Disaster Recovery and Build Back Better
Prof. Ram Sateesh Pasupuleti
Department of Architecture and Planning
Indian Institute of Technology - Roorkee

Lecture – 20
Cities and Climate Change: Adaptation and Mitigation

Welcome to the course, disaster recovery and build back better; my name is Ram Sateesh, Assistant Professor, Department of Architecture and Planning, IIT Roorkee. Today, I am going to talk about cities and climate change, adaptation and mitigation. So, I will give you an overview of the basics of climate change understanding and I will also talk about how different cities are able to cope up with it, and what kind of strategies of for adaptation and mitigation they are developing and we will have a little critical understanding of all these approaches.

When we say about climate change, I think let us start our discussion with the basic understanding on of what is climate, what is weather. Mark Twain simply tells climate is what we expect and weather it is what we get.

It can tell imagine, you are going to Mississippi or you are going to the Scandinavian countries or the arctic circle areas, it will tell you what kind of climate you are going to face so, you may have to prepare what kind of clothes you have to purchase, we have to buy you know for the harsh living conditions you may have to cope up with -20, -30 degrees.

So, in that way a regional level understanding will give you some preparation. Whereas in a weather, it helps you to decide what clothes to wear each day, is it going to rain tomorrow, is it going to get sunshine today, is it a sunny day today right, so accordingly you can even plan especially in a construction department in the European countries because daylighting is an important aspect so, weather plays an important role, weather forecast plays an important role.

So, even the satellite imagery of 2 kilometre by 2 kilometre, so they gives you an at least the nearest status of what is the weather going to be.

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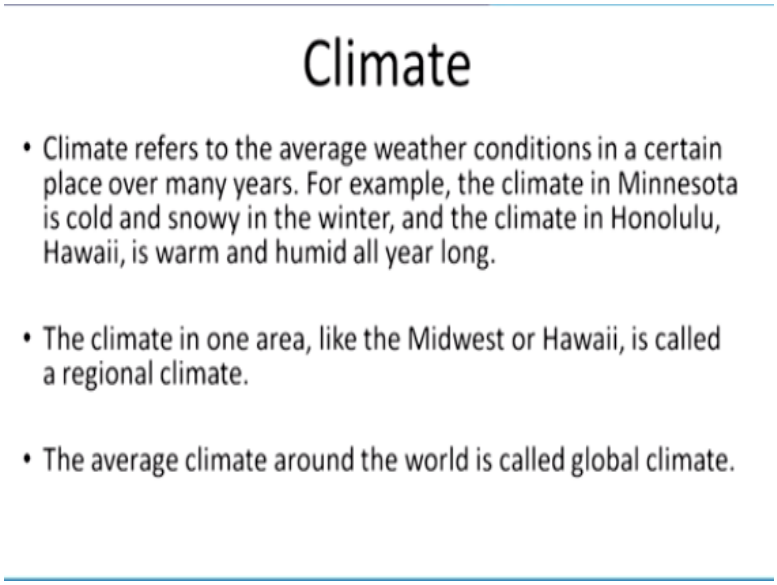

So, climate; it actually refers to the average weather conditions in a particular place, and it takes account of many years, so, for example, a climate in Minnesota is cold and snowy in winter and climate is Honolulu, Hawaii is warm and humid all year long, so which means it has taken the account of many years and that is where we are talking about what kind of climate it have.

Again, we are talking about different climatic zones, in a globally how they are divided like we are talking about the tropical climates, temperate climates, so there is a different scales of climate which we are also talking about. For instance, the climate in the one area like the Midwest or Hawaii is called a regional climate so, when we talk about a particular zone or a particular area, geographical region, it is refers to the regional climate.

Whereas, the average climate around the world is called the global climate so, here we are talking about the one-degree rise of the global around the world, so that is where we are talking about the global climate so, I think these terminologies are very important for you to understand before understanding the climate change.

