenities begin and urbanization occurs. It is only as a result of urbanization that cities are getting congested. In villages, or village life or rural life, does not mean a backward life. People wouldn't find the need to move to a city, if you have internet, if you have malls, if you have theatres, if you have a good entertainment and cultural centres in towns & villages. The need to come to a major urban city will reduce tremendously. If a village offered good transportation, education, health care and well-constructed homes with good entertainment pockets- why would there be a need to over crowd the cities? Before we look in to 'futuristic cities' we need to analyze and re-examine the current cities and their future. If the current urban scenario is not repaired- the future will bring about more disparity and increase the problem that lies within the city. It will be like cosmetic surgery- outwardly you will think that person is looking very beautiful; or all things might seem fine but inside there are lot of decaying elements. If you look at the different stress factors in an urban scenario, in not only in India but other parts of Asia- you have the slums in Manila; this is a port-au-Prince in Haiti; and this is an apartment complex in china. Here you have congestion, which is the second stress factor. Streets in the centre of London. 'Go slow' that in Lagos, Nigeria. Rush hour in Los Angeles. You can't even see the road basically; it's a sea of vehicles. Third, is an urban stress- environmental problem or Brown Agenda', which is basically solid waste management. What can be done? Pollution, all kinds of waste just entering the water bodies, smog and land pollution, air pollution all of that becomes a huge issue in urban cities. Social problems, is the main important thing in terms of disparity, if you look at a family in India with so many children and no way of life, no food, no homes. You have this, not only occurring in India but other parts of the developed countries and developing countries, as well.

Sustainable Cities

Now, on to sustainable Cities, which will take us truly into what kind of future we can look forward in to? If you look at urban planning it has grown quite a bit. From the garden city concepts in 1900s to the Ecological city & the urban sprawl period in 1970s to the demand for sustainable city which is now. If you look at sustainable land use you need to have optimal site, cost accounting of nature, and the buildings, sustainable building strategies. If you look at different concepts off, that has come about in the last 25-30 years. Village home concept in Davis, California. This is considered a ecological city- urban sustainability as a solar design, natural drainage and edible landscape. The creator of this concept is Michael Corbett in 1975. It was inspired by the medieval village of Spain. Solar design should cut daily family energy budget, and when residential developments implement sustainable principles, both economic and

environmental benefits will also follow. Cities must be sustainable. More than three quarters of the world's population will have lived in cities by 2050. If the cities are sustainable it will greatly affect the earth's environment. So, architects and city planners can considerably contribute to help to prevent the pollution and improve our planets environment, as well as the government. All cities must be sustainable for the future. When you think of the word sustainable it is usually misinterpreted. All, like we just saw the Songdo as an example; yes! That is a sustainable city but just having high technology does not make a city sustainable. It should have zero emission; it should have carbon dioxide that is on the lower side. It should have good oxygen and air quality. It should have a lot of other things that support a good quality of life. That's what makes a city truly sustainable. Yes! It can be technologically high flying that is obviously a main component of a city and urban life. Compact and mix-used city reduces the need for transportation. Zoning of function makes people depend on their private transportation. Like if you have three different zones - one for residence, one for entertainment, and one for commercial. So, then the need for cars comes into being. But if you have compact nodes, it can reduce the use of cars, and people can either walk or use bicycles. So, they should have a common area, where the residence, the commercial and entertainment sector are all mixed with in a particular area, and that would be a truly well developed compact area. How do you connect the compact nodes? If you keep growing like this, this is the open linear system. This again leads to sprawl. Because from here if I have to go the fourth component it is going to take a longer time. So, compact nodes have to be join by mass transportation, like train system where the centres are connected as well as the outer ring roads are also connected.

Energy reduction, compact city can also reduce energy consumption. Obviously goes without saying once the city's becomes compact the number of cars will reduce. And If at all cars are taken, it will be taken only for short distances, and then you will be promoting more cycles and more people walking. So, that's the main result, and the second thing is when you promote public transportation that again reduces the individual car consumption or fuel as well as pollution from individual cars. So, if you will actually look at it, only one unit is supplied to a city; some energy loss over the trip and 2 units of energy loss as heat. So, this is the conventional system that power is generated far to a city. Now in a compact system power is generated in the district, so heat of a secondary product can also be reused. So, CHPs is nothing but combined heat and power. So, CHP's supplies heat and electricity to the region, Heat will not be wasted, that will be used by another industry or sub-industry. So, CHP's can turn refuse also in to energy. If you take clean refuse, you can actually get about 2/3 units of fuel. And if you take the output of heat and electricity, you get about one unit of fuel. So, you actually thing about reducing the energy consumption it makes a huge impact on how far the city will go, and how the citizens will also benefit from that. This is the compact and Mix-used City Example, the RiverParc project in Pittsburgh, Pennsylvania. The small neighbourhood of 6 acres with about 700 residence units, hotels, art venue, retail, offices, and variety of parks. People can satisfy their daily necessities including their jobs in the only two-block walk-able neighbourhood without a car. The big eighth street is paved for pedestrian community's spine. This is the community spine and this is the entire sector that we are looking at. You have only the roads that are used for pedestrian activities. And if everything is contained within 6 acres it makes it completely eco-friendly in terms of lack of use of fuels; reduce pollution from cars and other motorized vehicles.

