Environmental Impact Assessment
Professor Harshit Sosan Lakra
Department of Architecture and Planning
Indian Institute of Technology, Roorkee
Lecture 54
EIA Methods - Cumulative Effects

Welcome to the course Environmental Impact Assessments. And in today's lecture, we are going to look at how we undertake cumulative impact assessments. This will be undertaken within the larger umbrella of EIA methods. So, we will see what kind of things are taken care and while we deal with cumulative impact assessment. So, the key reference for us for this particular session is chapter 19 of the book Terrible and Bots.

Moving forward into this, we have already seen what is cumulative impact, and we have seen certain examples of that as well. So, today, we are going to look into the methods part certain guidelines that are available, and examples of how it is undertaken.

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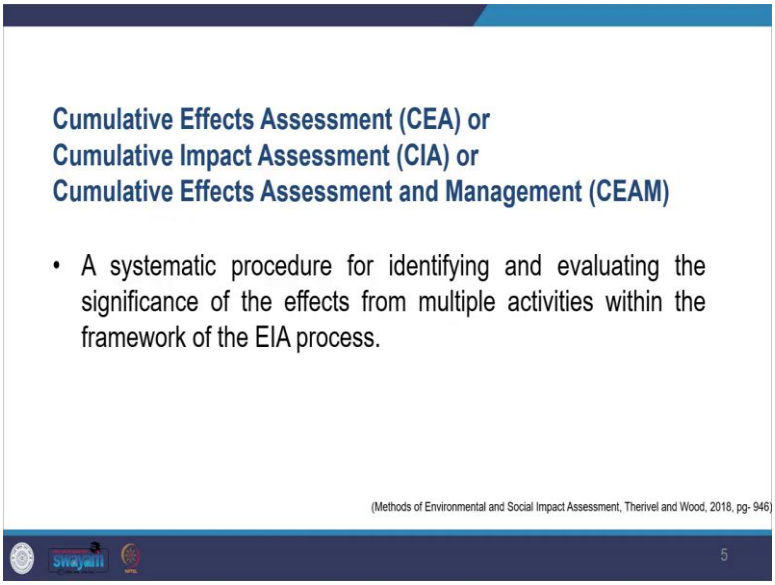

So, just to recap what cumulative effect assessment, is like, it is said to be a systematic procedure, where we identify and evaluate the significance of the effects from multiple activities within the framework of the EIA process. So, the key thing that we need to understand here is the impact effects of multiple activities. So, just not the project, what a range of projects or other things, which will go in and around the place of your concern. So, that is what we talk about when we deal with cumulative effect assessment. And you will see you will come across a lot of other terminologies apart from Cumulative Effect Assessment, you would also come across Cumulative Impact Assessment, CIA.

You will also come across Cumulative Effects Assessment and Management, CEAM as well. So, they all will be more or less dealing with the same aspect, even if you come across different words. So, looking at the purpose of the CIA.

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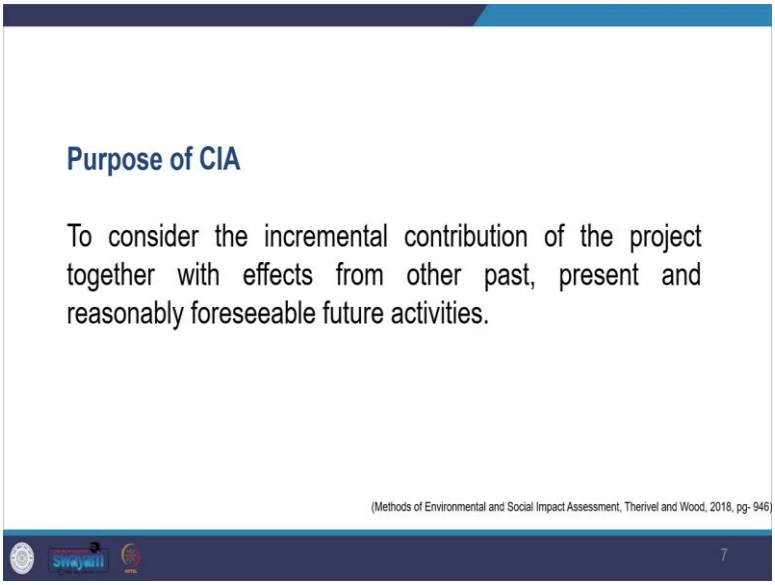

As you consider the incremental contribution of the project, together with effects from not just all the projects together, you also look at the past, and present as well as you look at the future possible activities, which will come up. So, you have a complete assessment of what is happening at that particular place. And with this, you might also realize how complex it is and also what kind of methods might be involved. And currently, it is said that the approaches are fairly inadequate. So, today, in this particular session, we are going to cover.