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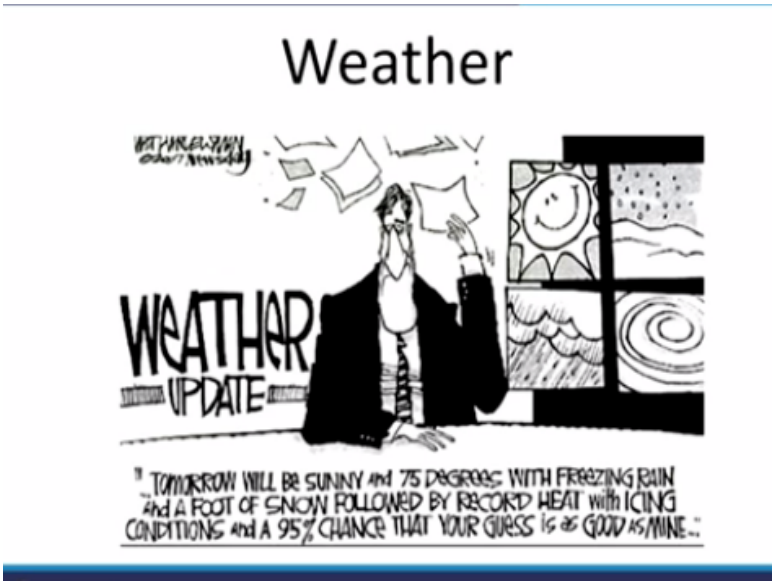

And weather; as we all know that every day when we switch on the TV news channels, so at least the last 3, 4 minutes, the weather reporter comes and explains that in your region or in the country, what is the weather forecast and how it is going to be, what kind of storm events are going to face in which part of the area, so that it will give an alert situation for the communities to prepare themselves.

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But now, when we talk about seasons, earlier we could see a very good diversity at least our great grandfather's time or father's time even in our generation, when we were kids we could able to see a good difference in over the seasons you know in terms of its landscape, in terms of its flora, in terms of its fauna, in terms of the nature because in Scandinavian countries they call it a 6 seasons in some places they even call about 8 seasons in some places because of the winter conditions of the transitional time.

So, you know from the snow time, snow and ice conditions, how they transform from one nature to the another nature and the whole geographical setting. But in the recent times, how many of us have witnessed that this variance has gradually coming down, in fact, if we talk about a country like Scandinavia and Sweden, if you go up north we have the snow cover for about 8 months in an year but now, it has gradually come to 6 months in a year.

So, maybe in future it may come up to 4 months in a year so, which means that season duration, the season variances are very subtle changes are there, and similarly, we see that this is a cartoon explaining the spring and summer looks the same, and there is a fall on winter looks the same you know.

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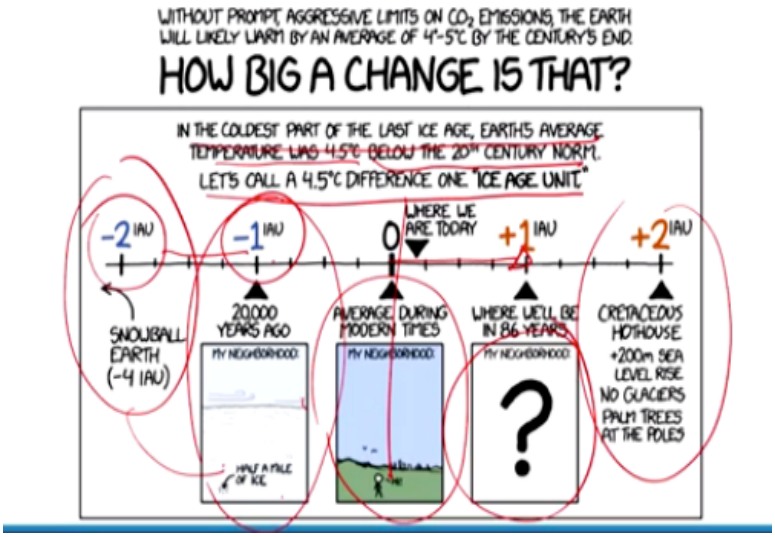

So, when we talk about the change, today we are talking about the global temperature has increased about 1 degree right, so let us see earlier, if you look at the history of the whole earth is referred with the snow; the snowball earth and about in the ice age, 20,000 years ago the whole thing was in half a mile of ice and today, if you see we hardly see that snow cover that is also gradually reducing, you take the conditions of Himalayas, the glacier formations, you take the conditions of the arctic circle how the ice is melting.

So in that way today's generation we are right now here, but here we are talking about minus 2 degrees of a global temperature and an average and minus 1, 1 degree change, this is the impact and now we are here let us say if increases plus 1, what happens to this and if it is plus

2, what is the; so there will be no glaciers, no vegetation, no poles you know so everything will have a very cataclysmic change.

So, this is just an understanding of 1 degree temperature and how it will have an impact on our global environment, so that is what in the coldest part of the last ice age, earth's average temperature was 4.5 degrees Celsius, below the 20th century norm let us call a 4.5 degree difference on one ice age unit.

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So now, how this whole change is caused and what is the impact, why we should bother about this; this is one thing from a basic understanding, I need to talk about some very basics of the climate change and the greenhouse gas emissions. Now, we have the earth, and then we have the atmosphere belt, this is the atmosphere, and here this oceans, landmasses and the main source of the energy is the Sun.

