System Design for Sustainability
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Module - 01
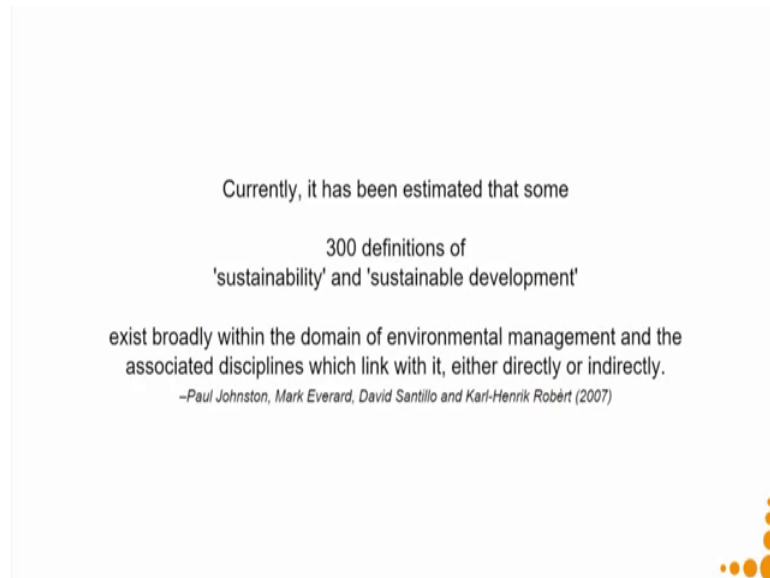**Lecture - 02**
Sustainability and Sustainable Development

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Hello everyone. So, welcome to the second lecture. In our previous lecture, we were discussing about what is unsustainability, and why do we need sustainability. Today, we will discuss about the definition of sustainability and sustainable Development. Why do we need to have definitions, because in order to do design for sustainability, we first need to know: what are the things which comprise sustainability, and only then we can go ahead towards designing for sustainability, hence the important of definitions.

Why do we want to look at the definition of both sustainability and sustainable development is, as we will discuss sustainability is achievable only when we look at the confluence of social economic and environmental sustainability, which implies that we are not only talking about sustainability, but we are talking about the entire system that is the entire system needs to be developed in manner that it is can be qualified as sustainable development.

Currently, it has been estimated that some

300 definitions of
'sustainability' and 'sustainable development'

exist broadly within the domain of environmental management and the
associated disciplines which link with it, either directly or indirectly.
–Paul Johnston, Mark Everard, David Santillo and Karl-Henrik Robért (2007)

The problem is the domain of sustainability is there are too many definitions of
sustainability, and not all definitions of sustainability are such that that it can help you in
designing products and solutions to achieve sustainability. So, it is estimated that
currently we have more than 300 definitions of sustainability and sustainable
development; these exist in various domains like environmental, management,
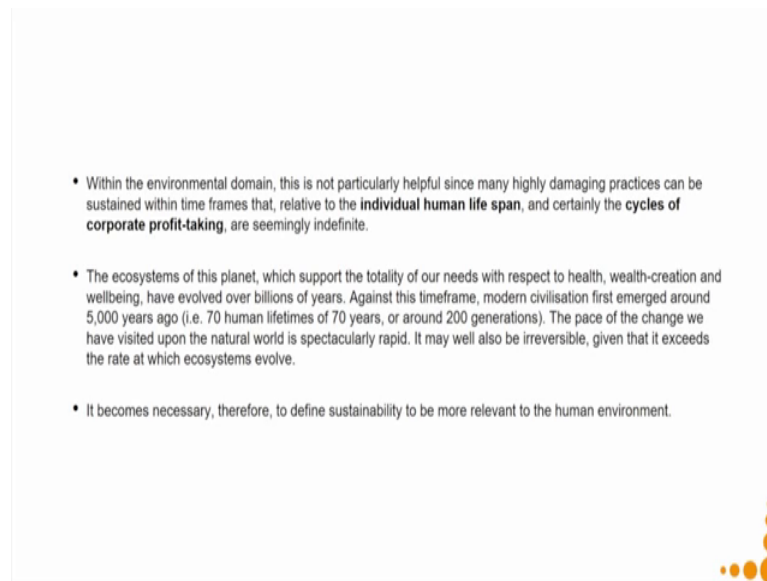agriculture, biological sciences, and so on.

Definition of Sustainability

At the level of the dictionary definition, sustainability simply implies that a given activity or action is capable of
being sustained (i.e. continued indefinitely).

So, the dictionary definition of sustainability says, sustainability simply implies that a

given activity or action is capable of being sustained that is continued indefinitely.

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- Within the environmental domain, this is not particularly helpful since many highly damaging practices can be sustained within time frames that, relative to the **individual human life span**, and certainly the **cycles of corporate profit-taking**, are seemingly indefinite.

- The ecosystems of this planet, which support the totality of our needs with respect to health, wealth-creation and wellbeing, have evolved over billions of years. Against this timeframe, modern civilisation first emerged around 5,000 years ago (i.e. 70 human lifetimes of 70 years, or around 200 generations). The pace of the change we have visited upon the natural world is spectacularly rapid. It may well also be irreversible, given that it exceeds the rate at which ecosystems evolve.

- It becomes necessary, therefore, to define sustainability to be more relevant to the human environment.

Now, if you look at this particular definition, within the environmental domain, this is not particularly helpful since many highly damaging practices can be sustained within timeframes that relative to the individual human life span, and certainly the cycles of cooperate profit-taking, are seemingly indefinite. What do we mean by this? Say for example, it was during the industrial revolution, and couple of decades after the industrial revolutions specifically that we try slowly came to understand the concept of sustainability, because of the environmental and other health related damages which was being caused due to industrialization.

So, from this example, you can see that it was about the 19th century, when the industrial revolution became more and more widespread; it was only around the 1960s, when the debate related to environmental pollutions started taking lot of attention. So, it was about a 100 almost about 100 years after which the debate started cropping up. Already if 1960s we knew that at the rate of consumption that we are doing of our resources, we cannot sustain. And if you see today after more than six decades have passed on, we have still sustained.

