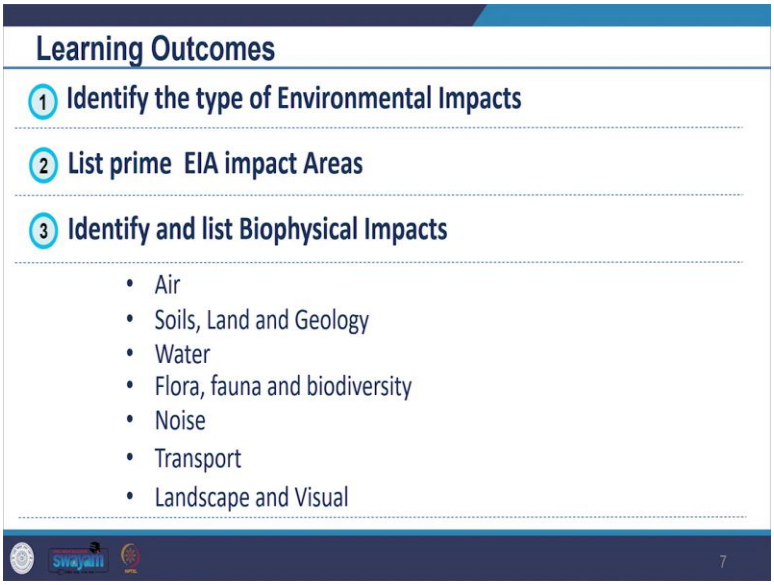
Environmental Impact Assessment
Professor Harshit Sosan Lakra
Department Of Architecture And Planning
Indian Institute of Technology, Roorkee
Lecture 07
EIA Impact Areas, Current And Emerging (Part-1)

Welcome to the course Environmental Impact Assessment. In the previous lecture we covered, we looked into environmental impact assessment EIA, we looked into its definition, we briefly looked into process and the purpose the key purpose of EIA, and today we will look at different impact areas, we generally look into through the EIA process what it really addresses which are the different, different impact areas which we cover through EIA. The key reference for this lecture is chapter 10, from Blason and Terrible book, which is our textbook for this course.

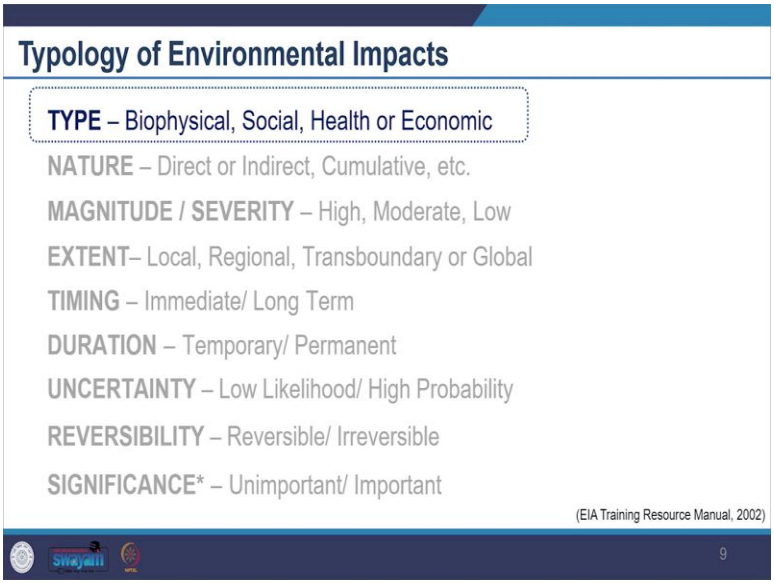
(Refer Slide Time: 01:04)



So, for today, our coverage would be the typology of environmental impacts, we will look at various types of impacts, which are there, then we will look at various impact areas and today are, we will discuss the biophysical impact. So, out of all the impacts, we are going to focus into biophysical impacts.

So, accordingly the expected learning outcome include that after going through this you should be able to identify the type of environmental impacts, you should be able to list prime EIA impact areas and then further you should be able to identify and list various biophysical impacts among all the impacts, you should be able to identify and list them.

(Refer Slide Time: 01:49)



Let us first look at the Typology of Environmental Impacts, environmental impact can vary, and like it can vary in type it, the impact can be biophysical in nature, which we are going to look at today, like one would be seeing what kind of impact happens on air, what kind of impact happens on soil land and geology as well as on water, flora, fauna and biodiversity.

So, these are all what we are looking at is like, biophysical in nature. And likewise, you can also look into the noise level, landscape and the visual assessment. So, all of these cover like biophysical characteristic of the environment. So, by this we understand what type of impact we are looking at, there can also be socio economic impact.

Where we look at the social impact, and then we also look at economic impact or the health impact. So, they are different nature of impact we are looking at. So, by looking at these we understand the typology. Impact when we see can be both direct and indirect.

(Refer Slide Time: 03:05)

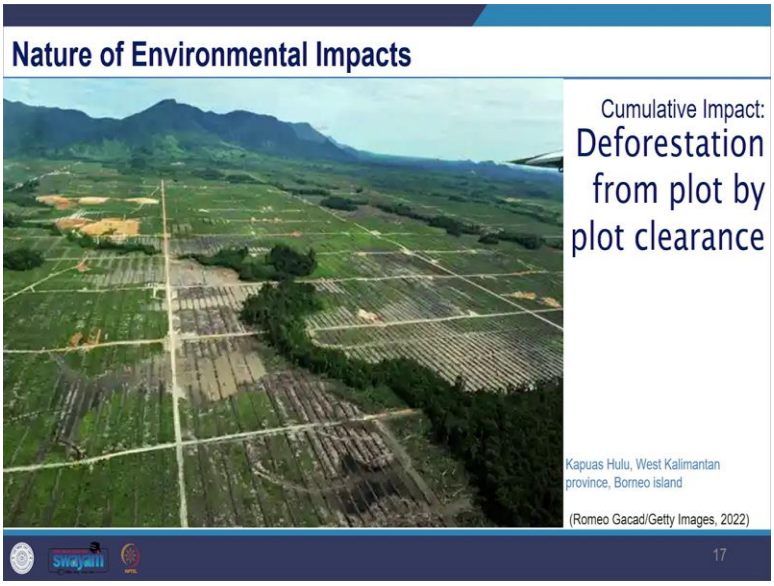
So, for example, direct impact of a project could be air pollution or water pollution, which may further indirectly impact the health of the people living in the influence area, whatever is the project's influence areas so where people are living and eventually your project is impacting the water or the air and then indirectly impacting the people who live there.