So, now we are getting and this is the greenhouse gas, it is a layer of this atmospheric layer, and then one thing is the energy is transferring from this which is a kind of short infrared radiation and then, this is again reflected back, and there is a long infrared; there is a short and long infrared radiations and how it is reflected back, and then in this process this is actually helping us to protect from the direct radiation.

So, this layer is actually protecting us but now, with our human interventions, the way we are living today, the way we are living as a dependent society, now these activities on the earth

especially, the escalation of the fossil-fuel consumptions which is taking our CO2 and different gases, you know there is a different gases which reach to the atmosphere conditions.

And then the CO2, the carbon dioxide which we talk about because the fossil fuels when we talk about industrial, then smoke which is coming from all the industries and as well as the fuels which we are; I mean the motor vehicles which we are using and various industrial sectors which were so, it is almost coming about 7 Giga tons per year which is about you know 2000 million elephants size of the carbon dioxide which we are emitting.

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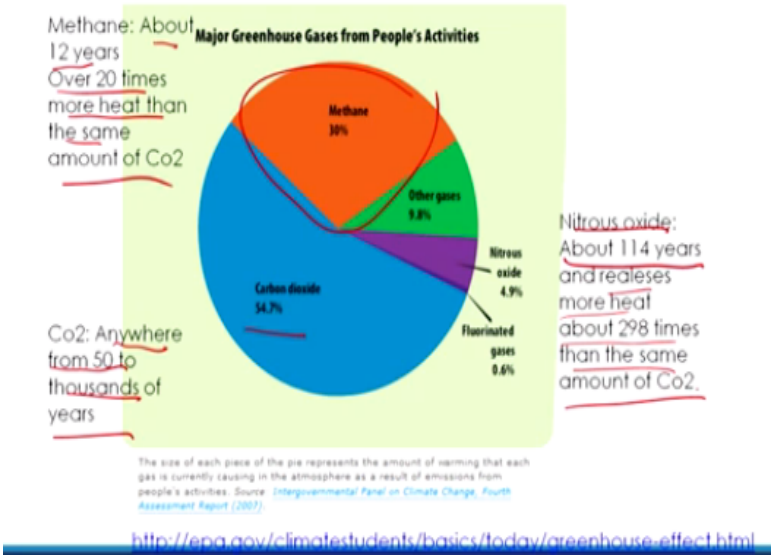

And now, what it is doing is, in fact this carbon dioxide, if you look at this, there is a methane going up to the 30% and 54.7% of carbon dioxide and then you have the other nitrous oxide and the fluorinated gases and as well as other gases so, now how much time it will take to evaporate? So, this takes about 12 years over 20 times more heat than the same amount of CO2.

And this takes about anywhere from 50 to 1000's of years to you know get diffused and so now, nitrous oxide it takes 114 years and releases more heat about 298 times than the same amount of CO2, so this is the scientific facts that which talk about, this is actually from the Intergovernmental Panel on climate change in the fourth assessment report. So, now what is happening is now we are getting, and the CO2 is still blocking it.

So, now what is happening is; we are; the radiations are coming, and then these are not passing out, it is coming back so, this whole segment so it is become like you kept a lid on

the top of your bowel and then it started boiling then it is the heat is generated so, this is where the oceans are getting warmer, okay because the heat is coming back again and again so, it is not going further, it is not diffusing because this the layer is making like a cap.

And when the heat is coming down to the oceans, the oceans are getting warmer and similarly, it gets to the glaciers and it melts the snow, and the moment when we talk about the melting of snow, it again raises to the sea level, and this absorbs; this melting of snow and ice, this is earth absorbs more energy and again, you know it is reflected back into this, greenhouse gas trap energy.

And it also have droughts, wildfires and it also affects the flora and fauna, it also affects the coral reefs which will have an indirect effect on the aquatic system and in turn it affect the human systems you know so, it works not only on a part of just warming of the oceans and melting of snow but in turn it will have many disastrous conditions and this is where the change in the conditions for plants and animals, so as well the migration of birds also keep changing.

Because you know, the number of birds which are coming to Indian subcontinent that has gradually coming down and the same changing seasonal patterns and this is where we talk about the habitat loss, there might be chances of extinction as well. So, this is the basic understanding of climate change and the greenhouse gas trap energy systems. So, one side we are pumping the CO2, making it as a cover layer.

And the whole energy is trapped inside this and then it is warming of the oceans, it is melting the ice, and in turn it is giving an indirect consequences and direct and indirect consequences on a natural systems and also the human systems.

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