So, the problem with the previous definition that sustainability simply implies that a given activity or action is capable of being sustained might not be very useful, when we want to design something, because, in a human lifespan which might be about 80 to 100

years, and maybe even lesser, and for very few people little more. We might not be able to realise all the damaging effects, we might be able to continue at the rate we are continuing for another two generations with obvious degradation keeping on happenings, and we can still sustain.

Similarly, for a company, which wants to reprofit as fast as possible, again these changes are very much more slower than a corporate or a company's profit taking cycle. So, what we need, because we are designers and engineers, and we want to design products and services which will be used by human beings and which will be produced by corporates. We need to have the definition, which is more suitable as per the individual human lifespan, and the cycles of corporate profit-taking.

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900-year drought wiped out Indus civilisation: IIT-Kharagpur

https://timesofindia.indiatimes.com/india/900-year-drought-wiped-out-indus-civilisation-iit-
kharagpur/articleshow/63776710.cms

Say for example, it is been found out by a team of IIT, Kharagpur Scientist that it took 900-year long drought to wipe out the Indus civilisation. Once they saw drought for such a long long period of time, gradually they started migrating to greener pastures. So, when we are looking at sustainability we have to have a definition, which is in the human lifespan as well as the corporate profit-taking lifespan.

So, the ecosystem of this planet has evolved over billions of years, all of us know about this. In the context of the our earth's history, human history is very very small; say about almost 5000 years long. But, in this very very short span of human existence on this planet, we have caused changes to this planet, which are at a very very rapid rate.

Especially the changes have been very rapid post the industrialisation has happened.

So, the basic fundamental over here is that the pace of change we have visited upon the natural world is spectacularly rapid. It may also be reversible, given that it exceeds the rate at which ecosystems evolve, because, the whole ecosystem has evolved over billions of years. Hence, we the rate at which we are consuming which is alarmingly high, we may not be able to the ecosystem might not be able to regenerate itself. So, it becomes necessary to define sustainability to be more relevant to the human environment.

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Examples of these definitions are:

* [sustainable techniques] [sustainable agriculture] of, relating to, or being a method of harvesting or using a resource so that the resource is not depleted or permanently damaged

* [sustainable society] of or relating to a lifestyle involving the use of sustainable methods
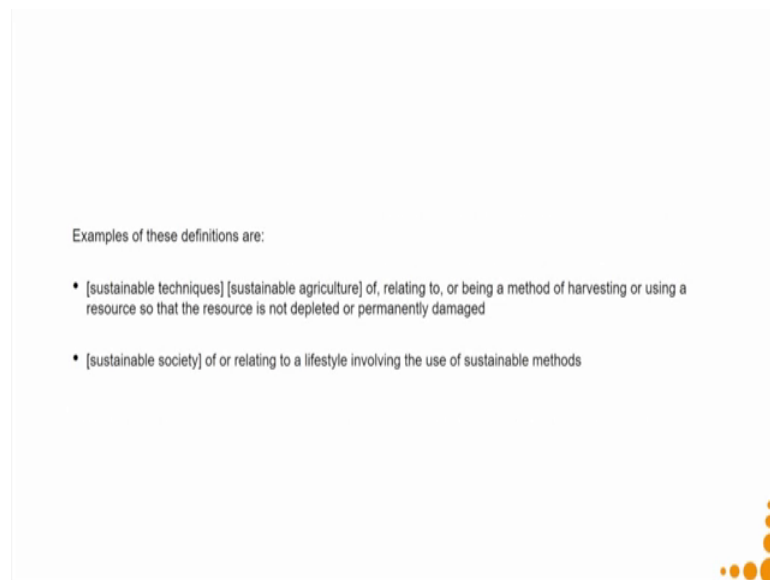
So, some of the examples of these definitions are, say sustainable techniques or sustainable agriculture or sustainable technology can be defined as of relating to, or being a method of harvesting or using a resource, so that the resource is not depleted or permanently damaged. So, now see for example, can we reap or extract coal in a manner that it is not permanently depleted or damaged, it is not possible. But, we can reap wind energy, solar energy, in a manner or say tidal energy in a manner, so that the resource is not depleted or permanently damaged.

Sustainable society is therefore, defined as of or relating to a lifestyle involving the use of sustainable methods. So, we can define sustainable methods or sustainable technique as per the previous definition that is of or relating or being a method of harvesting or using a resource, so that the resource is not depleted or damaged completely. A society, which does that, is which lives that way is a sustainable society. From here we come to

the importance of the fact, why do we really need to understand sustainable development.

So, let us take an example. Say in case of agriculture, if I want to maintain the fertility of the soil, which means I am not extracting nutrients from the soil at a rate at which it gets permanently damaged, I have to extract nutrients from the soil for growing my crops at a rate, so that the soil can naturally replenish it. So, what do I have to do for that, there are couple of techniques for doing that. One of them is I will have to keep the land fallow that is uncultivated, so for maybe a season or two seasons depending on the context, depending on the type of soil.

I might I must have to use compose or natural manures to enrich the soil, I should be not using fertilisers or should be minimising the use of fertilisers insecticides or other damaging effects. Now, the agricultural machinery, which are going to work on the soil, so that the soil is pulverised, and then I can plant my crops. The agricultural machinery should not also damage the soils texture. So, my machinery has to be designed in that particular manner. I should also allow the growth of earthworm and other insects, which help the soil to maintain its nutrient quality; I will also have to take measures, so that my soil does not get eroded during rains or due to wind.

So, now you can see, whenever I started talking about sustainable agriculture, but I have to do so many different activities, in order to just maintain soils health, so that the nutrients of the soil is not depleted soil itself is not depleted, because of erosion. Same will come in other stages of agriculture. So, a sustainable sustainability cannot looked upon across only one particular activity or a step, it has to be looked as a holistic system that is why it is important.

That whenever we are talking about sustainability, we are actually talking about sustainable development. So, when I talk about sustainability in terms of agriculture, I will have to bring in a development, a scheme of mechanism, a scheme of techniques for doing the various activities in involved in agriculture, so that my agriculture become sustainable.