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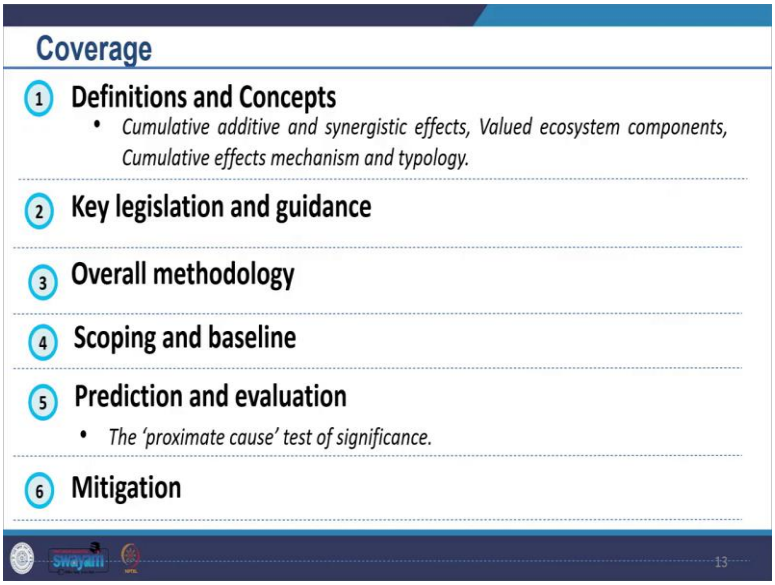

We are going to look into the definitions and concepts of cumulative effects assessments. So, we will be looking at what are the different concepts involved in the additive synergetic effects, then how what are the different perspectives involved in it relate with, and value the ecosystem components, and we will look at the cumulative effects mechanism and type of logic involved in this. So, that is what we will cover in the definitions and concepts. But then we will look at certain key legislation and guidance, like what is the scenario with this at this moment, and then we will look at the overall methodology, then we will look at these coping and baseline the format which we have been following.

And then we will look at how we undertake prediction and evaluation and then what is done when we deal with cumulative effects, and what kind of mitigation measures are taken, so we will just look into the approach related to that.

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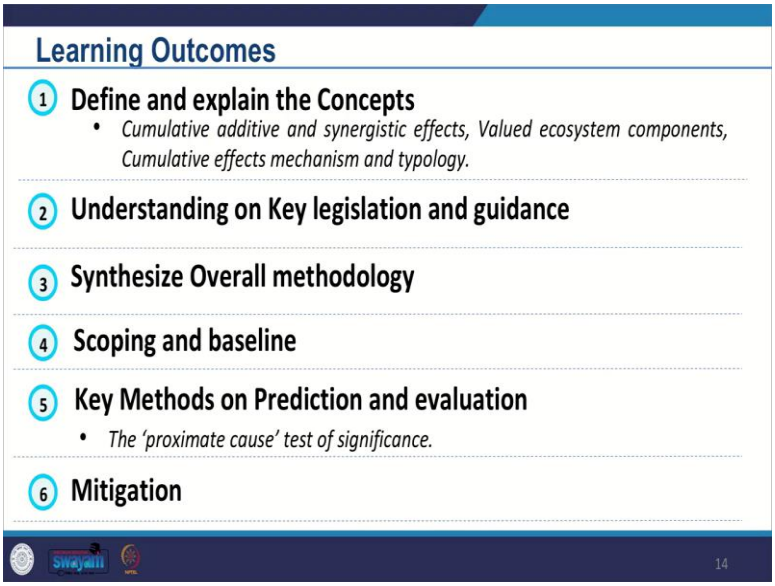

So, accordingly the learning outcome, the expected learning outcome would be that you should be able to define and explain certain concepts related to cumulative impact assessments and what additive or synergistic effects and so on. Further, you should be able to give an understanding of key legislation and guidance and what is the context at this moment, so that you should be able to explain.

You should be able to synthesize the overall methodology that is involved and then identify key steps that one should take in scoping and baseline assessments. And then similarly, you should be able to identify key methods used in prediction and evaluation and identify approaches used for mitigation purposes. So, that is the learning outcomes expected from you after you complete this particular session.

