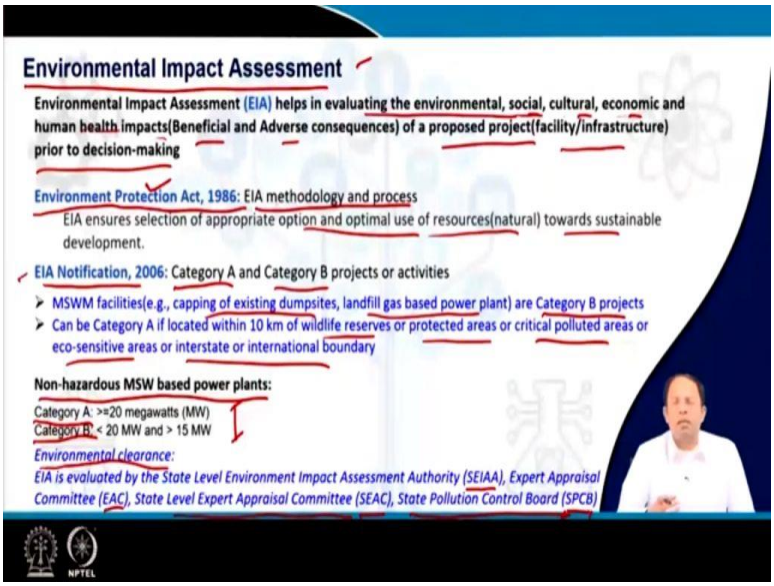
Urban Services Planning
Professor Debapratim Pandit
Department of Architecture and Regional Planning
Indian Institute of Technology, Kharagpur
Lecture – 10
Service Planning Basics: Part V

Welcome back. In lecture 10, we will cover the last part of service planning basics which is part five.

(Refer Slide Time: 00:32)

The different concepts that we will cover are environmental impact assessment, environmental impact assessment clearances, impact assessment and mitigation measures, life cycle assessment, life cycle assessment framework.

(Refer Slide Time: 00:48)



Then, coming to the evaluation criteria. Once we have fixed with the location how to choose a location; then comes how do I evaluate a particular option. So, even in this kind of service projects or this kind of infrastructure or facility projects, there are different ways to evaluate a particular criteria.

The cost implications and all these things we are, we have already considered earlier. That means all the options that are in front of us are suitable as per all the constraints that we have got; like for example, there are cost constraint, there are some organizational constraints, there is some constraint based on certain laws and regulations. So, we have already considered that.

Now, we have got several options in front of us from where we have to choose, or we have to evaluate that which option is better. Now, this evaluation is done based on certain, certain ways. One of these ways to evaluate the environmental impact assessment for this particular infrastructure or this particular option, or facility which, whatever we are talking about.

So, this environmental impact assessment helps in evaluating the environmental, social, cultural, economic and human health impacts, both the beneficial impacts and the adverse impacts of the proposed project or facility infrastructure prior to decision making. So, I have finally come based on weightage criteria and all; I have decided on our particular option.

But, this is like we can only compare similar options; but, we like for example, comparing incineration and landfill. That means, once this solid waste is collected, the city has to now decide, will I set up a ration plant or will I set up a landfill facility which will take care of all the waste? So, these are two very very distinct items.

So, whenever we are considering alternatives and all, we have thought about alternatives for where to look at the incineration plant and all this in the previous stage. Or what would be the best alternative location for a particular landfill site; that location choice and all we have determined in the previous stage.

Now, comes the question of out of this two alternatives which one is more better, or which has got a lesser impact on the environment, or social, or cultural, or economic, and human health impacts are less for which alternative. So, that is what we assess in environmental impact assessment. Now, in India, the Environmental Protection Act 1986 is the one which initiated this requirement for EIA that has to be conducted for different projects.

So, EIA methodology and processes has been discussed in this Environmental Protection Act 1986. EIA, ensures selection of appropriate option and optimal use of resources, natural resources of course towards sustainable development. So, that is the goal why EIA was proposed in Environmental Protection Act, because it is it is helped us in selecting the best possible option, where the less effect on the environment happens.

Now, to make it mandatory, EIA notification came during the year 2006, which actually made EIA mandatory for certain kinds of projects or certain kinds of activities. Now, primarily there are two kinds of projects or activities are defined; one is category A project and another is Category B project. Now, Category A project is something when a facility is located within 10 kilometer of wildlife reserves, protected Areas, or critically polluted areas, or eco-sensitive areas, or interstate or international boundaries.