Again there are many definitions of sustainable development, the one which is the most popular and also very useful for the context of design, comes from the Brundtland commission of the United Nations; and it was coined on 20th of March, in 1987. It define sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs; interesting definition.
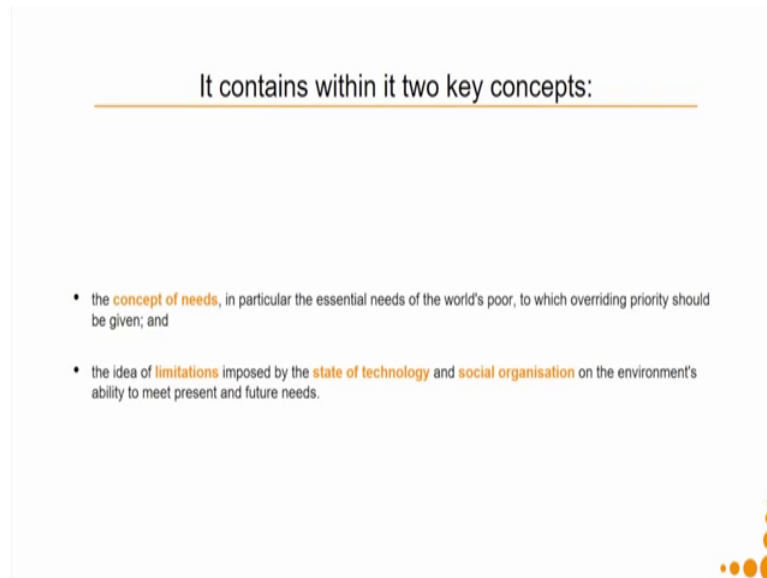
It has two very important concepts into it. First important concept is the concept of needs, as you say it is talking about development that meets the needs of the present without compromising the ability of future generations to meet their own needs. So, the concept of needs, whose needs say for example, I have good enough resources. And I might feel that I need a smart watch, why do I need a smart watch, because it is very important for me, I can track my physical activities, I can track my sleep, I can track my other health activities.

So, I have a feeling that I really need a smart watch; I cannot do without a smart watch. But, is that really a need or is a just my want or design. So, it was very important in this particular context that we should define what is need only then my definition of sustainable development can be operationalized. So, the concept of need, in particular the essential needs of the world's poor, to which overriding priority should be given, because food, water, safety, medical care, good quality air, and so on. These as the ones which are the most important needs, they have to be fulfilled.

We have to always thus, when we are talking about sustainable development, we have to always try to give a conscious thought, whether the development that we are trying to bring in is a essential need, is a desired is a want, and so on. The second key concept is the idea of limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs.

CNG Vehicles
Technical Limitation
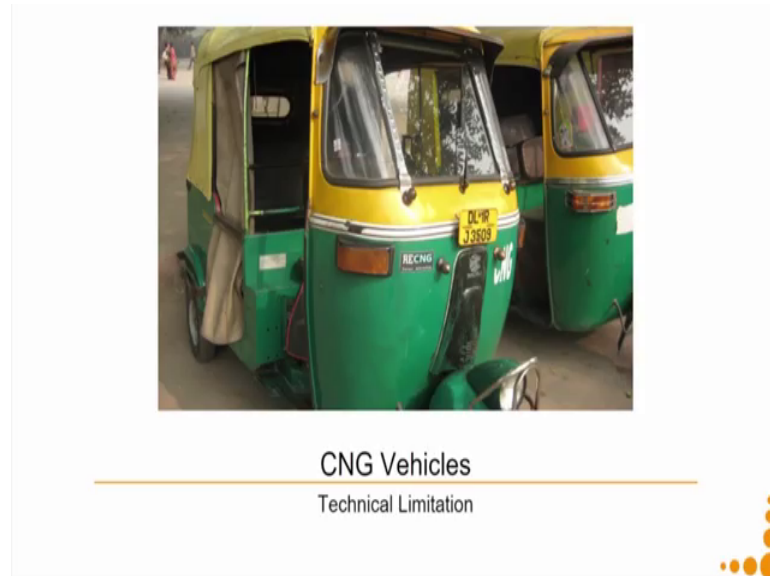
In our previous lecture, we were talking about this CNG vehicle. So, I told you that because CNG vehicles do not emit any kind of visible smoke. So, it was assumed that it is very environment friendly, because it is not releasing smoke. So, many of the local Government the city level Governments or the Governments of different metros of the country, pursued means and measures, so that all kind of public transportation like auto rickshaws or buses, they are run by CNG.

But more recently as per a study conducted by CSIR, it was found out that these CNG run vehicles, they emit carbon nanoparticles. Now, this carbon nanoparticles because then a nanometre sizes, you cannot really see them. So, you do not know that they are being emitted, but they are casino genic, which means they can cause cancer when inhale.

So, there was point of time in which we did not know about the we did not have the entire technological knowhow of CNG, and its impact on pollution, and we assumed that this is less polluting. But now, when the technology has evolved and we already know that there is a serious environmental pollution and health hazards associated with them, we might have to have change directions.

Another example is that of using DDT as a pesticide. So, in couple of decades back, DDT was used extensively and it was also suggested by scientist and agricultural experts for being used in farms as a very effective pesticide. It was only little later that it was

realised that DDT has very harmful effects. So, it has been couple of decades, since the use of DDT has been completely stopped. But, still very small amount of DDT is found even in the bloodstream of babies born nowadays, so that is why the idea of limitation imposed by the state of technology.

We might not be technologically advanced or our knowledge might not be so scientifically advanced at a given point of time, and that becomes a limitation for our sustainable development concept at a given point of time, which the knowledge increases and the knowledge develops over time, and then we will have to change.

