Sustainable Architecture
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Lecture – 10
Established needs for Sustainability in Building Sector

Good morning. Welcome back to the course on Sustainable Architecture. This is the last lecture of week 2. In the previous lectures we have seen the impacts of built environment on natural environment on elements like water, land, air. And, then we discussed the Agenda 21 and how the United Nations, the world~~'s~~ together placed the emphasis through various agendas which will help us to move towards sustainable development. Unfortunately, despite such a strong robust agenda being in place for 3 decades not much progress was made towards sustainable development as was anticipated.

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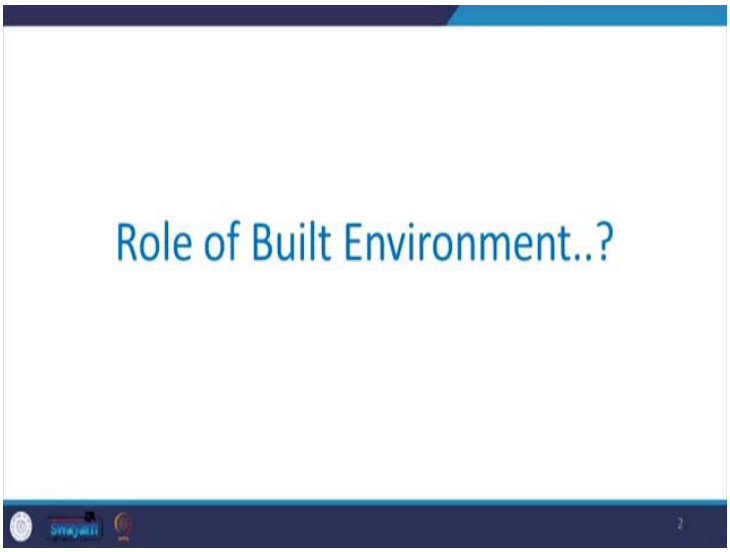

So, here we have to understand how the built environment, buildings architecture will help us in achieving the agenda.

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Now, before we move ~~on~~on, we would look at the goals, sustainable development goals which were refrained, concised to form very crisp 17 goals for sustainable development. And, then we will see how we can achieve or how architecture, built environment contributes to each of these goals. These 17 goals are poverty, food, health and well being of quality education, gender equality, clean water and sanitation. Access to affordable and clean energy, economic growth, industry innovation and infrastructure, reduction in inequality, sustainable cities and communities.

Responsible consumption and production, climate action, aquatic ecosystems, terrestrial ecosystems, peace, justice and strong institutions and partnership for goals. If you look at these 17 goals; sustainable development goals, we see architecture helps in mitigating or achieving many of these goals. First of ~~all~~all, poverty, we have seen how urbanization, concentration of population in urban areas leads towards poverty. Thus, developing, designing our cities not just cities, but are settlements in a sustainable manner will address the goal 1.

We can also address the goal 3 partly which is of health and well being by designing proper settlements which provide for access to green open areas, health ~~immunities~~amenities which help people to distress, remain stress free which are safe. So, that people are not stressed about the safety of elderly, women and children. All these would lead towards the achievement of goal of health and well being.

Another goal which can be addressed partly through sustainable built environment is of gender equality. When we create spaces where we allow community to come together, we address the goal. Clean water and sanitation, sanitation requires intervention of built environment, how the settlements are designed, affordable and clean energy. Now, buildings have a greater role in this particular goal which is goal 7 where buildings are major guzzlers of energy.

So, through the consumption pattern which is also the goal 12, through the consumption of resources both energy and other material resources, through judicious use an efficient consumption we can address these goals. The goal 11 which is of sustainable cities and communities is addressed only through sustainable architecture, sustainable built environment which is how we design, construct and develop our settlements. Climate action because, buildings consume a major amount of energy and resources it has a direct impact on the environment as we have seen in previous lectures.