Then, it is comes under Category A project; and for that category A project, there are certain evaluation criteria. Whereas, for category B project, usually all solid waste management facilities comes under Category B projects, such as capping of existing dump sites; that means open dump sites that we have there, we want to cover it. So, it is one project, so that will come under this.

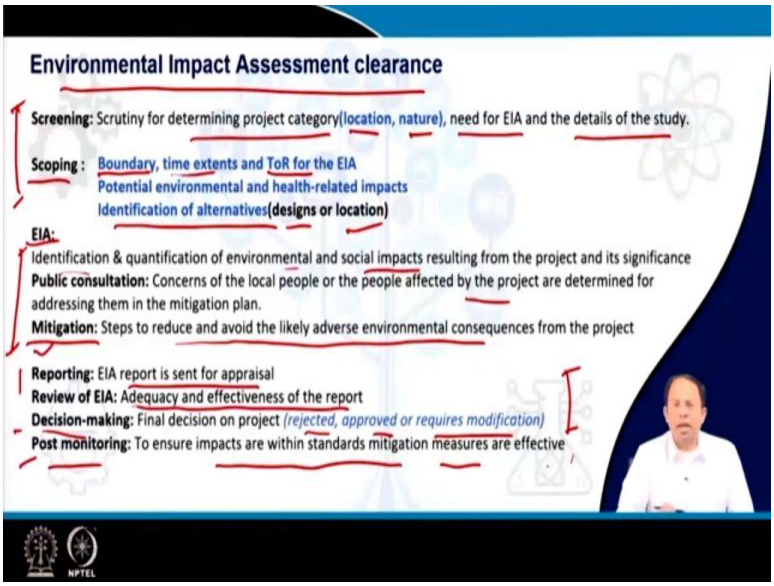
Or landfill gas based power plant that is we want to create a power plant, which is being using landfill gas or methane to generate power. So, this kind of projects has to be evaluated via this EIA mechanism. So, these are Category B projects and usually this we are mostly concerned with category A or B projects.

But, in case of non-hazardous MSW based power plants, like when we are talking about municipal solid waste based non-hazardous municipal solid waste based power plants, then there are. If the capacity of the power plant is greater than 20 megawatts, then it will be considered a category A project; and its evaluation mechanism is different compared to a category B project, which is when the capacity is above 15 and lower than 20 megawatt.

So, accordingly we can decide on in which category or following which processes the evaluation will happen. So, we this EIA notification actually state that we have to obtain environmental clearances for these kind of projects, and to get a environmental clearance; you have to follow certain procedure. And within that procedure, you have to also conduct impact assessment or mitigation measures for different kinds of options, this processes that are there for this particular option or infrastructure that you are evaluating.

So, EIA is evaluated by the State Level Environmental Impact Assessment Authority SEIAA, expert appraisal committee EAC, and State Level Expert Appraisal Committee SEAC, and State Pollution Control Board, and sometime pollution control committees as well. So, these are the organizations. So, these are the committees which actually goes through the, they not only determine what sort of EIA has to be performed, which category of project it is; and then and then also gives approval for this project.

(Refer Slide Time: 07:03)



So, there are different parts to this analysis; one is screening, then there is scoping, then there is EIA, and the general EIA; and within EIA, we can also do public consultation as well. And EIA also it not only looks into the impact, but also looks into the mitigation measures. Then finally, reporting review of this of this particular report decision making and post monitoring; that is after the project is implemented, some post monitoring activities also needs to be conducted.

Now, going into detail. Screening: when to obtain this environmental impact assessment clearance from the relevant organizations. The first job is to take a pre-feasibility report on this particular project, detailing it what kind of project it is; where it is, where is the location of this project? What is the nature of the project? To determine where this, which is the product category in Category A or Category B? Does it require a detailed EIA to be conducted? And what are the contents of that EIA that is going to be there?

So, that is first determine in the screening part. So, once the screening is over, then comes the scoping part; that is we (deter) every project has got different boundaries that we can keep on. Suppose a project is set up which has got some amount of pollution that will it will result in. So, what is the boundary that we will consider? The boundary could be geographical boundary; it could be a time boundary, for till how long we will consider it.