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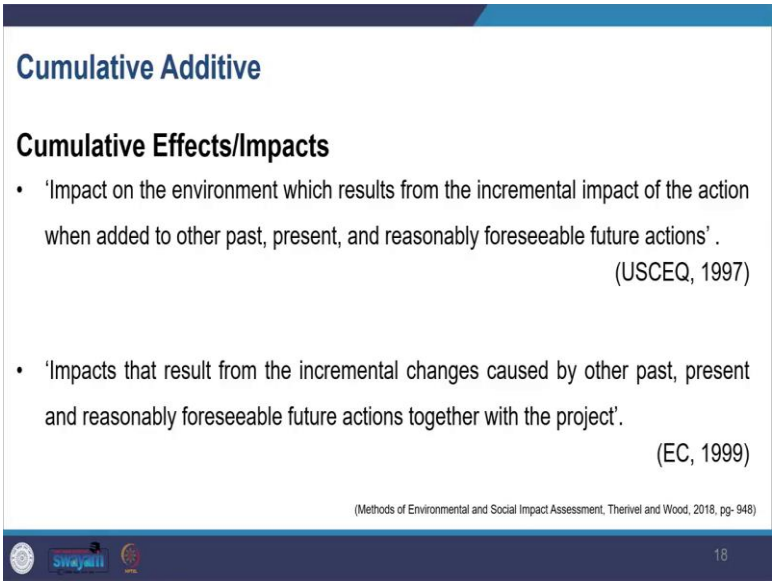

So, looking into definitions and concepts, so, looking at first what like, cumulative additive and synergistic effects are, so, the like the impact on the environment, which results from the increment, till impact of the action when added to other past, present and reasonably foreseeable future actions.

So, that is what we call cumulative, we are looking at the incremental how slowly, gradually, what is happening to the environment, given what was past, what is present, and what is going to happen in the future. Likewise, the definitions also say that impact, cumulative impacts that result from incremental changes, what kind of changes are happening in the past, and present, and what kind of change will happen in the future when you take all of them together with the project.

So, that is what is said to be cumulative. So, these are some of the definitions which you see.

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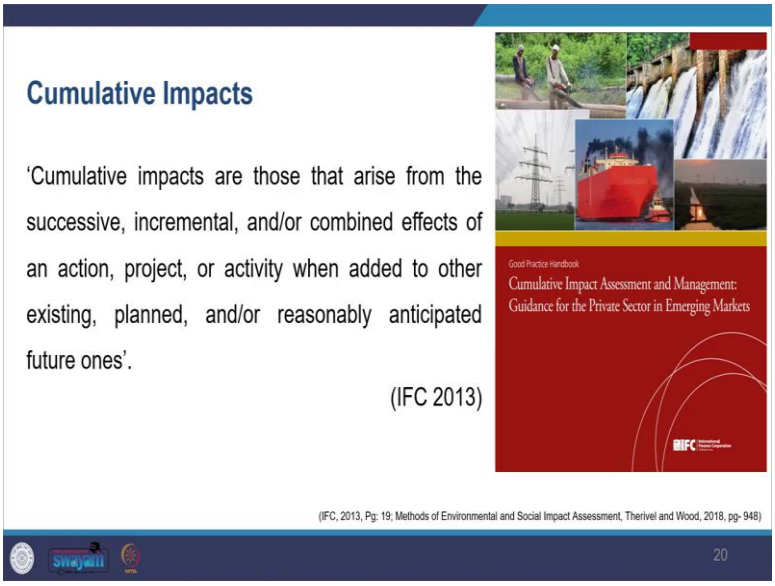

So, our cumulative impacts are those that arise from the success of incremental and combined effects. So, not just like taking it together, but in an incremental manner as well. And then also or like, how do you look at the combined effect, not only just one effect but the other effects and together effects, what kind of effects would happen from the project and series of projects, which might come in future as well. So, that is what we talk about when we talk about cumulative impacts.