So, this goal is also impacted. ~~Again~~Again, the aquatic ecosystem and terrestrial ecosystem both are impacted by how our cities, how our settlements perform. The amount of waste which is generated, how it is disposed, how it is treated, how the waste water is being treated will impact goal 14 and goal 15. So, in all many goals can directly or indirectly be achieved through sustainable architecture, sustainable built environment.

Now, why are we so concerned about shaping our built environment, shaping our buildings in a sustainable manner? It is simply because we spent 90 percent of our total time of a lifetime indoors, right from the birth till our death 90 percent of the times which is an unfortunate situation.

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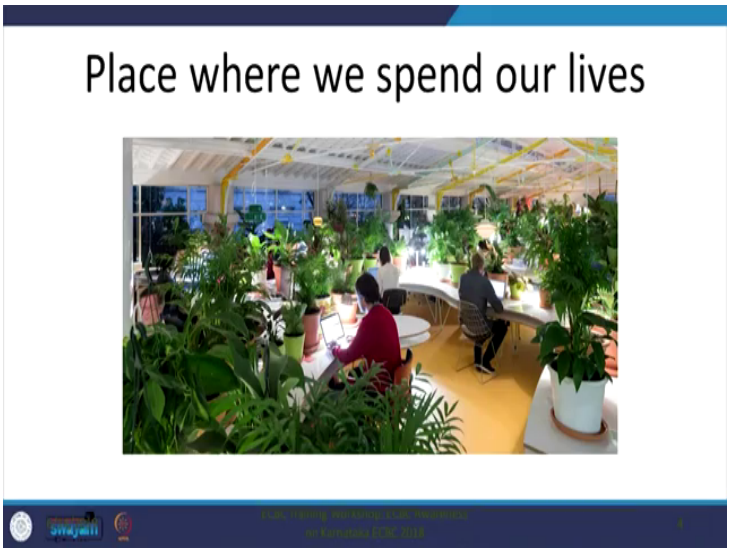

~~But,~~But ~~yes~~yes, we are spending all the time indoors whether we are studying, we are inside our homes, we are engaging ourselves in recreational activities; majority of them they take place indoors.

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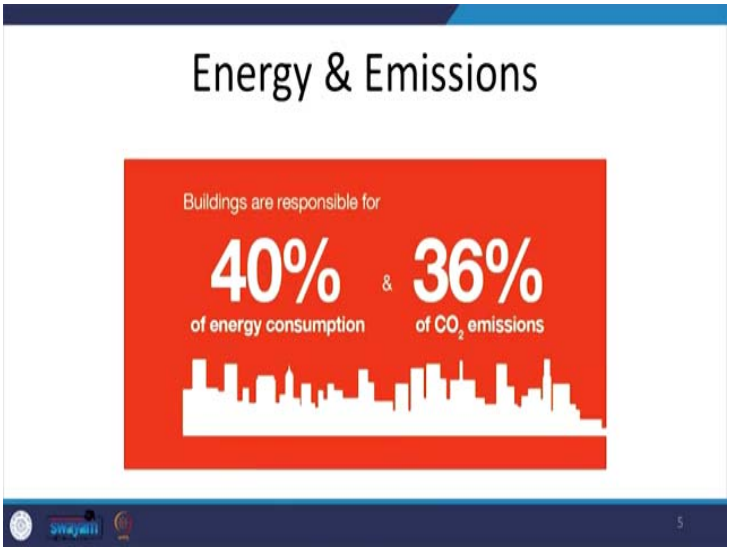

That is why more and more buildings are being built for a population which is increasing. And what do these buildings consume? They are responsible for 40 percent of energy consumption worldwide and around 36 percent of ~~carbon dioxide,~~ carbon

dioxide emissions which is leading to climate change which is leading to an adverse impact on global climate.