And this can happen due to the exposure to the contaminants, the pollutants, which build up in the food chain and so on. So, that could be direct and indirect impact. So, you need to look at like what kind of impact you are looking at.

(Refer Slide Time: 03:49)

Or we can also think of water withdrawal by an industry. So, looking at another example, which may directly impact the biophysical environment like lowering the water level, the status of the water level could be lower here and have indirect Socio-Economic influence like lowering of the water level may lead to the lowering of the harvest level of the farmers in the influence area.

(Refer Slide Time: 04:19)



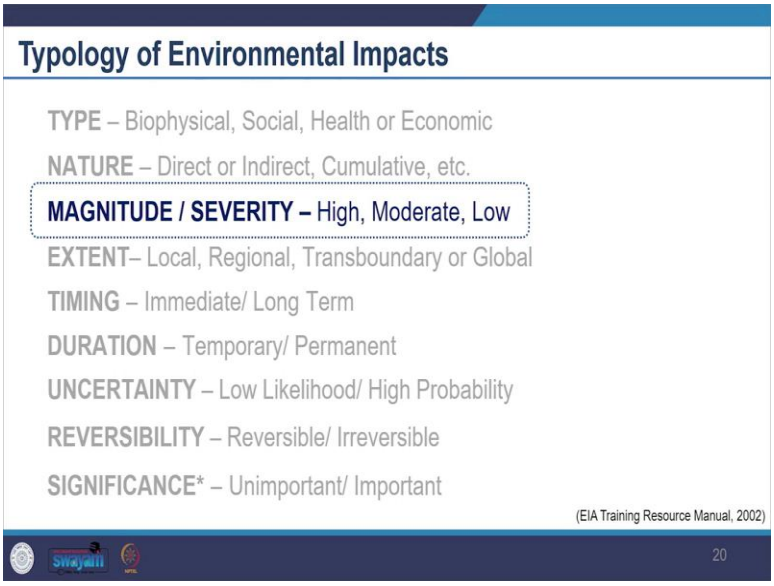
The impact can also be cumulative in nature, meaning project may, may not have significant impact at the individual level. So, when you look at one individual project, then it might not have that kind of impact.

But when you look at them all together with other developments, which would come in some time or in the same region may have significant impact on the receiving environment. So, example of this could be like deforestation like you have seen in the previous week. That how what kind of deforestation is happening so deforestation resulting from plot by plot clearance.

So, when you look at one plot, it might not be really that significant, but when you look at the cumulative manner when you look at in totality, it would be leading to large scale of deforestation. Another example, which we can look at is the number of development in an area with the future projects like traffic levels may increase and result in additional increase in noise level in the communities.

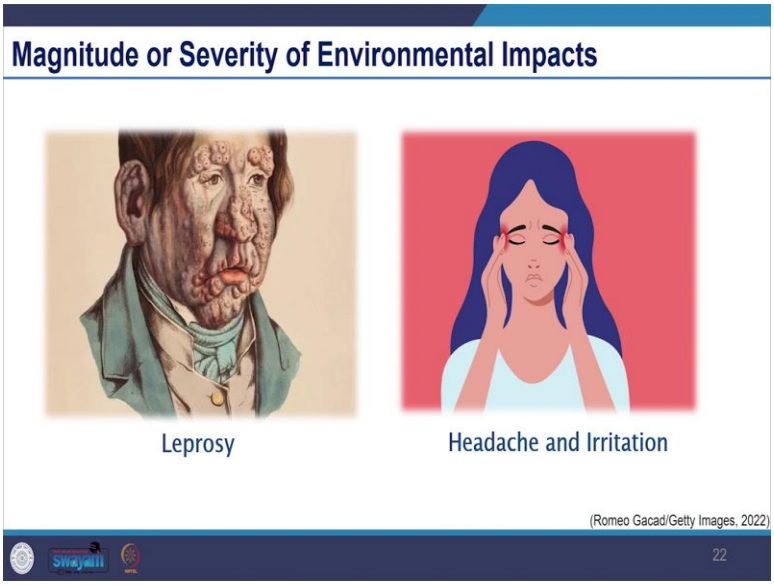
So, you might be calculating only for your project, but then there might be other projects also coming up and then the cumulative impact would be greater than what you are projecting from one of the projects. So, you may see cumulative noise level for those communities under study is extensive. Further, we see that when we talk about cumulative meaning having over a longer period of time.

(Refer Slide Time: 06:03)



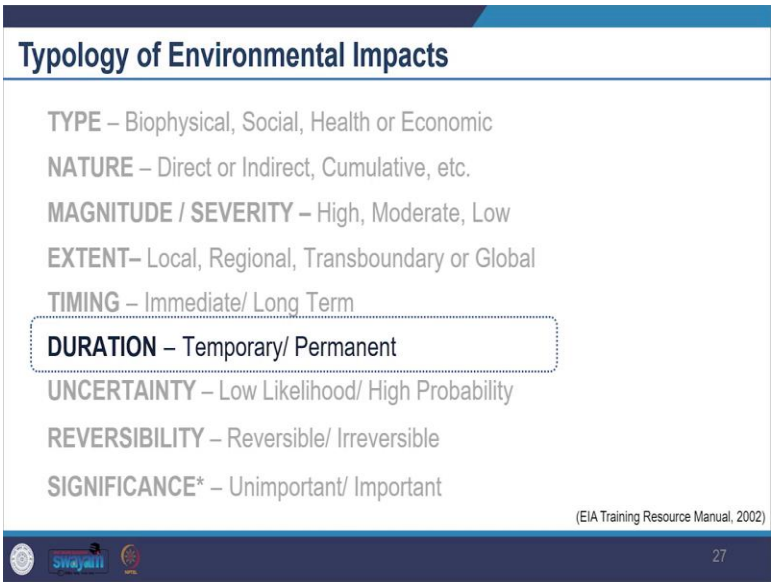
The impact can be different magnitude or severity such as high magnitude, moderate or low magnitude.