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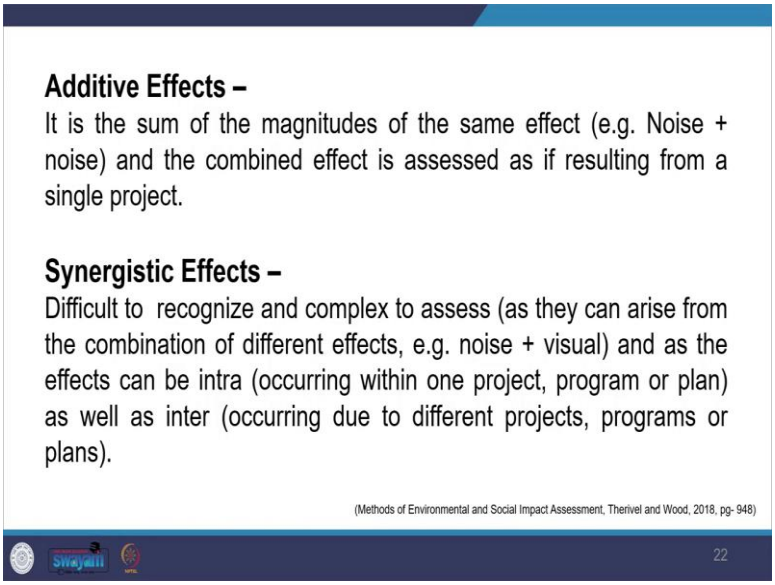

So, now looking at the additive effects was what is like additive effects, you might pay attention here. So, it is the sum of magnitudes of the same effect. So, when we say additive effects, like whatever same effect, if you are dealing with noise, we are looking at the in one particular context, we are looking at noise coming from one source and noise coming from the other source. So, what is the combined effect of that particular effect on the overall environment? So, that is what when that is what we mean when we say additive effects. So, noise plus noise would be the cumulative results and effect which would be called additive effects.

Likewise, you see another term which is synergetic effect. So, in this, it is really difficult to recognize this and it is also very complex to assess and evaluate this, but what conceptually it means is when there you have all the effects combined, so that becomes a synergy of different effects, like noise coming from one place that is coming from another place, and there is visual distortion and other. So, that would be a synergetic effect. So, like with all kinds of effects, how do you get a sense of that particular place, what it results in for that particular environment, that would mean synergetic effects.

Further, we see that you will come across some more terms. You will see it by IEMA. So, it gives one term which is intra-project effects.

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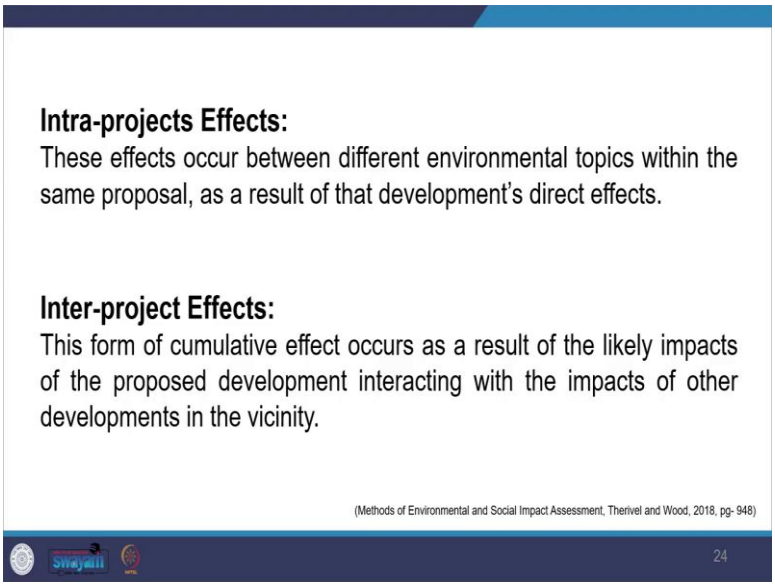

So, these are effects that occur between different environmental topics within the same proposals, so within that same project itself, how different domains or effects deal with, so that is intra-project effects. And then you also have inter-project effects. So, this form of cumulative effect occurs as a result of the likely impact of the proposed development, interacting with the impacts of other developments in the vicinity. So, what happens from one project and what happens from the other project, and together how, what is the result of all those impacts? So that is inter-project effects.

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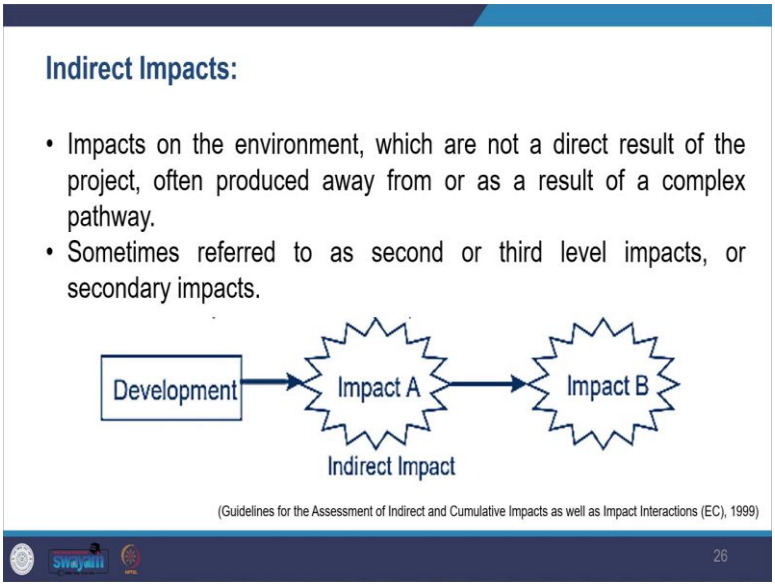