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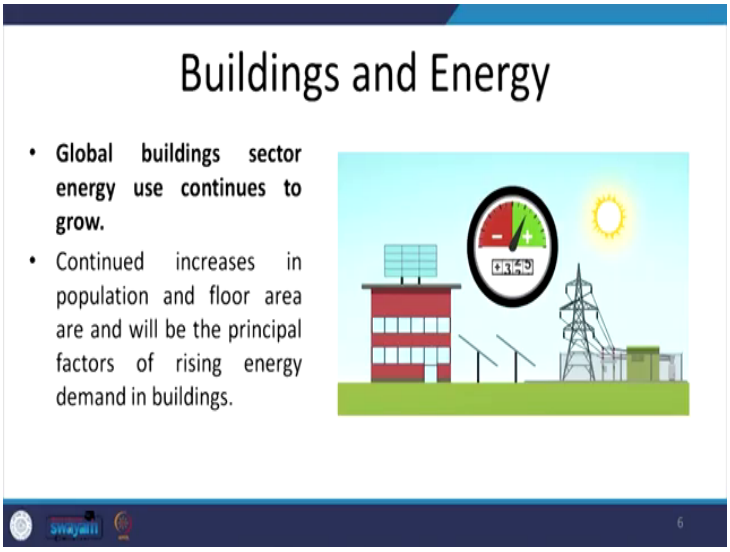

So, this is at the global level that buildings are consuming. Now, as the population is increasing as and as the world becomes more and more urbanized, more buildings are needed, more buildings are being added in the world. ~~Also~~Also, as our lifestyle is ~~changing~~changing, we are becoming relatively distant from the natural environment.

We are more confined indoors and also because of the global warming as a temperature is increasing, the energy use in buildings is increasing. It is also anticipated that this energy use is going to increase for few more years to come, if we do not mend our ways.

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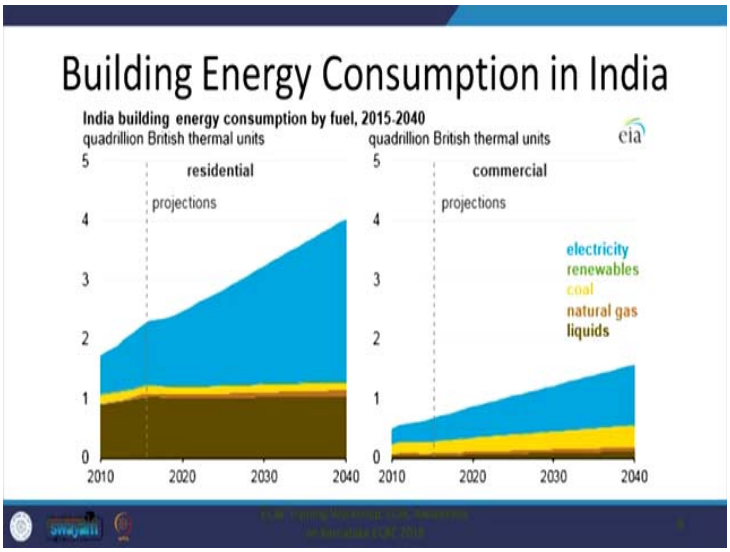

If we look at the situation of energy consumption in building sector in India, we see that buildings, the use of energy in buildings is continuously increasing and large portion of that energy is electricity which is required. In India as on date electricity is still produced using the conventional fuel which is coal. So, majority of our electricity comes from the thermal power plants. Thus, emphasizing the point that the fuel, the energy that we are using in buildings causes huge emissions to the environment.

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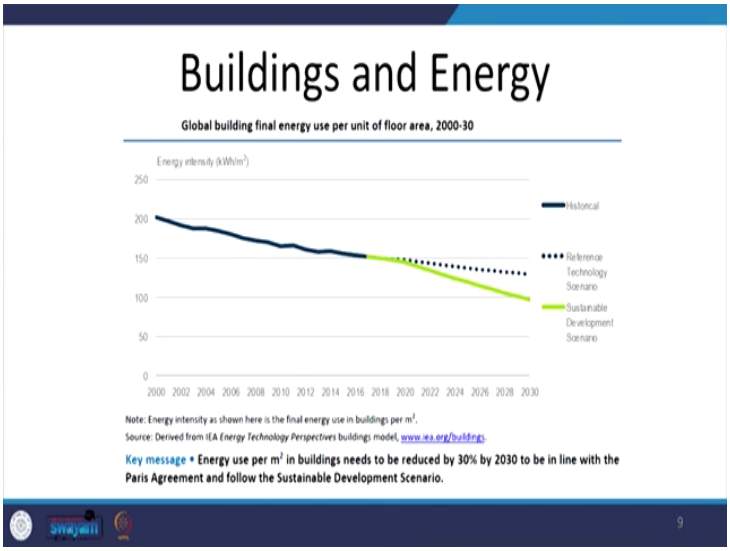