And it could be also like certain processes and all are common with other things. For example, like certain processes we can ignore, because they are taken care of by other aspects like, if I am generating leachate in a landfill site, and I am treating it; but for treating it, I am sending it to the municipal leachate treatment plant. So, it is the treatment is done by some other (pro), in some other organization.

So, we stop at the leachate, transfer of leachate, what is being generated in the landfill site until that part; so that is where I create a boundary. Then finally, we also need to create the terms of reference for the EIA; that means what are the different, we have to say the write up that what this EIA contains. Then, potential environmental and health related impacts of this particular project.

Each project has got different impacts, so we have to first list those; because those will be part of this EIA identification of alternatives in terms of both design alternatives or location alternatives that has to be chosen. So, we have to not only look into one alternative but multiple alternatives, so that there is options to choose. So, this two part is the initial screening and scoping determines what sort of assessment we need to do.

Then, finally comes the time of the actual assessment which is EIA. So, we identify and quantify the environmental social impacts resulting from the projects, and the significance of this impacts, what this causes. We also go for public consultation where concerns of local people or the people affected by the project are determined for addressing them in the mitigation plan. That means we have to talk with the people to see what they are feeling about this project.

What is the actual effect of the project on those particular people, maybe the property prices will come down, maybe some health issues and all this; so we need to consider those in the mitigation plan. And finally comes a mitigation plan where we put down the steps to reduce or avoid the likely adverse environmental consequences from the project. So, if some problem happens, so some bad impacts are there.

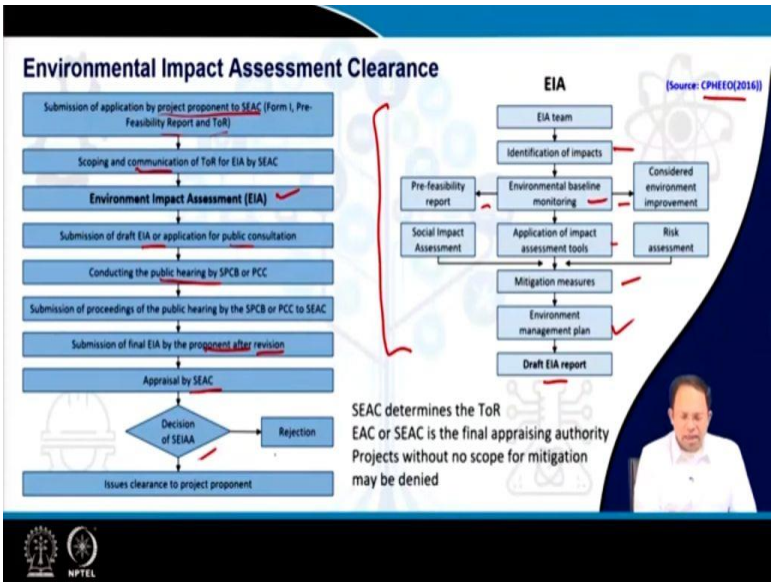
How do we mitigate that? So, these are this is what is spelled out in the mitigation plan. So, this together makes the EIA. Now, once the EIA is created, the EIA draft report is created; it is sent for appraisal. So, that is called reporting. Then, we that is being reviewed, so the adequacy or the

effectiveness of the report is being reviewed by the committee; it could be a EIC EAC or is the state level committee as well.

Then, decision making is done which is a final decision is the project rejected, approved, or it requires certain modifications. So, these kind of decisions are given. And finally, once all these things are over, the project is approved. Then, finally also we have to do some amount of post monitoring, so that to ensure impacts are within the standard mitigation measures, and mitigation measures are effective.

That means the proposed mitigation measures are they really effective or not that we have to also check. So, this is how the overall environmental impact assessment and the impact assessment, clearance process (takes) is happens.