(Refer Slide Time: 06:11)



So, here we see example like air pollution must be happening, but at low level, so, if a project air pollution is happening, it is within the standards then it might be acceptable rains compared to a high level of pollution. So, magnitude would also vary. Likewise, how severe is the impact is also looked into, for example, a toxic pollution in soil causing leprosy and increase in noise causing headache or irritation. So, you can think about like, how severe is the bat which one would be severe and which would you would let it go.

(Refer Slide Time: 06:54)



So, similarly, the impact can be at different geographical extent. So, it can, the impact can be at the local level. So, whatever activities are undertaking the dust produced in that could be at the local level or the air pollution which is happening can go beyond at the regional level or you are interfering with some ecosystem.

Then it can be at the regional level or it can also have a water body if at what level you construct the dams and other structure can also impact the, Transboundary or the industries together can also have global impacts like

accidents and other things can also go at the global level. Further, we also look at the timing of the projects like we can see that the impact can be immediate, or it can be long term as well.

For example, there could be certain kinds of impact which happen immediately at sites like an increase in noise level, because of the project that could be causing irritation. So, that is immediate, like it would happen from the project from the immediate level whereas the toxic pollution what is coming from any kind of project may have deformed childbirth for several generation.

So, here, we are also seeing that what kind of impact will it be like a temporary impact for a shorter period of time during the construction period or otherwise the impact would go from generation to generation. So, that also we see that what kind of impact would be long term or short term.

Further looking at the nature of impact, when you evaluate the impact, you also look at the duration of the impact. So, whether the impact will be temporary or it will be permanent in nature. So, looking can this, you see that impact can be of only temporary nature for example, rising air pollution at the time of construction, if some building is being constructed or there is a road construction taking place.

So, at that time when the air pollution takes place, then that is temporary nature which will go away after that activity has stopped whereas there can be some permanent increase in air pollution level due to increase of the traffic flow. So, when a road is constructed, so during the construction, there might be a short term dust pollutant there, but when the road is constantly in the functioning way, so the ambient noise level of that particular area would permanently change.

So, while you see all these kinds of impacts and then typology you also see when you make these impacts you also predict and it all the impacts are related with prediction, there is certain level of uncertainty. So, when you are looking at these typology, then you also see what level of certainty is there in the projection which has been made.

So, we need to know what are the likelihood like it is a low likelihood or high probability of that impact which is going to occur or your predicting to occur. So, there are certain kinds of uncertainity in impact prediction, for example, you have scientific uncertainty, so, you have limited understanding of the ecosystem or the community is affected.

So, we really do not know much about those things. So, that is why there is like, what kind of projection you make, prediction you make that has certain scientific uncertainty, then also in your prediction, there can be data uncertainties, so you might not really have complete information or your methodology could be insufficient.

So, there are always these kind of limitation in the process. Further, there is also like policy uncertainty. So, they can be unclear policies or they can be conflicting objectives of different people involved or there can be

absence of standards or they can be change and standard. So, these kinds of uncertainties are there whenever you do things.

So, that also you need to take in perspective, while you evaluate the impact like what kind of impact it has. Further we see that the reversibility or irreversibility of the project, for example, loss of vegetation can be reversed, like with plantations. So, whenever you are making a project, for example, we take the road project and for that, we are going for certain cutting of trees.

But eventually if that loss can be compensated by planting more trees, so that process the impact can be reversed, but when there is loss of endangered species, that particular impact could not be reversed. So, that would be irreversible loss. So, when you evaluate those things, so which one would you really emphasize more so the one which you are able to reverse or one which you are not able to reverse.

So, definitely, where you are not able to reverse the process that would have much more weightage when you are analyzing the impacts. So, based on these significance of the impact, so, while you look at all these aspects, and based on all these significance, the impact is evaluated, whether it is important or not important, what type it is, how when it will happen, what is the likelihood of it is happening, and what is the certainty involved in this. So, viewing all these taking all these in context you decide you make decision of the significance of the impact and not only this, you also look at the sensitivity of the receiving environment.

So, when we say sensitivity that means we say what, what is the receiving capacity of any environment, maybe a person from different economic background would the same increase in the price or the change in the lifestyle would be expensive for that person or for same travel distance for women would create another problem or blockage of any access road would create problem for certain people who are walking or old age people.

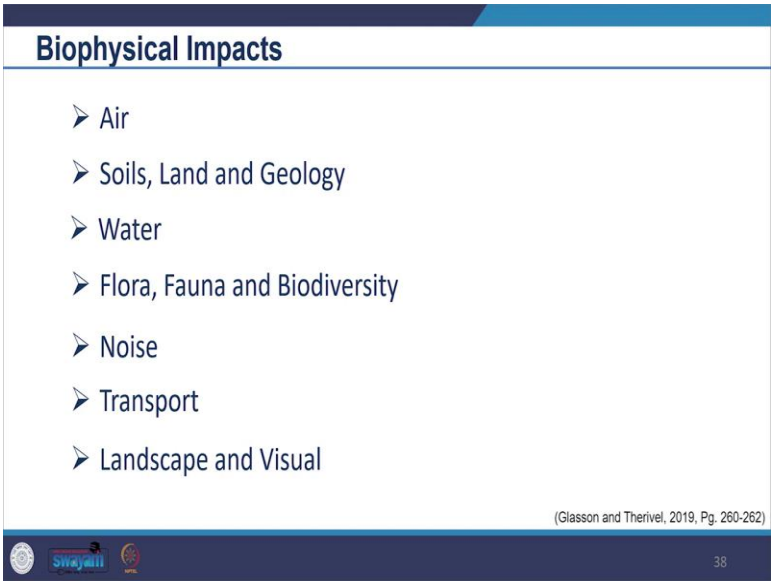
Sensitivity of the receiving environment or the community is also important while you consider the significance of any impact. So, we saw the typology of impacts. So, we finished that particular section and how we determine significance of an impact.

(Refer Slide Time: 14:00)

Now will look at EIA impact area. So, what are the areas which are usually taken and within EIA, and following those impact areas are considered. So, we saw the typology of impacts and how we determine significance of an impact. Now will look at various EIA impact areas. So, we see that the impact areas include the Biophysical Impact, which we are going to cover today, then it also includes Socio-Economic impacts then also Health and Safety, Economic and Fiscal Impact.

We also see Indigenous Peoples Rights and Traditional Areas, Emerging Impact Areas, then also there are some Wider Impact Considerations which are upcoming. So, will be in our part one we are going to only look at today, the biophysical impact areas.