Further, you can see an indirect impact. So, how do we look at or differentiate with cumulative impact or there might be overlapping understanding here? So, impacts on the environment which is not a direct result of the project often produced away from or as a result of a complex pathway. So, that is said to be an indirect impact and sometimes referred to as a second or third-level impact or secondary impact as well. So, that is an indirect impact and we had seen this in our initial lecture. Now see what is cumulative impact here.

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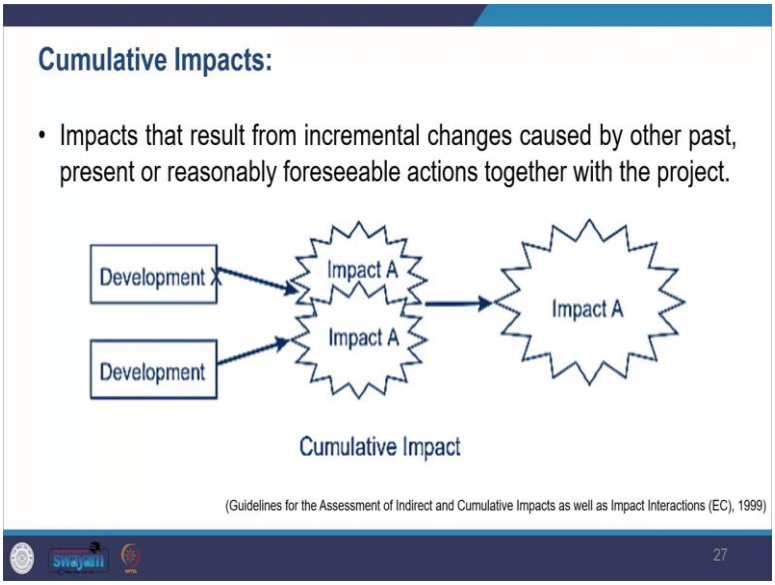

You can see the impact that results from incremental changes caused by the other past, present, or reasonably foreseeable actions together with the project. So, you have to see impact A, impact A, and impact A in the future and then from one development to another development. So, what is happening there, so, you see that way.

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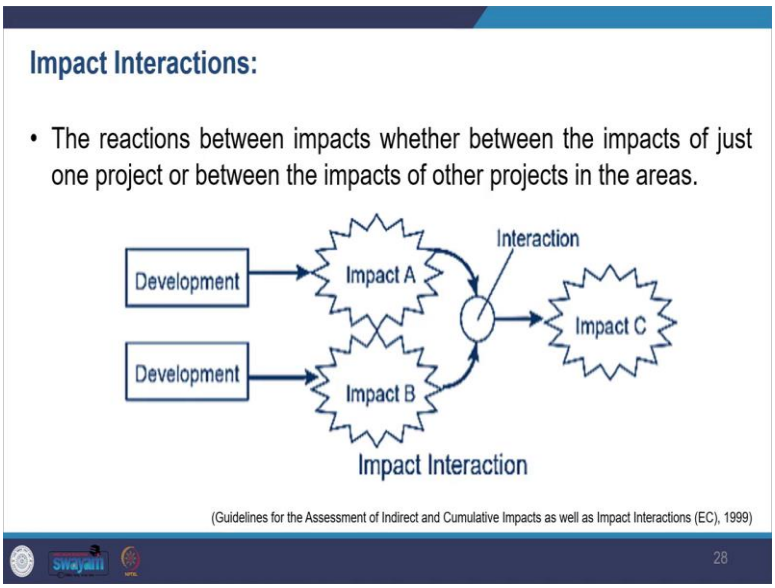

And then you also see impact interaction. So, the reaction between impacts was whether between the impacts of just one project or between the impacts of the other projects in the area. So, you will see impact interaction impact A, impact B causing impact C from development A and development B. So, this is impact interaction. So, now, looking at another concept key concept, when we deal with cumulative impact assessment is a valued ecosystem component. So, you will see that we have seen these value ecosystem components before also.