If we look at the global final energy use per unit of floor area, if we develop all our buildings, the built environment in a sustainable manner that is when by 2030 which is the year by which sustainable development goals need to be achieved. That is how we will be able to reduce our per unit of floor area energy consumption, that implies that are buildings are entire built environment which is going to come up has to be developed in a sustainable manner.

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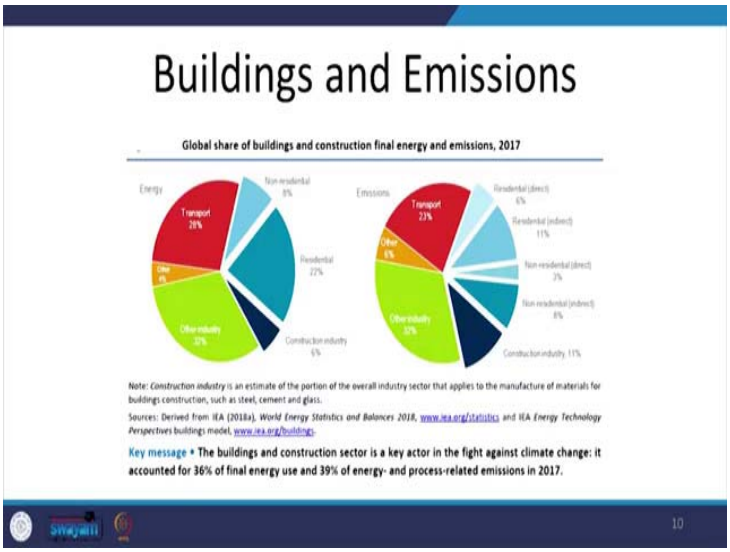

If you also look at the global share of building and construction final energy and emissions, we see that around 35 to 40 percent of energy consumption and emissions are because of the construction industry and the buildings which is a significantly large amount. And, also the fact that it is low hanging food because we can manage the demand side.

We can reduce the consumption by virtue of the design and construction of these buildings and bring in a substantial reduction in the energy consumption as well as emissions through these buildings. Buildings and construction sector industry are responsible for larger share of this air pollution.

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Because, of the suspended particles which to a large extent cannot be controlled; if sustainable practices are not adopted, it is a major cause of air pollution. Buildings consume high amount of material and resource.

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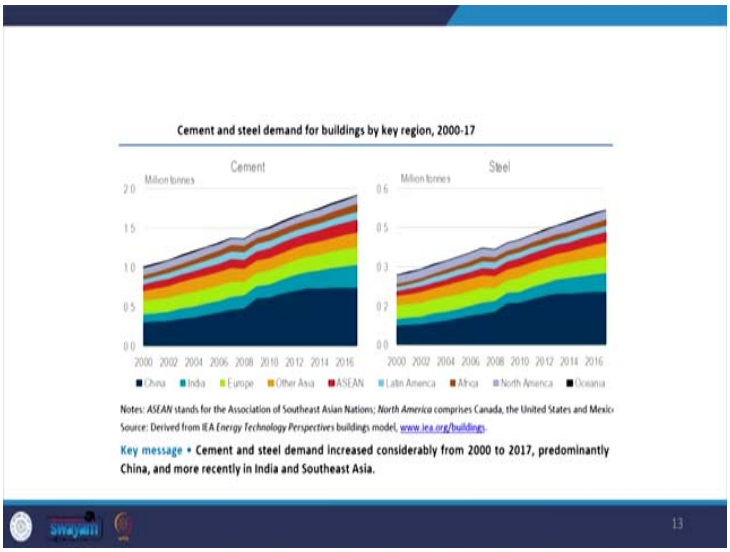

If we look at the kind of resource that goes into the building, we would also see that majority of the resources materials which are being consumed in buildings are also highly energy intensive; for example, cement and steel. Unfortunately, the practices for using locally available indigenous materials has substantially gone down.