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Festivals and Pollution
Social Limitations
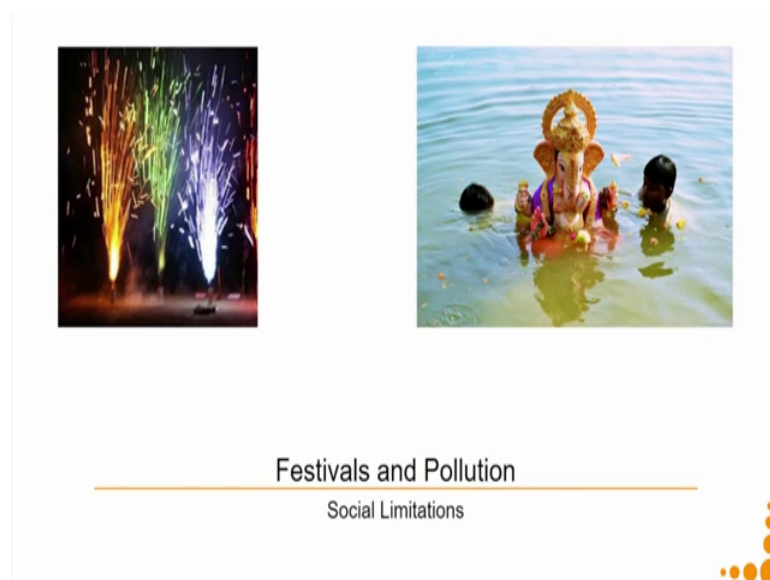
Now, coming to example of limitations imposed by social organisation say for example, all our festivals, there is lot of pollution happening. So, during Diwali we have lot of air pollution caused by crackers, lot of sound pollution caused by crackers. During all other festivals, when we have some kind of idle the idol is finally emerged in the water, the idol is usually made up of different kinds of plastic material and plaster of pairs, they are none of them are biodegradable. So, there is a lot of pollution, and all these polluting activities they happen in our water bodies.

So, now the social organisation is such that let even after running lots and lots of awareness campaigns, we cannot bring in changes in people's behaviour, because festival is supposed to be celebrated in a particular manner, it is assumed to be fun in a particular manner. So, it becomes very difficult in spite of all the awareness to convince people to

not do activities in similar situations. Similarly, there can be other activities which are part of the social organisation, which although one might know that a at least to some kind of unsustainability, but it is very difficult to bring in changes in that case.
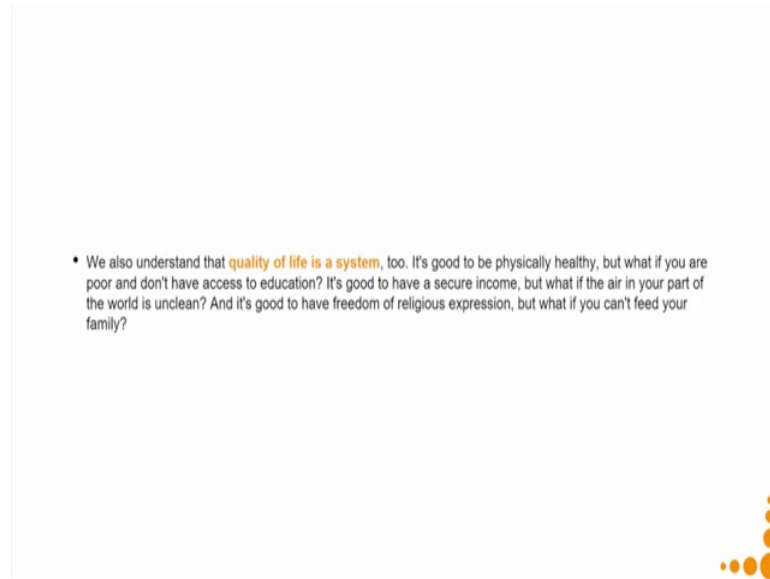
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- All definitions of sustainable development require that we see the world as a system—a system that connects space; and a system that connects time.

- When you think of the world as a system over space, you grow to understand that air pollution from North America affects air quality in Asia, and that pesticides sprayed in Argentina could harm fish stocks off the coast of Australia.

- And when you think of the world as a system over time, you start to realize that the decisions our grandparents made about how to farm the land continue to affect agricultural practice today; and the economic policies we endorse today will have an impact on urban poverty when our children are adults.

So, all definitions of sustainability required that we see the world as a system, a system that connects space; and that connects time. What do we mean by this is, so when you think of the world as a system over space, we come to understand that if we do a polluting activity in say Guwahati, where I am living the pollutants will not be limited to Guwahati, they will travel to every other part of the world. So, the air pollution caused over here is added to the whole globes air pollution. If I pollute the rivers over here, they will ultimately go in to the Indian Ocean, which is connect to the other oceans.

So, whenever we talk about sustainability, we have to think about world as a system over space, which is connected over space; secondly, when we think of the world as a system over time, like I gave you the example of DDT. So, it was about three decades back, when the use of DDT has been stopped, but we still see the damaging effects of DDT. So, it is not that the activities that I do now, will only affect me now, it the effect will continue over a long period of time; and it may continue for couple of generations.

- We also understand that quality of life is a system, too. It's good to be physically healthy, but what if you are poor and don't have access to education? It's good to have a secure income, but what if the air in your part of the world is unclean? And it's good to have freedom of religious expression, but what if you can't feed your family?

Another important aspect is quality of a life as a system. What do we mean by that? So, see if I have very good physical health, I have access to very good education, I also have access to very good quality food and air, but I do not have access to good employment, I will not see the quality of life as very great.

So, sustainability is so say for example, I might say let this whole region be a forest area, let us not bring any industry over here, but the people living in that entire region if they will have great quality of life, because of good unpolluted food, the unpolluted air, unpolluted water. But, when it they might also get good education, because educational institutions can be set up, but when it comes to getting employment, because they do not find good employment opportunities, they might have to migrate to another place.

Because, now quality of life as a system is not be achieved at that location yes, of course it does not mean that only industries can generate employment, this was just an example. It was example considering the fact that other sectors of economy have not been developed. So, this example was given. Do not assume that a place, which is very green cannot have industries, one can always have industries created in a manner that the pollution is not happening.