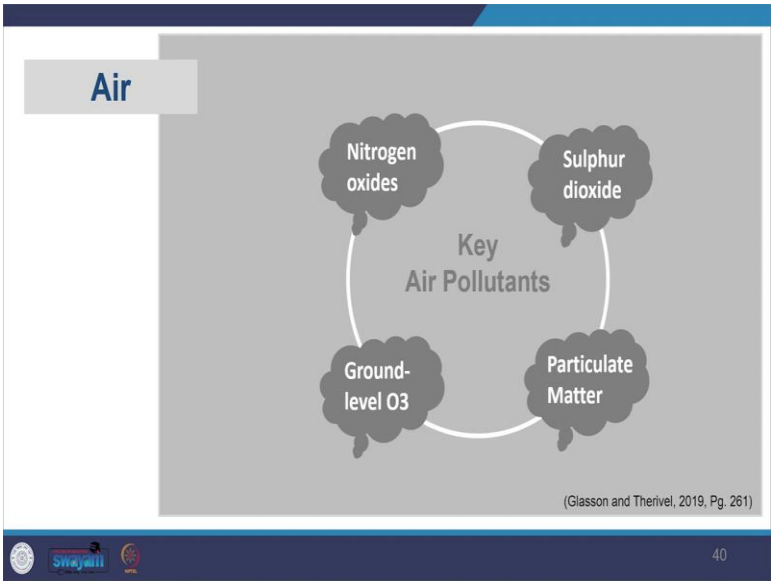
(Refer Slide Time: 14:58)



So, looking at what all is usually considered under biophysical impact. We look at air, soil, land and geology, water, we look at flora, fauna and biodiversity, we look at noise, transport, and landscape, we also look at the visuals, each one of them will be covering in detail in the methods section also. So, right now, it is only for to

give an overview of what all impacts are considered, each one of them will be considered in detail in the methodology section.

(Refer Slide Time: 15:31)

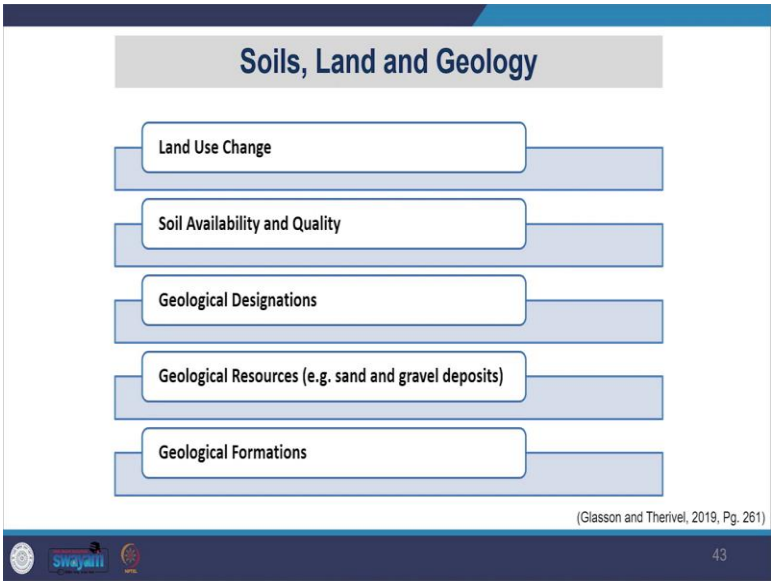


So, we had looked at the environmental status of air and what kind of problems we are facing and to what extent so, we saw that how air quality is going down despite improvements. So, if you recollect those sessions, when we assess impact, so when we are evaluating the impact on air, what do we really look at?

We look at key air pollutants like what is the nitrogen oxide levels, sulphur dioxide level, ground level, ozone, and particulate matter? So, we look at these areas, there are like legal standards, how do you really know what is more or less and then there are legal standards for these and other air pollutants as well at the national and international levels by the World Health Organization.

WHO within air sometimes as per the legal requirements, it might vary from country to country, and also sometimes country may also include order that you might have to consider in the impact assessment. So, impact assessment for air quality is very well established under the EIA process. So, we see that they have a very good methodology and all these standards are in place and most of the countries.

(Refer Slide Time: 16:55)

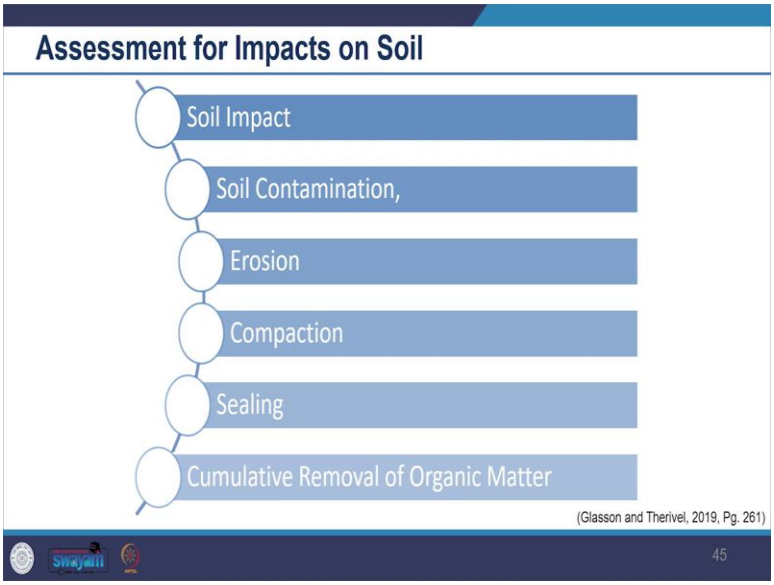


So, under soil land and geology, we cover like we look into land use change, we look into soil availability and the quality of soil. And then we also look at the geological designation like what types are there and then geological resources example like what resource we get sand, gravel deposits.

Which are there and geological formation that like what constrained or facilitate the project or if anything goes happens and how the entire area would behave. So, these things are looked into while considering the soil, land and geology. So, we generally see that the impacts on land are usually cumulative. So, if you live in various places.

So, you will see that whenever the impact happens on land, it is usually cumulative, it happens for a longer periods of time, and it happens with all the other activities simultaneously going in the place. And what when we say it usually happens in a cumulative manner, meaning it occurs over time.