More and more of our buildings because of their ~~the~~ need for a global look, because of the need for global aesthetics and also the usage, the need for going vertical at consuming materials like cement and steel. Both these materials and many others which are used in buildings today are highly energy intensive. They use, they consume a lot of energy in the process of their production. And, the use, the consumption of cement and steel has been increasing year after year as the graph very clearly represents.

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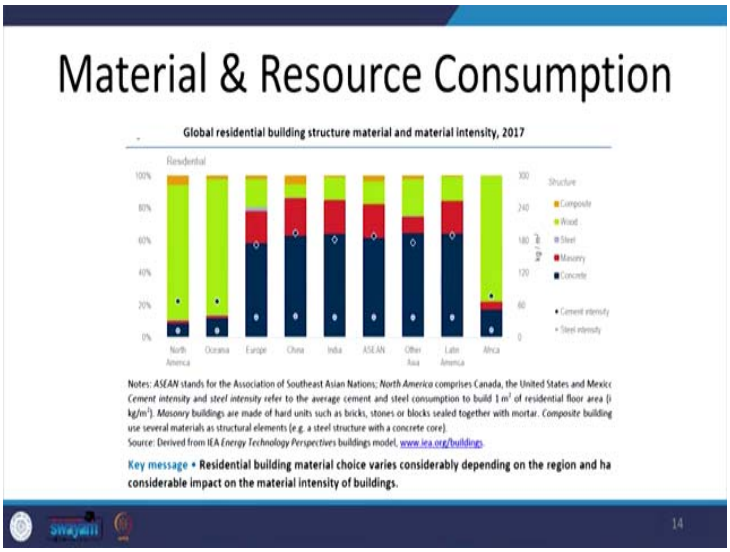

If we look at the use of different materials in residential building structure that is concrete, masonry, steel, wood and composite; we see that the share of concrete is substantially large. Majority of the buildings consume concrete for their construction which as I just said is highly energy intensive and puts tremendous pressure on the global resources.

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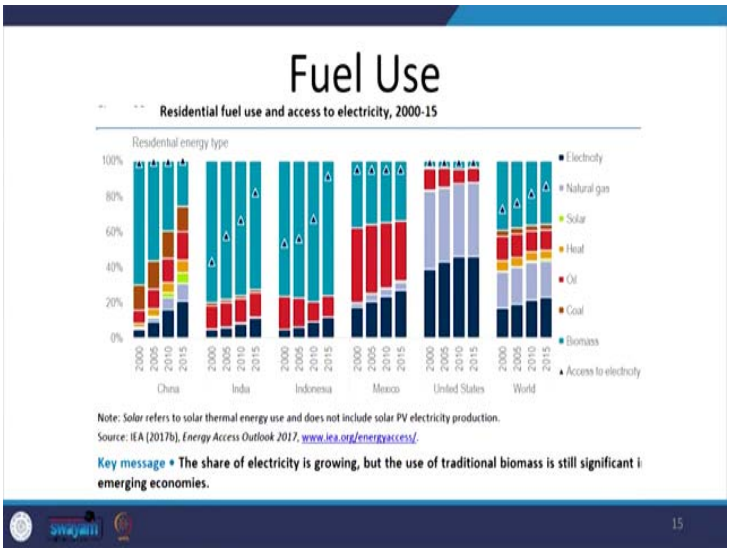

If we look at the use of fuel in residential buildings and we focus on how the world has access to electricity; looking particularly at the case of India we see that more number of

residences now have an access to electricity which implies that for a developing country like us, as the access to electricity increases, the consumption overall consumption of electricity in residential buildings increases. And, that puts an increased pressure on the resources, our demand is increasing.