What my intent of saying over here is quality of life as a system. So, I need lot of different things to happen well in my life to see it as a good quality of life. And if I cannot give good quality of life that kind of sustainable development is not sustainable.
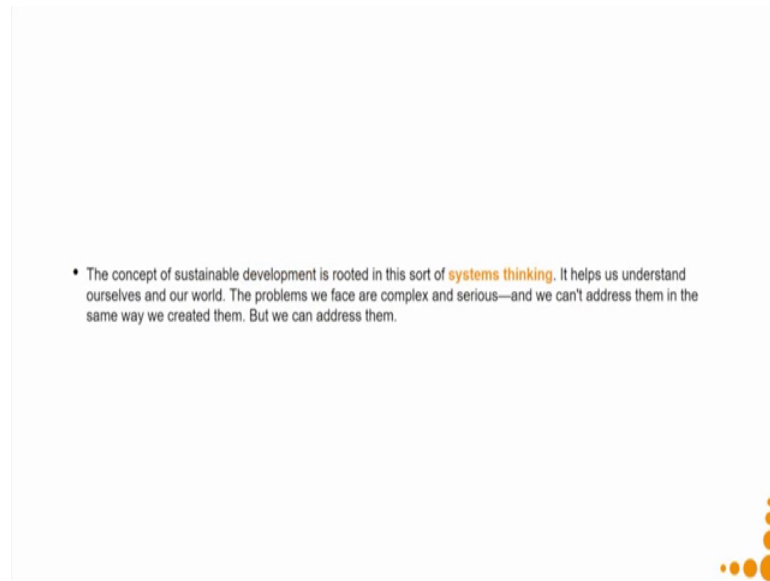
So, the concept of sustainable development is rooted in systems thinking. For example, if I want to sell milk in tetra pack, now tetra pack if collected back can be recycled, because the four layers of tetra pack can be separated and recycled. So, the plastic layers can go forward recycling accordingly, the paper can go accordingly, and aluminium can be again reused, but only if the tetra pack is collected back.

So, in order to for tetra pack milk to be a sustainable solution, I have this, but aspect which involves that the collection of tetra pack has to happen, which means I have to develop this entire system in which, not only I procure the material for making the tetra pack, I also own the machines which will dismantle the tetra pack, and do the recycling process. But, I will also have to have a nationwide collection system.

Hence, the concept of sustainable development is to is rooted in the sort of systems thinking. It helps us understand ourselves and our world; so it is not only me. If I have to maintain the health of the soil, I have to also look into how do I maintain the earthworms. If I have to have good agriculture, I also need the bees. If I have to ensure good living for myself, I have to also ensure that I do not pollute someone else's pond, because that is indirectly connected to my pond. So, it helps us understand ourselves and our world. The problems we face are very complex and serious, and we cannot address them in the same way we created them. But yes, of course we can address them. How to address them, that is what the concern of our courses.

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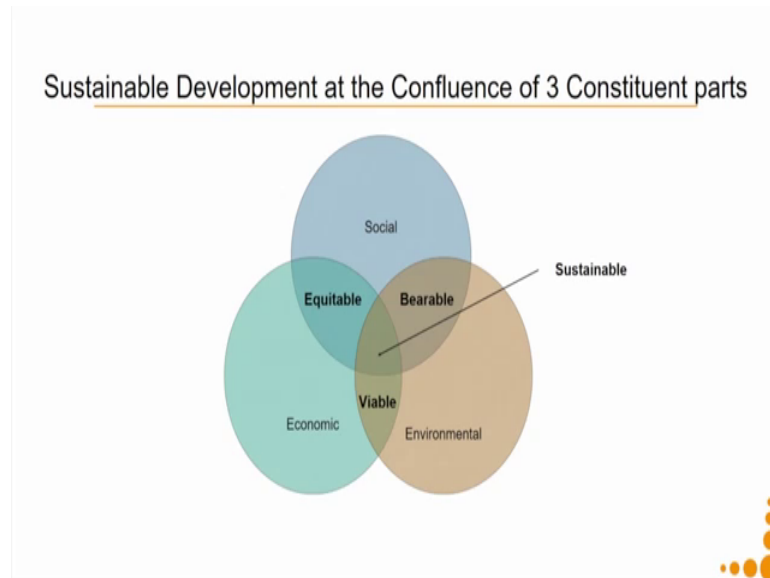
So, we discuss last time in our last times lecture that sustainable development happens at the confluence of 3 constituent parts; social, economic, and environmental.

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According to United Nations Agenda 21, they added another fourth pillar, which is culture. So, now we will try to understand all these different pillars.

Circles of sustainability

The Circles of Sustainability model is now being used by organisations such as the United Nations Cities Programme and Metropolis.
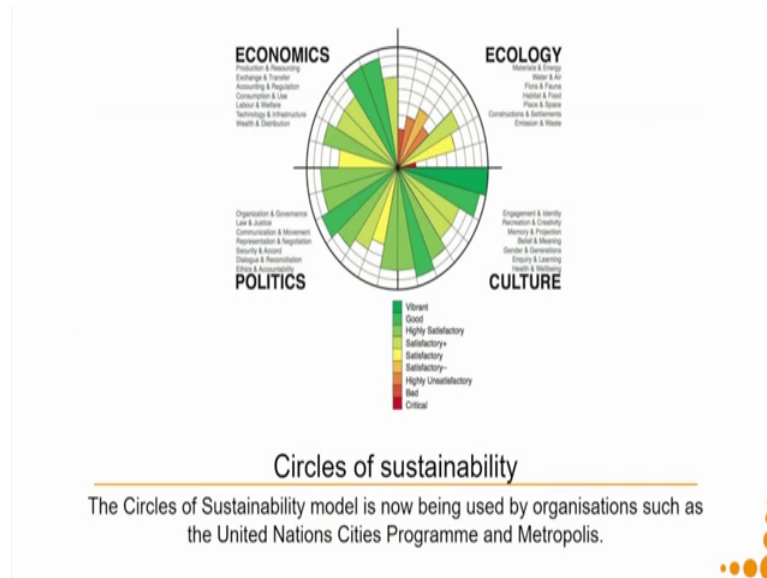
There are different organisations, and for different purposes, different pillars or dimensions as you might call them have been identified. So, I will explain it more from the context of circles of sustainability, because this one is a very comprehensive list. So, the circles of sustainability is a model, which is now being used by organisations such as the United Nations Cities Programme and Metropolis.

This particular matrix is used by used for measuring the sustainable level of sustainability of different cities and metros. It comprises of four dimension; economics, politics, ecology, and culture. So, when we were talking about the social dimension in our previous slides, we were talking more about something which is was the combination of politics and culture, which has now been separated to get away more detailed list.