(Refer Slide Time: 11:59)

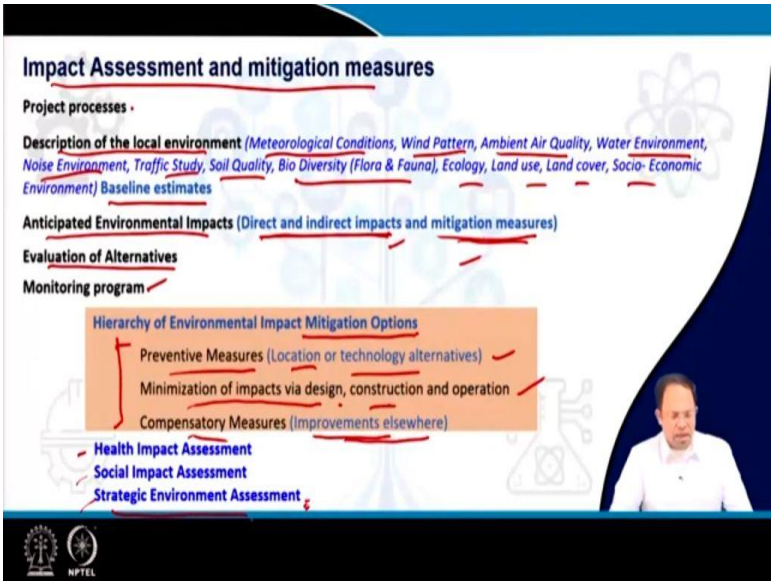


So, whatever we discussed, this is what CPHEEO gives us, that this is the flowchart on how these decisions are taken one after another. So, you can see that the submission of the application with a project proponent to a SEAC form one has to be submitted; it is a pre (physic) physically report and the terms of references submitted. Then, scoping and communication of ToR, this is done. Then, the actual based on that communication or feedback that you get based on which category the project belongs, what kind of EIA has be done, extent of the EIA.

We do the actually EIA assessment which is over here. You can see the EIA team is formed and we identify the impacts, the baselines are created what is the baseline? I will discuss that later. And then a pre-feasibility report is considered is prepared, what sort of environmental improvement could be done based on this particular project? Then application of different tools are used to determine the actual impacts social impacts are done, risk assessment is done, mitigation measures are proposed.

Then, finally the environmental management plan is proposed and a draft EIA report is submitted for further evaluation. So, once it is done, it is the submission of draft happens. It is put up in the public domain for public consultation. And once the public hearing is over, then this, then some amount of revision and all is to be taken up. And once it is done finally, it is again appraised by a SEAC; and then final decision is taken; either it is rejected or clearances are given for a particular project.

(Refer Slide Time: 13:38)



So, to detail out that how this EIA project impact assessment and mitigation measures are conducted, or what how we conduct this kind of studies. First of course, we have to define the project processes, what this project involves. Second, we have to describe the local environment; this is also known as baseline creation or baseline estimate determination. We have to study the metrological conditions of the site, wind patterns, or generally area characteristics, the cost, land price, everything is studied under that.

The wind pattern of that area, ambient air quality currently, water environment, noise environment, traffic study around this site, soil quality, biodiversity, ecology, land use, land cover, socio-economic environment and so on. So, this creates the baseline that is what is the current situation. Then, what we have to do is we have to anticipate the environmental impacts, how direct and indirect impacts affect this particular baselines.

That means because of this particular project, there will be a lot of direct and indirect impacts; and how they will change this particular baseline. How water quality will change? How air quality will change? How biodiversity will be affected? All these things are measured. And finally we have to propose the mitigation measures. And once these are done, once we have done this detailed analysis, then we can evaluate different alternatives in front of us; and see which has got the least amount of impact or where mitigation is easier.

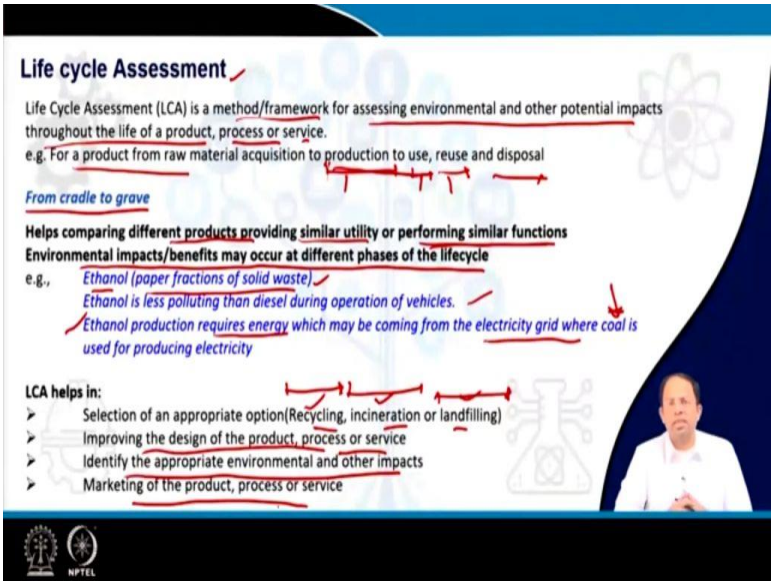
So, we can evaluate that and finally the monitoring program is designed. Now, when I talk about mitigation options, there is a higher. What is that? First of all, we determine that preventive measures, that is can I change the location? Can I change the technology or and find better alternatives? So this is the first preventive measure. So, when I talk about mitigation that is if I change the location or technology is the problem mitigate.