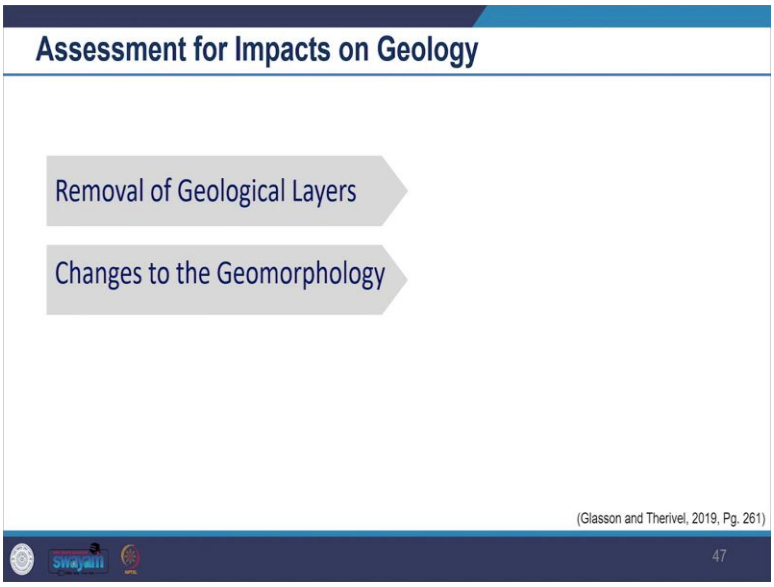
(Refer Slide Time: 18:05)



For example, how developed area witness gradual urbanization, so anything you have in one place, it would attract other activities and then eventually the place would grow and it would happen gradually in some due course in time. So, when we do this, we look at larger perspective, and when we assess the impact on soil, we look at the soil contamination.

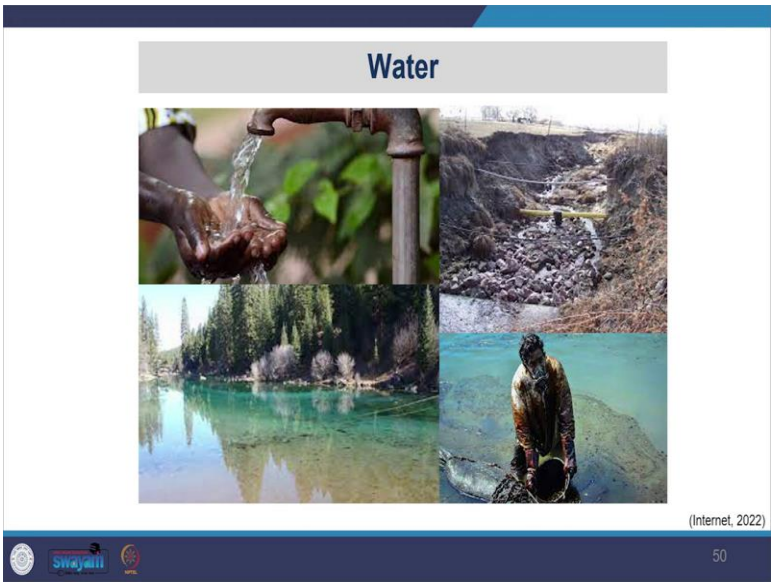
So, we are exactly looking at the heart core characteristics of the soil. So, we will look at the Soil Contamination, Erosion, Compaction, Sealing, and the Cumulative Removal of Organic Matter. So, if you will see the difference between the two, when you are studying the land, you are looking at the kind of land use, what it is going on and how it is other user coming in. And when you are looking at the soil, you are looking at the characteristics involved in that and then the quality of those characteristics.

(Refer Slide Time: 19:05)



So, while reviewing impact on geology, we look at like when we do that removal of geological layers and changes to the geomorphology. So, when we do certain kinds of projects, how those geological layers are going to change, or what will happen to the entire geomorphology there. So, in general, this domain has been not covered very well in the EIA process. So, when you see this geomorphology aspect, that is not really covered a lot in EIA process. So, this still evolving area.

(Refer Slide Time: 19:43)



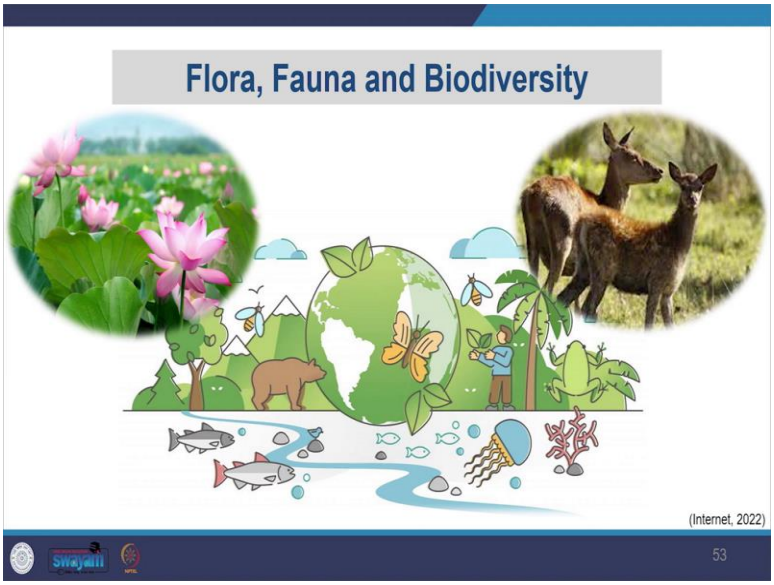
While looking at water, when we look at water component for environmental impact assessments, we look at both the water quality as well as water quantity. So, when we are assessing water in our EIA procedure, we look at both quality and quantity, water also act as base environments for many specific areas.

So, if you see that the water is connected to lot many other things like freshwater, (())(20:13) and marine, furthermore, it also leads to indirect impacts. So, like whatever will happen to water it will have impact on the

flora and human health, what it can also cause erosion flooding on land, so that it can lead to other impact and other resources as well.

So, most of the countries follow standards for quality of for drinking water, wastewater, bathing water and so on. So, you can look in the Indian context also the CPCB provides all these standards, there can be limitation on the volume of water withdrawal also. So, capping can also be done for that countries and different regions can cap that as per the context. And the limitation can also be given based on the area as well as per the seasons to protect the water quality and also the aquatic ecosystems.