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Circles of Sustainability representation – Melbourne 2011
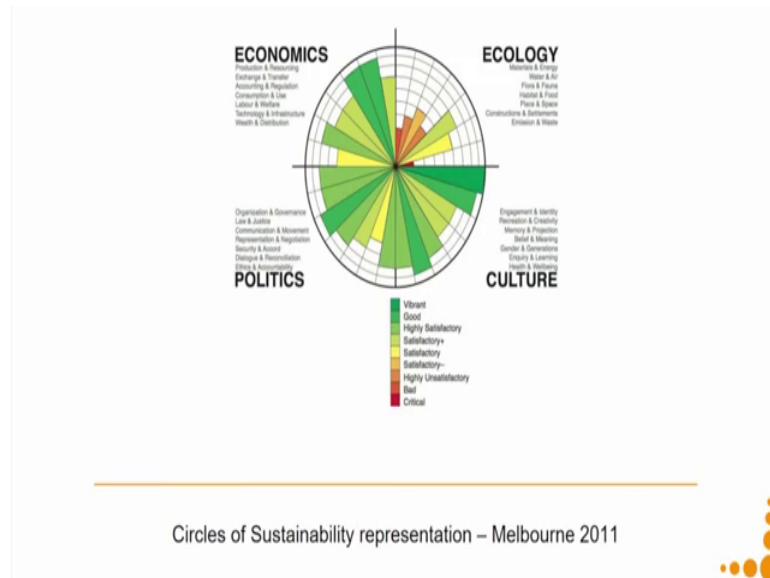
So, you can see this one is the representation of the city of Melbourne, from the year 2011. So, on a scale of 1 to 9, where special is like from critical to vibrant on different parameters you rate a particular city. So, when I compare different cities, so this is Melbourne, you can see this is Johannesburg.

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Circles of Sustainability representation – Johannesburg 2013
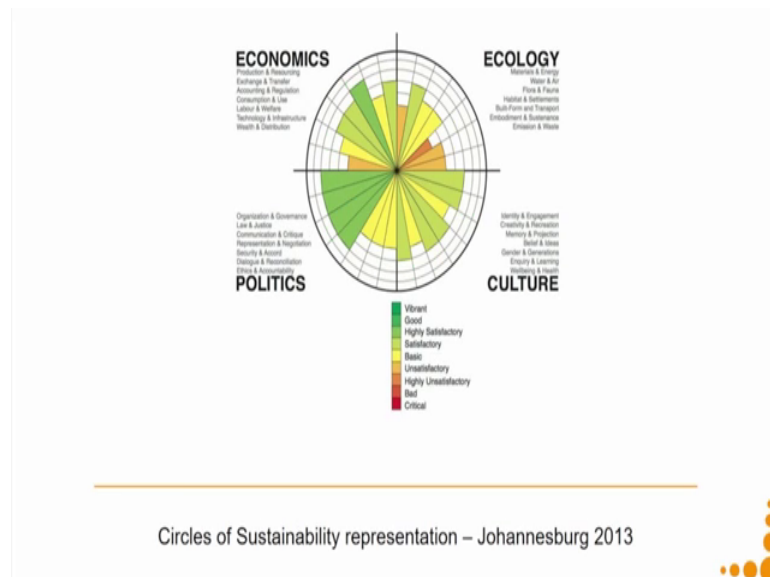
Whereas, Melbourne was vibrant on many more aspects, Johannesburg in this graph shows to be less vibrant.

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Circles of Sustainability representation – Delhi 2012
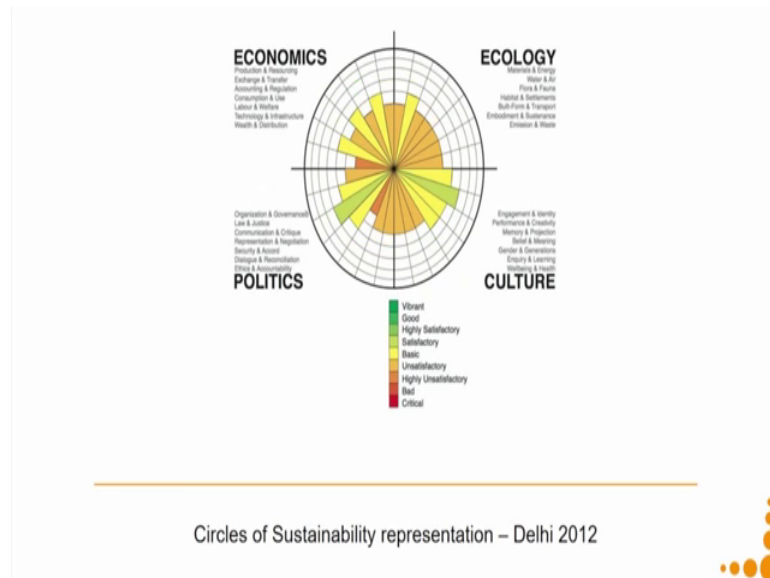
And this is the city of Delhi; this is the result from 2012. Now, let us go into understanding the definitions of each of these domains.

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Ecology

The ecological domain is defined as the practices and meanings that occur across the **intersection between the social and the natural realms, focusing on the important dimension of human engagement with and within nature, but also including the built-environment.**

- Materials and energy
- Water and air
- Flora and fauna
- Habitat and settlements
- Built-form and transport
- Embodiment and sustenance
- Emission and waste

So, first coming ecology; the ecological domain is defined as the practises and meanings that occur across the intersection between social and natural realms. What it means is the social and natural realms, so like materials and energy, we are all extracting it from the natural realm, and we are interacting with it while we are extracting it, while we are using it. So, whatever is lying inside, we are not bothered about that. So, we are talking

about the interaction between the social and the natural realm.

So, all the material and energy that we use, all the water and air that we use, all the flora and fauna that we are interacting with. Similarly, so interaction between the social and the natural realms, focusing on the important dimension of human engagement with and within nature, and it also includes the built form. What is meant by built form, all kinds of buildings, bridges, factories, anything that we have built.