The second is if that is not possible, then the second is minimization of impact via design construction and operation. That is can I change the design a little bit? Can I change a construction a little bit or the operation methods? So, that the effect is reduced. Even if this fails or it is could be done in limited value, limited amount, then we go for compensatory measures. That means we say that well we cannot do the improvements over here, we cannot mitigate to get all the problems over here.

So, instead we do some better things somewhere else, so that is improvements elsewhere. So, that means I cannot do a lot of improvement over here because of certain limitations; but I can do other improvements in other places. So, this is called a compensatory measure. So, these are the different ways we can mitigate. Finally, there is health impact assessment, social impact assessment and strategic environmental assessment, which is also carried on along with this environmental impact assessment.

Strategy environmental assessment actually refers to that this environmental impacts before once we have decided on certain options, certain technologies, certain locations; we conduct this EIA analysis. But, if I already do a very broad level assessment and I can put that effect of the impact on environment to a hard decision making level at a higher decision level; that is when even the options are being considered. I can that means environmental considerations are brought in in a much at a at in a previous level of discussion. So, that is what we can also consider; so this is known as strategic environmental assessment.

(Refer Slide Time: 17:29)



Finally, come to lifecycle assessment. So, after I do EIA, then we can also do lifecycle assessment also. Now, EIA is environmental impact assessment. Whereas lifecycle assessment, there are a lot of similarities; but there are also a lot of differences. Now, from the similarity point of view, obviously here also we are looking into environmental impact.

But, the difference is a lifecycle assessment. It is a method or a framework for assessing environmental and other potential impacts throughout the life of a product, process or service. So, it is not that immediate impact that is resulting from a particular project or a particular technology or so on. But, here we look into the overall impact throughout the life of this particular product, or this particular option, or this particular technology.

So, this is a more comprehensive analysis of understanding what is the impact of a particular facility, or a particular infrastructure, or a particular process that we are undertaking. But, primarily LCA is important when we are talking about certain products. In that case, this kind of assessment is more important. So, usually a product starts from raw material acquisition that is the mine and gets raw material.

And then finally it is used, after product we after; then we do produce the product, or refine that particular raw materials and make it into a product. In that process we use several processes. Then, we use the product. Sometimes we reuse the product, and finally we disclose the product. In each of the stages of its life or not only stages of his life, in each of these stages like even in the production or the use phases, we; there are a lot of other sub processes which are taken up.

For example, in a production it is not one process; there are many processes which are adopted. In use, the product to be used for many purposes; or it could be reused and the reuse purpose could be totally different. So there, so first of all, we need to understand the detailed products processes, which are involved or which we are considering.

So, once we know that in each of these stages when the product is being developed to be used or dispose, it has impacts on the environment. That means it has impacts in terms of emission, it has impacts in terms of emission could be of different kinds, it could be air pollution, air emission or leachate can come out, and pollute the ground or the groundwater. So, in that way that means it is the effects are also there in each of the stages, and this effect happens throughout its life.

So, we want to understand that when I take a decision on a particular alternative, I have to take a look at the entire life of that product, how it is affecting. Because in AI, we are not talking about the (())(20:37); we are just talking about the last stage where the product is being implemented, and what it is immediate impact on the environment. But, if I look into the overall the product over the entire life, we can get totally different results.

So, this approach is known as cradle to grave approach. And this helps comparing different products providing similar utility or performing similar functions. So, this approach helps us to compare between products or processes, which is for the same purpose; or it provides similar

utility to that particular, it provides two products are of almost similar utility, then how do we evaluate that?

That environmental impacts and benefits this assumption is environmental impacts and benefits may occur at different phases or lifecycle of that particular project, of that particular product; and we have to evaluate that. To give a better example, for example, ethanol can be produced from paper fractions of solid waste. So, ethanol is less polluting than diesel during operation of vehicles. So, once ethanol is produced if I am using it for running vehicles, I would see that the emission coming out of the ethanol is less compared to that of diesel.