(Refer Slide Time: 21:12)



So, now looking at Flora, Fauna and Biodiversity, while we are doing at the biophysical environmental impact assessment, it is a very vast topic. So, what we are talking about here, it is a very wide range, it is very complex and covers like birds, fish and mammals and also the conditions under which they nurture like how what really helps them to grow.

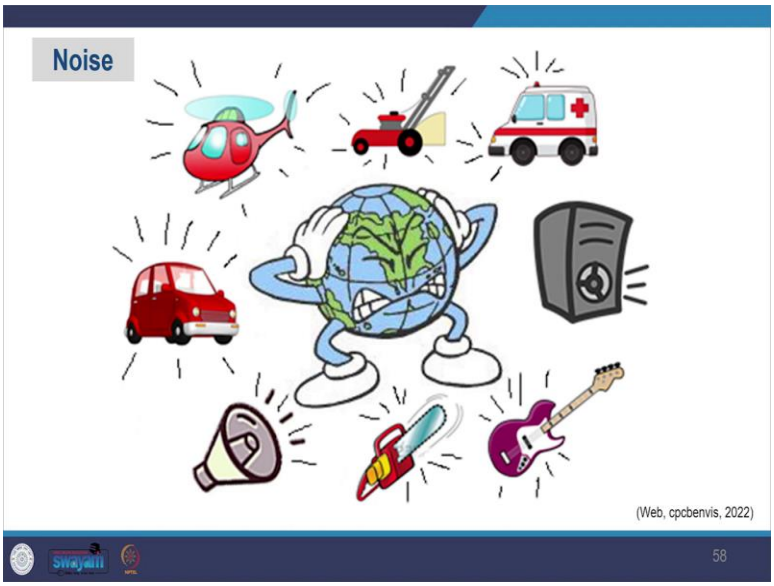
Such as biomass, you can think of the vegetation and other species, variations. So, all these get called are covered under this topic. Also, they are indirect impact of air, water and soil quality. So, all the other things also impacted. So, there are, like in order to protect that there are interventions at international level.

And despite these interventions, we see that lot of loss and decline is happening as we had already seen in the previous week. Because of it is, we also see that it is very complex. Now you can see how it is connected with air, water and soil as well as there is wide variety. So, because that is why it is very complex, and it is also interconnected.

And then it is connected with food, web nutrients flow, and then even the climate change. So, this is very complex. And because it is very complex, it is like it is said to be poorly covered in the EIA process. So, we are

now increasingly considering ecosystem services also. Which ecosystem services means the benefit which we get from the ecosystem, it is relatively new area and it is gaining attention so we are going to look into it in couple of sessions as well.

(Refer Slide Time: 23:06)



Further we also consider noise, noise in EIA process. So, considering noise, noise can damage human health and their well being, noise interferes with communication, increases stress, disturbs sleep. There are a lot of health impacts which happen and can lead to high blood pressure, also increased stress level, reduced efficiency and increased risk of heart attack.

So, all these problems can happen, health problems can happen and noise also affects wildlife. So, not just the human health, but it also affects the wildlife and vibration can affect building stability also, so it can also impact the infrastructure which we have around. So, prolonged exposure to high noise levels can cause deafness or partial hearing loss, noise can also change the character of the landscape or historical setting and it can also affect the property values.

So, there can be economic impact also and then also the community a small sphere might change and the quality of life my change. So, there are several impact which you can see here. So, noise may also affect the wildlife as said the domestic animals and in certain cases in EIA, there might be need to include specialists to undertake these studies.

So, in many of the EIA, we see that not much focus is given on wildlife, we will study this particular segment in detail in the methods section as well. So, obviously, that in while we evaluate noise, we have certain sets of guidelines which are there. And emphasis is also given by WHO, which have identified noise as one of this second largest environmental risk to public health and it is second largest after the air pollution.

So, they have also developed certain standards for this. Now, we see that understanding and assessment process for noise is considerably well established in EIA, with available evidence of the like, you have computerized models which allow you to model the noise impact, there is good understanding of how to assess noise in EIA with all the models available.

So, if you will think and reflect most of all development projects have noise impact, so you cannot really think of any development project which does not have noise impact. So, you think of noise is generated during the construction activities, then it would be during the foundation work and maybe it can be because of the transportation also.

Which is like during the construction work, you may also think of noise which are generated during operational phase also such as with the industries when it is an operating then you might also have noise from there. And also many times when projects are decommissioned. So, when they are demolished, also you might have noise pollution.

So, in almost all the assessments noise is considered. So, this is very, very key area, you see that the second most important area of concern after air pollution. So, that was about the noise now looking at the transport impact.

(Refer Slide Time: 26:45)

So, we see that transport is a key factor for any development project, it is important for accessibility like for us for any resident or the employees and the customer to move around the mobility aspect. So, every development project will have strong inter linkages with transportation, so any project which comes up so, it is going to have impact on the transport.

So, the impacts vary with the nature of the project. So, depending on what kind of project is coming, so, project can be transportation itself, transportation project itself, like you might be constructing highway, high speed rail or you may generate transportation demand, project can be of transportation itself, like you can have highway, high speed rail, and these may also generate transportation demand.

So, impact of both the types may vary in range, the impact vary with the nature of the project. Project can be transportation project itself. So, that itself like you are building highway, high speed and rail or they can be another kind of project which generates transportation demand. So, in both the cases where if your project is transportation itself and the other case is you are generating demand for transportation.

In both the cases the type of impact may vary, and also may vary in the range. And they will have different types of environmental and social impact, such as it will affect the noise level, air quality level, increase or reduce the accident rate or affect the accessibility. So, it could be both positive and negative as well.

So, transport project can also have significant cumulative impact, such as bifurcation of the habitats. So, like if a road is going from somewhere or rail line is going, then it might divide the two, divide the same area into two parts and they would disconnect each other. So, that kind of impact could also happen.

And then it might also lead to cumulative impact of like, in changing land use and then changing density also. And for transportation project, usually, EIA is required most in most of the countries by law. So, it is very well established domain for other type of development where it is known transport nature development.

Such as if you are developing industry where you are developing factory or you doing the large real estate project, that will all include considerable consideration for environmental impact of transport, due to movement of people and goods generated during the, like it would be generated during the construction period and also during the decommissioning period even during its functional period.

So, we see traffic is increasing concern and traffic problems and its impacts are also increasing, leading to air pollution to delay. So, this domain is well established like both the areas where you have the transportation or impact in transportation. So, they are both well established and established and you would find a lot of methods to undertake this.