So, it comprises of materials and energy, water and air, flora and fauna, habitat and settlements, built-form which is like everything that we have built and transportation. The difference between habitat and settlement is so habitat is so habitat is not equal to a house, habitat comprises of your house, and the surroundings in which you live; the settlement comprises of a group of habitats, which can be seen as one entity. So, the entity can be defined in terms of a city, it can be defined in terms of a nomadic group settled in a particular area, or it can be defined in terms of one village.

Next is built-form and transport, then comes embodiment and sustenance. What embodiment means is say for example, I make this mobile phone within the mobile phone, it will embody certain amount of materials, it will embody certain amount of energy for manufacturing it, and for disposing it, certain amount of pollutants will be released. They also form part of the embodiment, it is held inside that mobile phone. So, embodiment and sustenance what can be sustained, and what cannot be sustained cannot be sustained.

Next, comes emissions and waste. So, emissions is emission to air, emission to water, emissions to soil; and waste can be say plastic waste, paper waste, which is like the discarded part of things after they have been used. So, in this particular domain, it is very important that we talk about the interaction between the social and the natural realms, not just talk about the natural realms.

The next domain is economics. The economic domain is defined as the practices and meanings associated with the production, use, and management of resources, where the concept of resources is used in the broadest sense of that word. So, resource can be your human resource, materials are your resources, energy is your resource, money is a resource. So, when we use the word resource, it is in the broadest terms. So, we will have to consider everything, which is related to production, use, and management of all these resources.

So, the first sub clause in this is production and resourcing. So, production implies, so if I want to make a mobile phone all the processes, which are related to production of the different components of the mobile phone, and bringing the mobile phone together, assembling it together in the form that we see it; resourcing is wherever, we have to source all these materials from.

Then comes exchange and transfer. So, in exchange and transfer, exchange is something in which I might mutually exchange something between two people depending on the agreed upon value. So, say 1 kg of rice might be 50 rupees, and 1 kg of dal might be 100 rupees. So, the so for which means if I want to exchange both of them, 2 kgs of rice is equivalent to 1 kg of dal so, exchanges and transfers, which are happening. Next comes accounting and regulation. Accounting implies, accounting not only in terms of financial accounting, but accounting of say the amount of pollution that I am releasing; regulation

implies all the rules and laws which might be in place, which helps me to do accounting.

Then comes consumption and use, because we are talking in terms of resources, resources are consumed and used, hence the consumption and use. As I told you we consider resource in the widest term, so human being is also a resource, which means labour is a resource. Labour in the sense, knowledge related labour, physical labour. So, knowledge labours say for example, a teacher is a knowledge labour, because that person gives in knowledge in resource; a person who works in a factory and as physical labour is a physical labour so, labour and their welfare. So, labour in terms of both knowledge labours, physical labours, and all forms of labour.

Then comes technology and infrastructure. The last one is wealth and its distribution. So, if the wealth is not very well distributed that brings an unsustainability in that society. So, comparing how much wealth the society a particular city has that is the dwellers of the city, and how well it is distributed.

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Coming to the third dimension, politics so, political is defined as the practices and meanings associated with basic issues of social power, such as organisation, authorisation, legitimisation, and regulation. So, in this domain, do not get confused with the word politics, it really does not mean about different political parties, and just the Government. What it means is everything, which is about social power. So, social power is created by the structure of an organisation. How authorisation happens for different

activities, how do I say something is legitimate, and what are the different rules.

So, the parameters of this area extend beyond the conventional sense of politics to include, not only issues of public and private governance, but more broadly social relations in general. So, what it includes will make it more clear is all sorts of organisation and governance. Governance here does not really mean, something related to the Government. But, governance means how particular organisation is govern. So, if you belong to a particular school, there will be certain governance rules for that school. If you belong to a company, there will be certain governance rules for that particular company, which is the organisation

Then related to laws and how do we see justice. Communication and critique, it is very important that I should be able to have communication and communication in a manner that I can also have critiquing possibility. Then comes representation and negotiation. Representation is when I should can I have a voice in decisions, so say for example, in India, I can elect my Government, so which means they are my representatives, whom I have elected. So, I have a voice in the Government in the policies of the Government, so that is representation and negotiation. So, say for example, if there is a protest march happening, the protest march is happening, because they want to negotiate with the existing with our particular organisation or the Government on certain aspects.

Then comes security and accord. Security is related to safety, and security it can be both physical security, mental security, cyber security; and accord when even if there is disagreement between parties, the chances that the disagreement can be resolved, if there are platforms for that, that agreement can be brought in. Similarly, dialogue and reconciliation if there is possibility of talking between different people, different groups, and coming to an agreement, when some kind of disagreement has happened. Finally, comes ethics and accountability. So, can my system see if there is an industry releasing lot of pollutants; can my system hold that industry responsible for it.
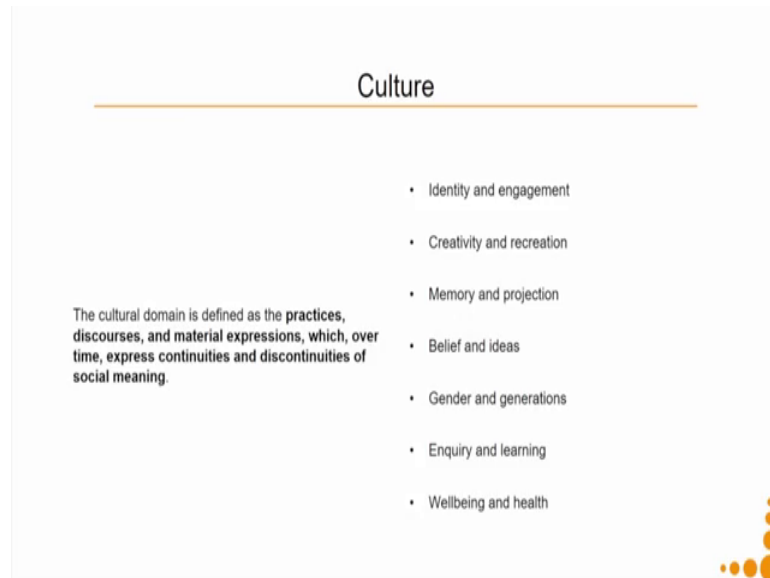
Finally, the last domain, which talks about culture so, the cultural domain is defined as practices, and discourses, and material expressions. Discourses means, all kind of knowledge related material. Material expressions can be defined as say for example, if I believe in certain cultural practices, I might own certain products in my house.