That means if I just evaluate the use of a ethanol and diesel, I will find that the ethanol is much better than diesel. But, if I look into the entire production process of the ethanol, particularly from paper, then the total energy that goes into production of ethanol from paper; this electricity energy is coming from the electricity grid, where coal is being burned to produce this electricity.

So, if I take into consideration the emissions happening because of burning of coal, and also the emission from ethanol use in the vehicle; and we service compare it with diesel, then probably we will see the diesel is having up its better in terms of the overall environmental impact it creates. So, that is how that means some very obvious alternatives may turn out to be bad choices. So, that is what lifecycle assessment helps us to assess.

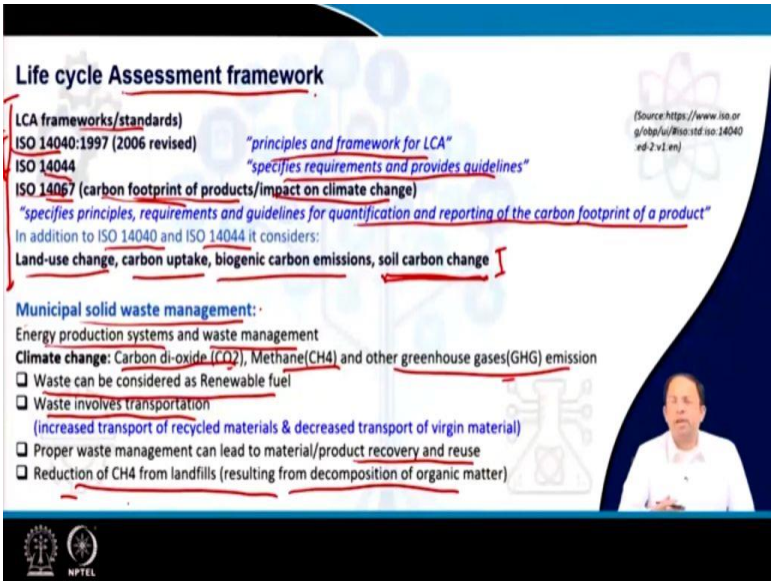
So, now coming to the context of municipal services, and particularly we will talk about municipal solid waste management. LCA helps in selection of an appropriate option, like recycling, incineration or landfilling. That means recycling will require some of energy and something. Incineration will require certain kinds of energy, certain output, certain processes, certain byproducts will come out. So, same goes for landfill.

So, we have to transport waste to the landfill, we the landfill waste will remain, some emissions will happen. So, all these processes that is involved are evaluated for the entire lifecycle with some boundaries we have to create Of course, and both for incineration, landfill or recycling. Because, these are three alternatives or they have they are performing similar functions; and then we can compare them to save which alternative is best in this particular context.

Then, this LCA, because we can compare different stages of the process; we can see where in which process or which stage emission is happening. We can improve the design of a product process or service by changing those particular stages. Identify the appropriate environmental and other impacts; because we can now do that analysis in detail for different stages.

So, we can identify the appropriate environmental and other impacts, and marketing of the product, process or service. So, finally, this helps us to because we are doing LCA and all; we can also mark it as that that we have done a full comprehensive environmental analysis, and then we are saying this product is better. So, that is how it helps in marketing as well.

(Refer Slide Time: 24:34)



So, as you can understand that without this this LCA analysis, it involves the entire lifecycle of a product, it looks into different stages, looks into processes. So, if I do not have any framework, then people will do evaluations as per their own understanding; and that may result in the different evaluations by the different people will give different results.

So, we cannot do proper comparison; so, that is why some proper assessment framework is required; so lifecycle assessment framework. This actually is there are certain frameworks created by the International Standards Organization, ISO 14040:1997 and revised to 2006; then, ISO 14044, and even ISO 14067, which looks into different aspects of lifecycle assessment.

So, the ISO 14040 talks about principles and frameworks for LCA, how LCA needs to be done? What are the principles? What is the broad framework? ISO 14044 specifies requirements and provides detailed guidelines on how this has to be done. What are the different stages and all? An ISO 14067 is a little bit different. It talks about overall carbon footprint of a product and impact on climate change.