As the access to the electricity increases, the lifestyle changes; instead of using manual machines, manually operated machines we are depending more and more on electricity operated machines and there a dependence on electricity as a fuel and our overall lifestyle that is changing. So, buildings the share of energy consumption is increasing.

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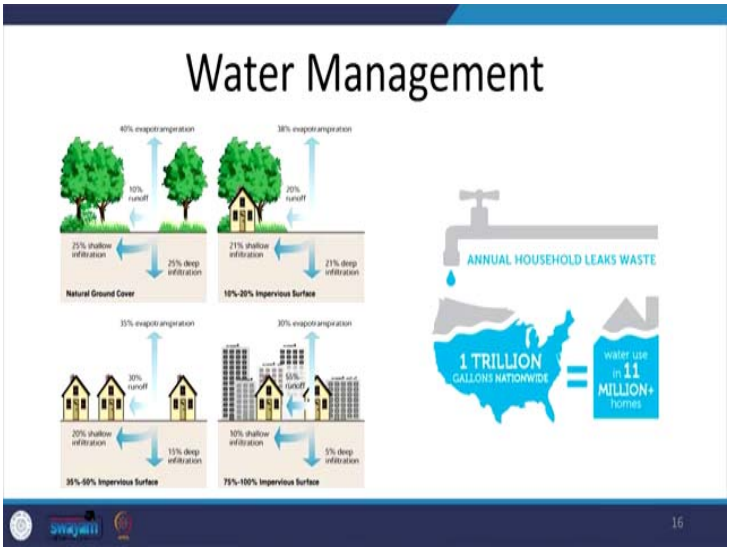

Another very important area is the use of water in buildings, buildings by virtue of the fact that they house people that they provide shelter to the people and people need water essentially to survive are major consumers of water. Now, unfortunately besides the consumption of water by human beings, human population; major portion of the water turns into waste water and it is not properly treated, that is what needs to be checked.

So, besides consumption which is actually been consumed by the human beings, the water is been converted in to waste as a waste water and also there is wastage of water through leakage and a lot of other such means. This particular picture on screen is for US where because of the household leaks 1 trillion gallons are wasted every year which are sufficient enough to be used in 11 million homes within US. Now, that is the situation almost across the world, that is one of the ~~reason~~reason that besides energy; since

buildings are a major consumer of water, buildings need to be designed in a sustainable manner.

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This is a grave situation in one of the cities in India, where people have to stand in queues for hours to wait for portable water supply in to their areas, homes.

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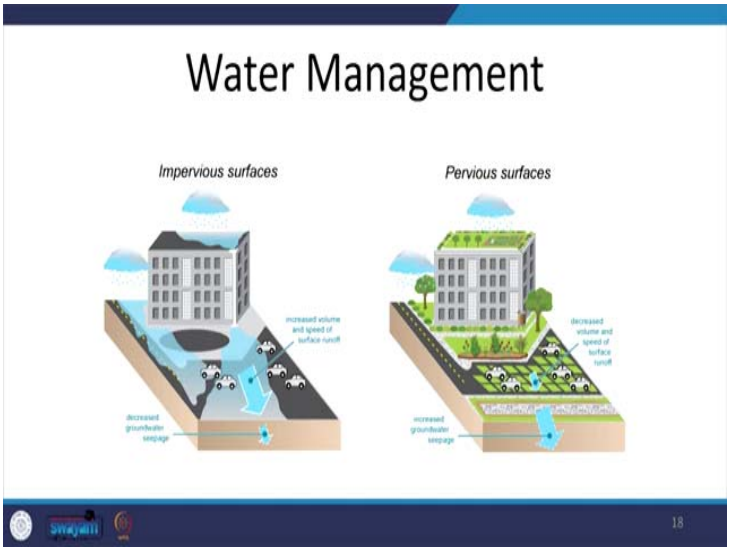

Another reason is that more and more of the urban areas, developed areas are becoming hard, impervious that leads to runoff, increased surface runoff and thereby reducing the groundwater recharge, percolation to the ground and reducing the overall moisture

content which is required to support greenery. And, that is a cycle which we have seen in yesterday's lecture, how it impacts the overall ecosystem and cities after cities are eventually turning barren.