Say if I prefer sitting on the floor, I might own a low height stool, which is traditionally meant for sitting on the floor or I might have some floor mats, which are traditionally meant for sitting on floor. My house will be also arranged in a manner that sitting on the floor is possible, so which is meant by the material expressions. So, the material that you own providing that expression that I can practice those cultural practices, whichever I have

So, the cultural domain is defined as the practices, discourses, and material expressions, which over time, express, continuities, and discontinuities of social meaning. Cultural practices are not like they will live over in finite amount of time, all cultural practices have certain length of time, so that is why it is being spoken about in terms of how do I continue a particular cultural practice, and what brings in discontinuities of it. So, the cultural practices include things like identity and engagement. So, if I identify myself with the particular kind of group or particular kind of practices that is meant by identity and engagement, when I can engage with those activities or my groups.

Creativity and recreation, very important, memory and projection so, memory is how I

remember things, and projection is how I like to remember those things. you can go into more details about each and every meaning, which will be part of your further reading. And I will share the links with you, where you can further read through all these definitions, and be more clear on toward each one of them me. The definitions of all these different aspects have been kept very broad, so that depending on different context, I can give different interpretations to them.

Say for example, if I am going to develop this going to use this particular idea of identity and engagement, in case of a city development, it will mean completely different, it might mean like how do I design the public spaces, so that identity and engagement can be aided.

But, say I want to do the same thing in case of a design of handbags that completely means a different thing ok. So, how does my handbag give me a particular identity and engagement, which ultimately leads to some sustainability. In other aspects of this culture domain are about beliefs and ideas, gender and generations, enquiry and learning, and finally, wellbeing and health. Each of these sub dimensions that is identity and engagement have seven more sub dimensions, which you will go through in your reading material.

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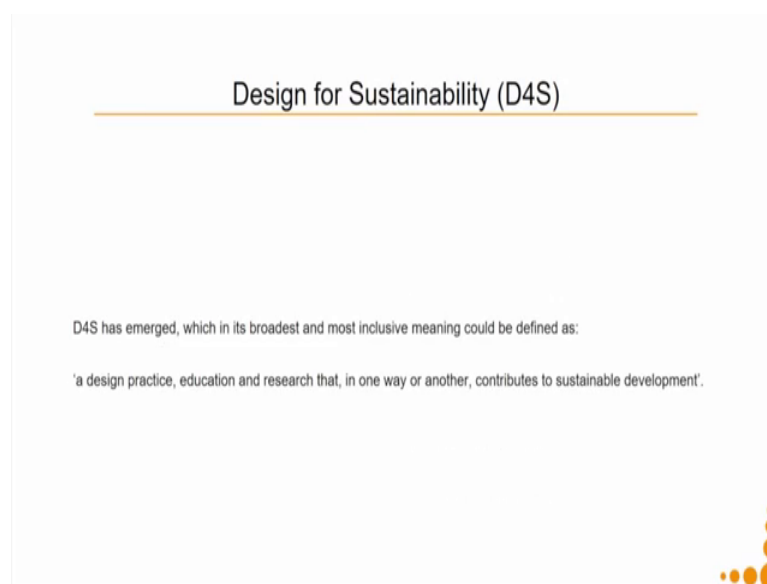
Now, what design for sustainability, so design for sustainability has again emerge in a very broad and inclusive meaning, and can be defined as a design practice or education

or research that in one way or another contributes to sustainable development.

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So, what did we discussed in today's lecture are point one, sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Next, the concept of needs, which is very important concept for the definition of sustainable development is in particular the essential needs of the world's poor to which we have to give overriding priority. Next, on this concept of present and future needs, we have the idea of limitations imposed by the state of technology and social organisation.

Then all definitions of sustainable development requires that we see the world as a system, a system that connects space; a system that connects time; and quality of life as a system. So, you cannot design a product. So, whenever you say I have designed a very eco-friendly xyz product, you cannot claim that it is very sustainable until and unless, you work it along the entire system. You check out what is the impact of the whole product on today's world, and in future world.
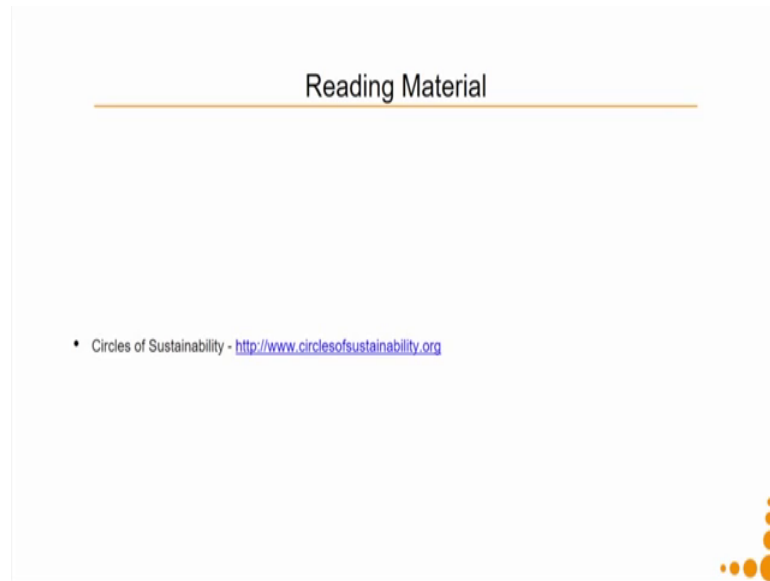
So, this reading material you can go through this particular website, circles of sustainability. It explains in detail all the dimensions and the sub dimensions, which are part of it. This particular website has many other topics and if you are interested, you can also go through all those topics which gives you more and more thought provoking ideas related to the whole concept of sustainability, and how different groups are approaching it differently in different contact say cities, agriculture, and so on. In the next lecture, we will start talking about how do we achieve sustainability through design.

Thanks.