So, if I am more focused on climate change, if I want to see what is the overall carbon emissions coming out of a product, we have to consider 14067, this particular framework. And this in addition to this framework specifies the principles, requirements and guidelines for quantification and reporting of carbon footprint of a product.

And this not only considered what is there in ISO 14040 and 44; that is not only this. In addition, it considers land-use changes that how land-use change effects in carbon emissions, carbon uptake by plants that how much carbon is being taken up by plants and all; biogenic carbon emissions that by decomposition how much carbon is coming out. Soil carbon change that means how much carbon is going into the soil; like we have if I do not burn stubble that we now know that in some states, the farmers burn their stubbles.

After cultivation they will burn the husk, rice husk and so on. So, if you do not burn it, it will go into the ground. So, when it goes into the ground, the carbon in the plant or the carbon content in this husk will go back into the soil. So, that is that will change the carbon in the soil. So, we will be able to store some carbon in soil instead of it going into that atmosphere via incineration.

So, these are the different things which are considered when we consider this ISO 14067 or we determine the carbon footprint. Now, so this is the standard frameworks which can be used in LCA analysis; we will discuss LCA in a subsequent lecture. And when we talk about municipal solid waste management, this when we talk about both LCA and this LC, this this kind of carbon footprint analysis and so on.

We see that even in municipal solid waste management this is very very effective with this sort of analysis; instead of just doing EIA, we can go for LCA. Why? Because energy production systems and waste management, these now are tied up; that means we generate a lot of energy from waste by either incineration or other kinds of technologies that are there. So, in that case, it

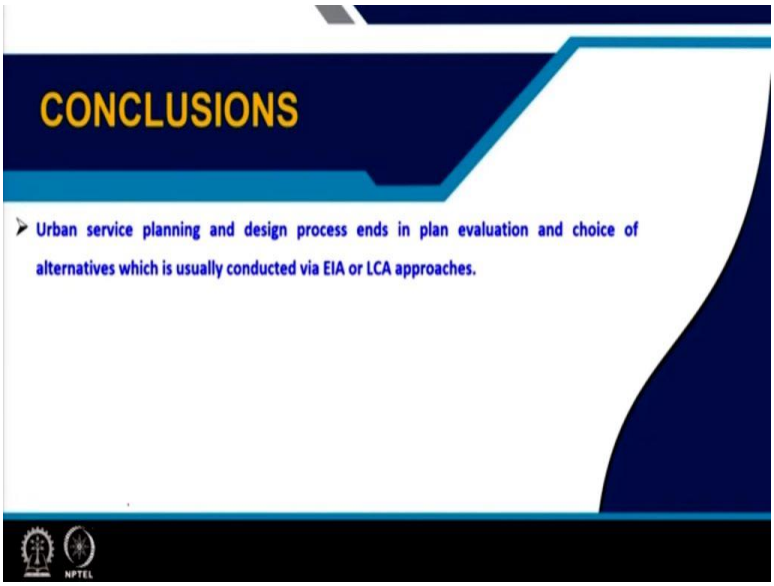
is a process we can because it is a sort of a process, we can evaluate it for the entire lifecycle of that particular process instead of just looking at its final impact on the environment.

Then, see as we know that CO2, CH4 emissions and other greenhouse gas emissions, this is a lot of concern these days. So, this analysis helps us in understanding the actual amount of CO2, CH4 and greenhouse gases that are being emitted, and which will help us to analyze climate change. And because waste can be considered as a renewable fuel, we can do that analysis.

And we can see that how much amount of this fuel when it is burned, how much amount of emission is coming, and at what stages what sort of process energy has to go into the processing of that and so on. And this waste also needs to be transported, so there is also energy use because of that. So, all the different processes for waste management it involves transportation, it involves conversion, emission, it involves conversion into other products.

So, the entire lifecycle of a particular process or every process, sub-process within a this particular option that is in front of us like either we go for landfilling, or insulation that can be regulated in a more comprehensive way. So, proper waste management can also lead to material product recovery and reuse, and reduction of CH4 from landfills resulting from decomposition of organic matter. So, these are the things that we can consider, and LCA or this carbon footprint analysis helps us to understand all this in more detail, so that we make the most best possible choice, or that is how we conduct evaluation.

(Refer Slide Time: 30:01)



So, these are some of the references you can look at. To conclude, urban service planning and design process ends in plan evaluation and choice of alternatives, which is usually, conducted via EIA or LCA approaches. Thank you.