The Compact and mix-used city example, this is Maiorca. Another example, the technoplois is divided into three communities. Each community is about 2000 residents and arranged to a walk-able or bicycle-able distance. Then public transportation connects the centres of them. So, within individual communities if you need to go, it's only a 10 min distance you can walk or use the bi-cycle. But, if you want to use or connect to the other things, other parts of the city or other nodes there is public transportation leading to them. So, again the lag, the first targeted node is the road. The road vehicles, public transport all of this reduces, the city automatically becomes greener and sustainable. How you can go about reducing energy consumption? First step to reduce pollutant fuel dependency. We use lot energy for lighting, heating and cooling. We can reduce this by utilizing nature, such as sunlight and wind, or passive cooling techniques. This is the Japanese shoji, you see as the simple example. A very big opening which takes in a lot of natural light but filtered light through a building, so, you don't need artificial light during the daytime. And because it's filtered, it's not the bright harsh sunlight that's go to cause the damage or hurt our eyes. This is the sliding door and it can actually moderate the temperature and the light, and protect us from the wind too. So, this can be moved according to different times of the day. It's manually done. It's very simple; you can control them easily, by just shutting it, open and close. If you look at the City's outlines, these are the certain proposals given. The Contour of the city is set considering that natural light can reach the utmost space and wind can be used as natural cooling system and ventilation. This is what, we even discussed with Songdo. You need to make sure the tall building are strategically placed; so they can cause a good tunnel effect and makes sure there is movement of air in the core or centre of the city as against the parts which are in the outer layering area . Six mix-used neighbourhoods specially create parks. Buildings with several heights are grouped, so that the obstruction of sunlight, wind current and views can be changed. This is the natural ventilation for a building. The Roof form actually creates natural ventilation and reduces necessity of mechanical ventilation. The surrounding trees clear the dust in the air and also provides for moistures. This is like, instead of, we working for the buildings, we have to make sure that the buildings are actually working for us. Energy source should be recyclable and unlimited. It must not damage the natural cycle. Sunlight and wind power is popular for reproductable energy source. Waste from lumbering is burned as energy fuel at Biomass CHP plant. This supplies electricity to about 3000 residence units and all commercial buildings in the commune. 100% wind – powered community, in Rock Port, Missouri. This Loess Hill wind form has 4 wind turbines on agricultural lands within the city of Rock port. These turbines do not take massive space. So, ground area which is prime is not occupied. This is actually useful for small compact communities. Wind of only 9 miles per hour can activate power production. The turbines are directly connected to city's main electronic lines. Rock Port consumes about 13 million KwH annually, and Loess Hill wind farm can provide nearly 16 million KwH each year. So, that kind of substantial production will actually make the city green. This kind of conceptual Appeal, what kind of green buildings we can come up with? Architecture and community should appeal sustainability visually and sensibly, not only functionally but also practically. Because very important thing, to create successful sustainable communities, in consciousness of people living there. People should not be short changed in any which way. On the other hand in the whole frame of sustainable living they shouldn't be losers in terms of financial bargain, they shouldn't loose on or

they should not have to pay too much to live in a clean environment. That is our requirement and our right.

Now, Nash's Island Civilization, is an urban sustainability project for global civilization of about 1.5 billion humans living in 500 compact cities. This came about by Roderic Nash. Urban compactness as an essential element of sustainability- Human presence on earth to endure, advance the rights of nature, preserve wilderness between cities, global population to maximize their intellectual and technology. So, when you actually look at these modules that we have seen. Different models of come about – one, where the building is smart and provides energy; one where the entire population provides for energy. Third, we have seen where solar and wind energy can be used. And then we have also seen the options where the urban planners have situated the city itself in such a way that it consumes less energy. Compact mixed-used energies city are also of the present.

Now if you look at the Hannover principles- a guide to the search of sustainability. Insist on human rights and sustainability recognises the interaction of design with the environment. Consider the social and spiritual aspects of buildings and designed objects. Be responsible for the effect of design decisions. Ensure that objects have long term value. You need to eliminate waste and consider the entire life- cycle of designed objects. Make use of "natural energy flows", such as solar power and its derivatives. You need to ensure open communities. Be humble, and use nature as a model for design. Share knowledge, strive for continuous improvement, and encourage open communication among stake holders. For all of this to happen it has to have lot of local participation, strong local participation along with a very strong political back ground, along with policy makers, urban planners , architects and even the citizens have a huge hand in this. It's not sufficient that even common citizens are involved ,but also you have also citizens communes that are formed, communities that are formed that enables simple task like waste collection; relocation of waste such that dry waste is collected differently can be recycled; wet waste can be collected and used for energy consumption . Other wet waste can be used as fertilizers for plants and other agricultural needs. All of this has to done not only by the government because the awareness has to start amongst the citizens for government to come in and take the next step. Sustainable city within a sustainability watershed. So, Urban sustainability is holistic, diverse, fractal and evolutionary. This concept was created by Margot McDonald in 1993. Transformation of Los Osos, in California. The holistic part was composed of interdependent and interconnected subsystems of multiple scales. Diversity in terms of decisions should enhance biological, social, cultural and economic diversity at all scales. Fractal in terms of design, with nature based on chaos pattern of geometry. Evolutionary seeks efficiency through iteration. So, lot of these people have taken up these smaller towns as examples and models; and created a lot of these models for us to learn from. And that is the primary first step we need to take for any of our smart cites or green cities or sustainable cities. We need to document that the changes that we are making on them because it is only if we can learn from others, the same way others can learn from us. If the community is going to be a part of it; other parts of the world can also see if a similar community exists. How is it, that it can be done? Green infrastructure- urban sustainability, as a regenerative urban system. This can be achieved, only if society incorporates regenerative energy and water flow systems of nature into its city. Vegetation modifies the bad environment, so make sure you have lot

of plants that will bring in animals and other birds. You need to have new residential concepts or new family units. Both that are owner- occupied and rented in a quality urban setting in which landscaped areas, social amenities and good architecture generate urban excellence.