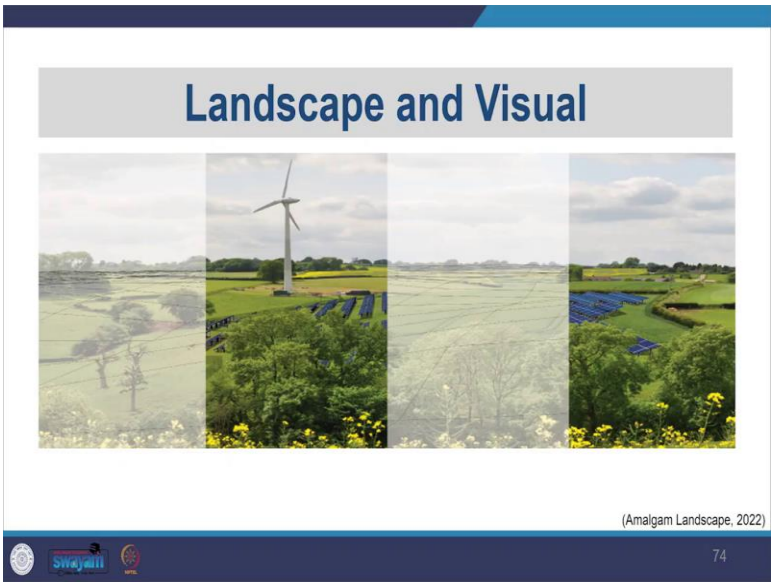
Also you would see that the geographical extent of impact of traffic is also quite large, and then the problem at one place can influence the traffic performance at the very distance place also. So, if you think about the typology, which we discussed in initial phase of this lecture, we did talk about the geographical extent of particular impact.

So, for such kind of projects, you can have larger impact. So, both proposal for new in transport infrastructure and the travel generated by other development will cause environmental impact. And this, these can include

noise, vibration, air pollution, impacts on biodiversity community, severance, visual intrusion can also happen and then accidents, chances also increases.

And it is very important that the good access is also provided for economic regeneration. So, transportation is important, so that it, because it connects and it is important for the economic purpose also. So, depending on the context, many methods are available, which we shall see later.

(Refer Slide Time: 31:25)



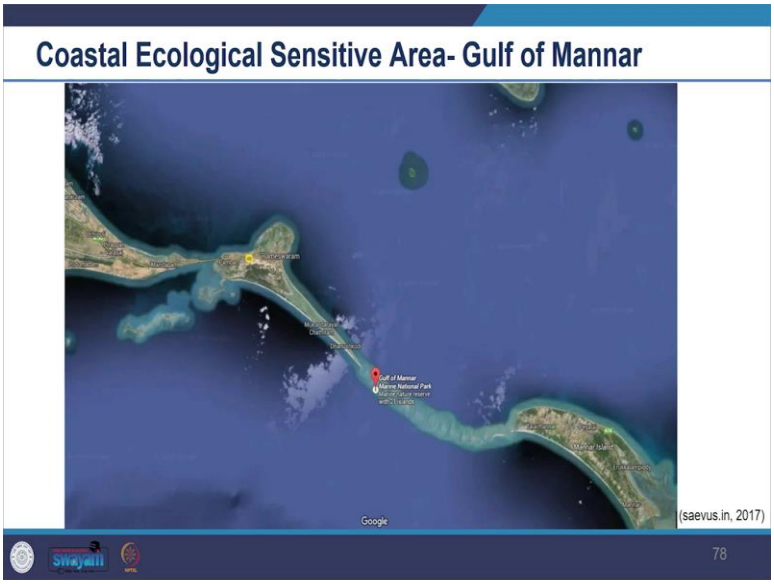
So, now moving on to another domain of analysis impact, we see that studies also consider landscape and visual impact assessment. So, let us try to understand the difference between the two. So, what is the difference between the landscape impact and what is the difference, what is about the visual impact.

So, while we assess impact on landscape, we try to indicate change in the landscape. So, we try to explain or describe how the character will change. So, what will happen there and then the quality of landscape will change over there. So, the quality also, the character also, whereas while we are assessing the visual impact.

So, we see how visual impression of the landscape changes with the project. So, visual is like just looking at the visual elements of it. But then when you talk about landscape, landscape would be a broader concept which we are looking at. So, landscape is a broader term and encompasses or connects with like ecology, ecosystem services, heritage.

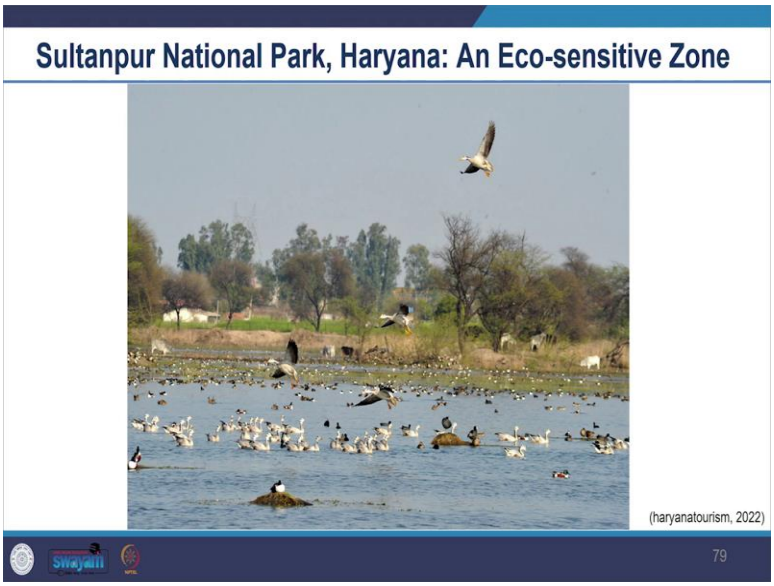
And it can also include historic landscape, and then also like all the elements of residential resources and safety and security. And we see that number of countries protect some of the landscape by giving it designation also, some landscapes are very sensitive.

(Refer Slide Time: 33:00)



So, they are given designation for their protection, like we have enlisted aqua, like we have enlisted aqua sensitive areas. So, in this image, you can see coastal ecological sensitive area of Gulf of Mannar you can see here.