There are several classic examples of cities becoming defunct simply because there was no water which was available. Detroit is one such example where because of overexploitation of water resource, the entire city was abundant. At one point of time Detroit was a very flourishing, it was economically a very flourishing city where majority of the car companies had established their industries.

But, because of inefficient use of water resource there was no ground water available for people to drink, to survive and people fled the city. The city was abundant for several years, decades before the nature took its own course and recharged the ground water and the entire ecosystems sprang back and now people are moving back to the city.

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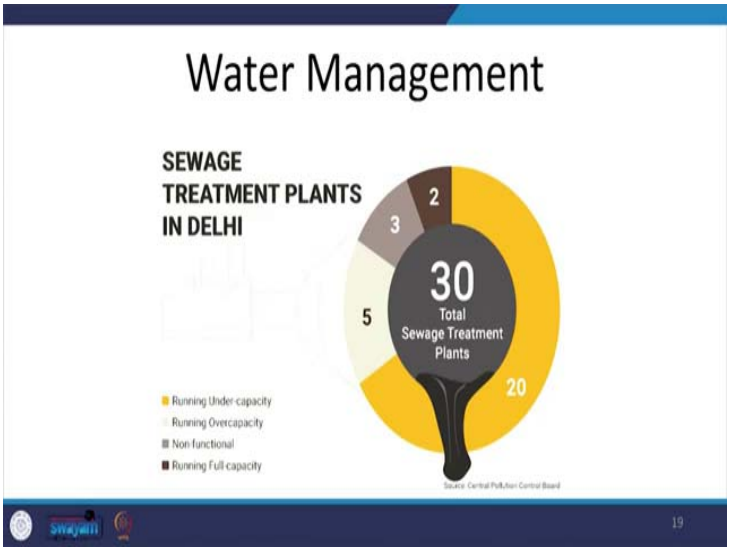

So, we need to sustainably manage our buildings to design our buildings to use the resources like energy and water through mechanisms like sewage treatment plants.

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Besides managing the resources, the planning has a major role to play. This is the picture of flooding in Chennai city. Chennai is a coastal city, ideally there should be no flooding because it is right next to the sea and the water should go to the sea, recede. And, the sea level since it does not rise there was no point how a city like Chennai be flooded; ~~unfortunately~~unfortunately, the natural drains have been encroached because of wrong planning. Because, of a planning which was not thoughtful, not efficient which was not responsive to the natural elements to the nature around us; such problems are common and on the rise across the world, not just within country.

Every ~~monsoons~~monsoons, every time the rains are there we hear about these news and reports were some or the other city at least few areas of the city get flooded; simply because the planning has not been done properly. Areas, low lying areas which were actually used to collect the rain water and that rain water be percolated to the ground have been encroached upon for construction, for building construction. And, that is why no water percolates to the ground, the ground water is receding, it is going down and the city gets flooded in every monsoon and rains.

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Another major reason why we should be talking about sustainability in architecture and buildings is this which is waste generation. Because, of improperly managed solid waste our cities urban areas are becoming dumping grounds; we have more and more of waste which is been dumped. So, almost the same amount of land is required to handle the waste which is being generated in cities as the city area itself.

The problem is so serious and grave that besides the environmental problems, it is leading to a lot of social problems, health problems. People are picking up more and more of sicknesses, illnesses.

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And, we see that Indian cities are generating very high amount of municipal waste because, it is not been treated sustainably.