(Refer Slide Time: 33:17)



You can see Sultanpur National Park Haryana, this also identified as eco sensitive zone. So, if you think on it, like, unlike others, where you saw the air pollution. You talked about water pollution, noise pollution they are very quantifiable. So, unlike them landscape and visual assessment, what we are talking here is more of a qualitative in nature.

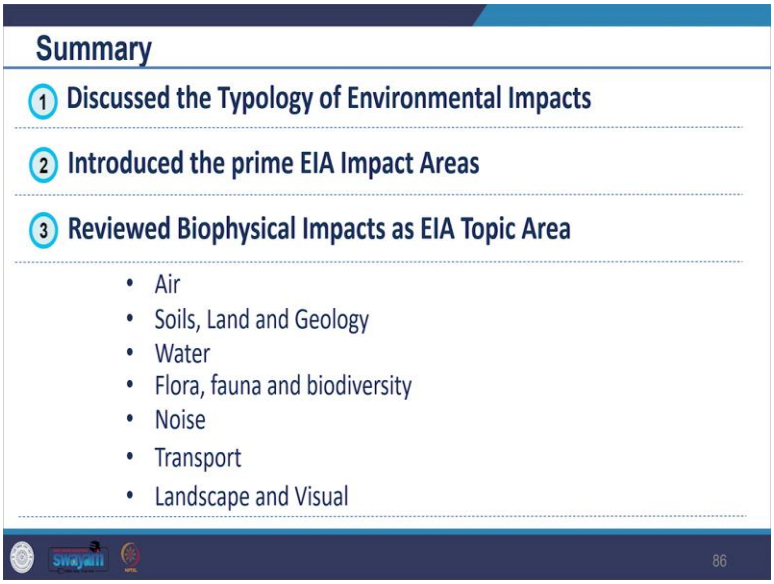
So, the techniques and tools which we use here differ a lot, and there is no standards for these things. And what is the significance of this impact would also depend on the quantity of landscape and any designation on it. And it would also depend on the community which is on the receiving side here.

So, understanding landscape, landscape is an important part of the quality of life for people wherever in urban areas and in countryside, in the degraded areas, as well as in the areas of high quality, in areas recognized as being outstanding beauty as well as everyday area. So, this is how the landscape is defined by the European landscape convention.

So, it is a very significant part of it. And a landscape provides setting for day to day lives also. So, that ways, it is important for various communities specially when we talk about the indigenous people here. So, the projects, which we see can result in effect of landscape character or quality and the views experienced and values of the local population.

So, landscape effects can be described in like the changes what are happening there, what kind of character change is happening, what kind of quality changes happening, so, while you do the assessment, you look into that kind of area.

(Refer Slide Time: 35:21)

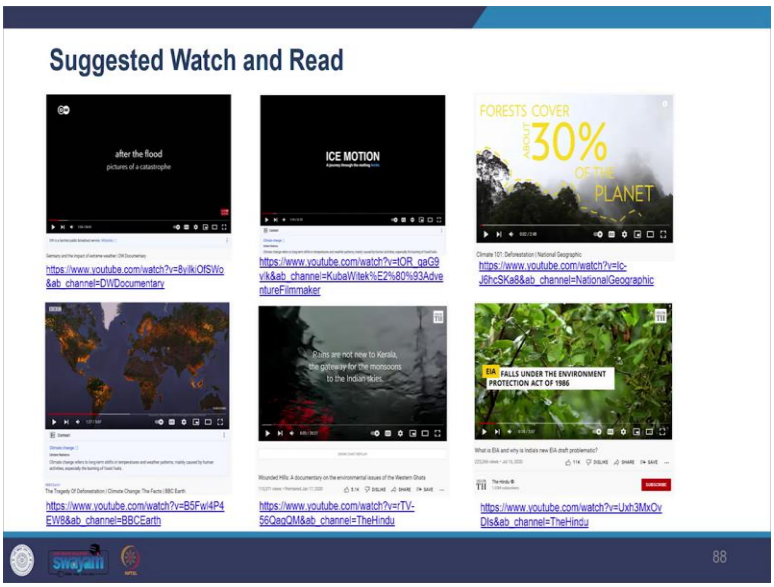


So, summarizing this session, in this lecture, we looked into the typology of environmental impact, we also introduced range of impact areas, which are generally addressed through EIA process. Then we focused on the biophysical environment topics, and in that we looked at Air, Soil, Land, Geology, we looked at the water component, what do we look into it Flora and fauna and biodiversity. And then we looked into noise level, and then landscape and visual.

(Refer Slide Time: 35:55)

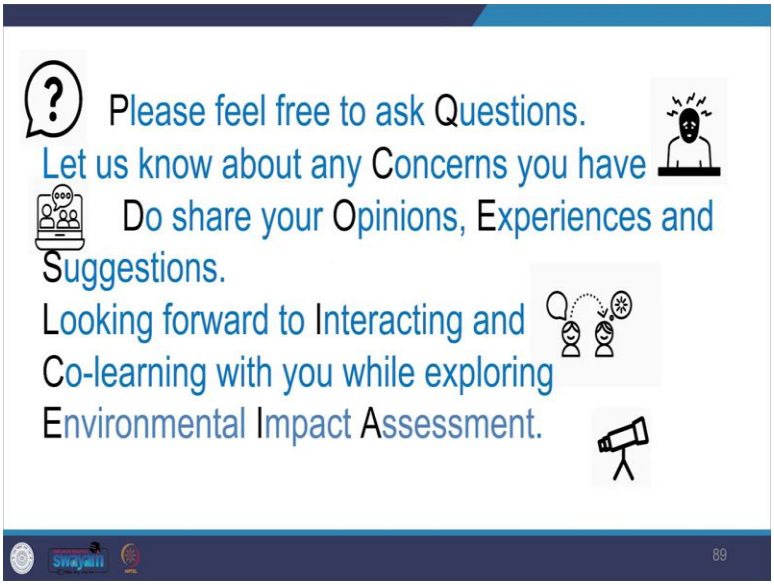
So, these were the references for this particular session. And I have also mentioned which is the key text for our reference here.

(Refer Slide Time: 36:03)



And these are the suggested watch and read for this particular session.

(Refer Slide Time: 36:09)



Please feel free to ask questions. Let us know about any concerns you have to share your opinions, experiences and suggestions, looking forward to interacting and co-learning with you while delving into environmental impact assessment subject. Thank you.