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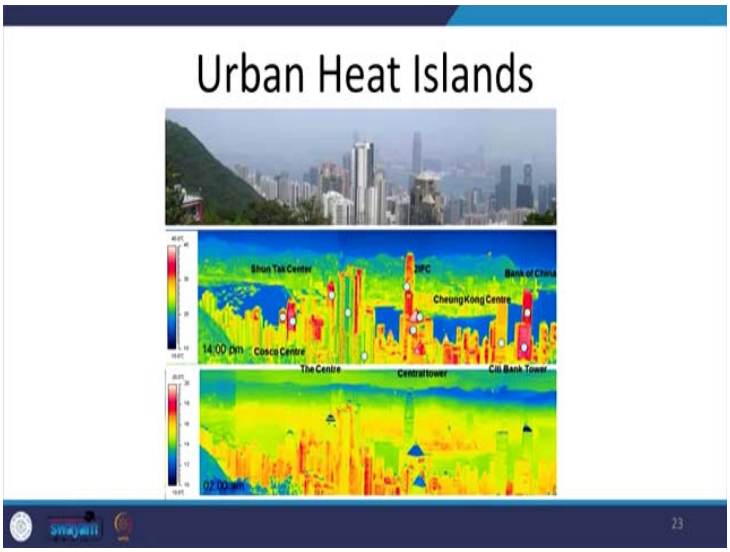

Another as we have also discussed earlier is the problem of urban heat island. We were discussing that if you move in to a city like Delhi from the surrounding suburban areas we can immediately feel the difference in temperature, which is because of the high concentration of hard surfaces in the city and impervious surfaces. We are also looking at the social aspects where we are talking about neighborhoods and sustainability.

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So, we are not just looking at the environmental aspects or the operational aspects of building, but we are looking at the quality of life and standard of living through a sustainably planned neighborhood or settlement. We are also looking at inclusiveness, we are talking about urban transportation which needs to be managed in a sustainable manner. This is required for ensuring the quality of life for all citizens.

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Everybody ~~need~~need to have an access to open green areas to a minimum standard of quality of life.

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Besides these we also need to protect the culture and identity of a place that can only be done through sustainable development of built environment. We are not just looking at the technological aspects of managing water, managing energy, managing waste; we are talking about the ~~socio-cultural~~socio-cultural identity, continuation of the identity of a place that can be responsibly done if we develop buildings in a sustainable manner.

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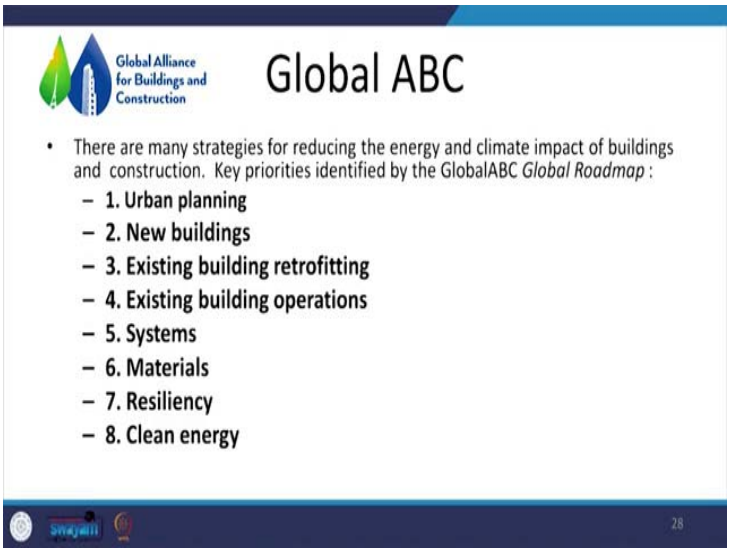

As identified by global alliance for buildings and construction, there are many strategies for reducing the energy and climate impact of buildings and construction. And, the key

priority areas which have been identified by Global ABC are urban planning, new buildings, existing building retrofitting, existing building operations, systems, materials, resiliency and clean energy. And, all these are encompassed within the larger domain of sustainable architecture, sustainable built environment; that is why we need to develop all our new upcoming buildings and convert our existing stock into sustainable buildings.

Starting from week 3, we would come to the specific understanding of what sustainable architecture is and how do we design and construct sustainable buildings. See you then.

Thank you.