But here in the context of cumulative impact assessment, our focus with cumulative impact assessment is on valued ecosystem components rather than on the project and its impact rather, we see what is happening

with valued ecosystem components, the ecosystem components, that are valuable to the people with whom we are dealing with. Then there is another term which you see is the valued components.

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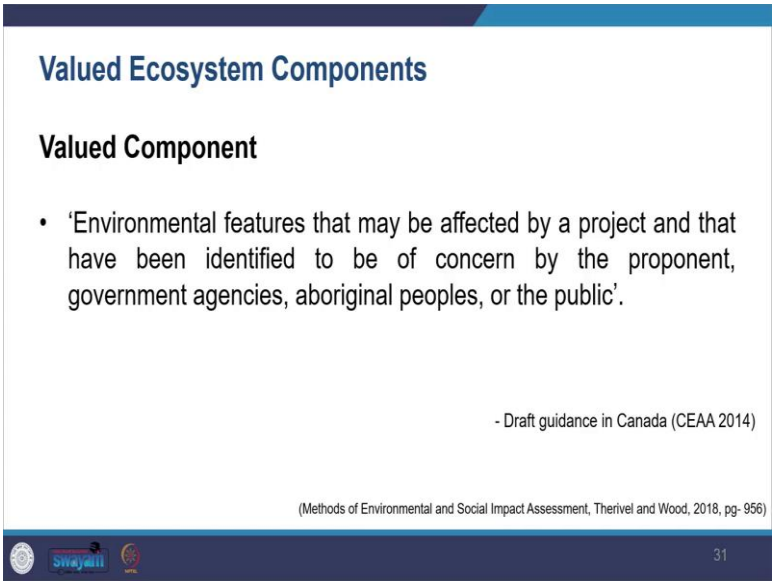

So, here, you will see that it means it talks about conceptually covering environmental features, that may be affected by a project and that have been identified to be of concern by proponents, government agencies, aboriginal people, or the public. So, that is also said to be a valued component. So, you might find this term as well. So, taken from the guideline here, you see the difference between EIA and a cumulative impact assessment.

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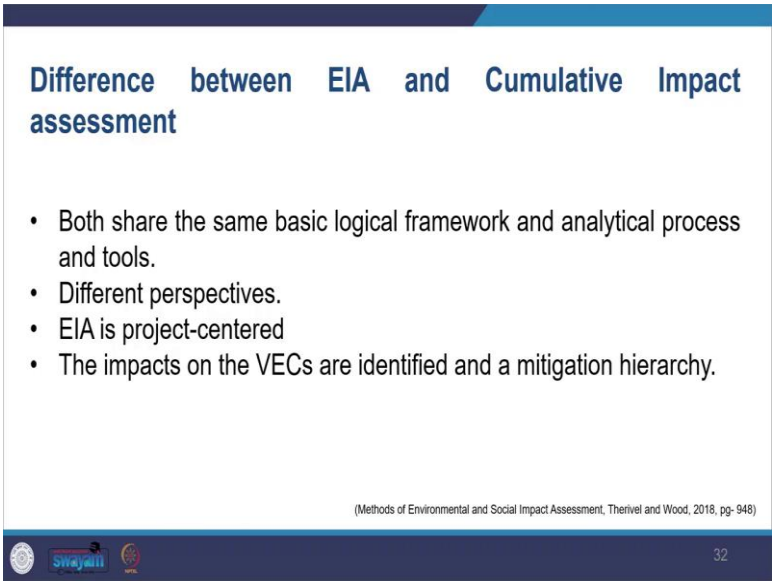

So, both share the same basic logical framework. So, when you do EIA or cumulative impact assessment. So, both have a logical framework it all proceeds in the same manner. In the analytical process and tools also same processes and tools are used while you do cumulative impact assessment. The difference key difference between EIA and cumulative impact assessment is of the perspective how from what side, what is the prime focus, so the difference is between the perspective and we see that EIA is project center. So, when

we look at the project, and based on the project, we look at what impact it is going to have. So, our complete focus is on the project.

While we are looking at the impact, we see what impact it will have on the valued ecosystem components of VECs. So, if there is a project, what will happen to the VECs then we try to mitigate it, and then we try to deal with all kinds of residues through the environmental management plans. So, that is how we have been dealing with EIA, but what happens with cumulative? So, in cumulative impact assessments, the focus is on the valued ecosystem component.

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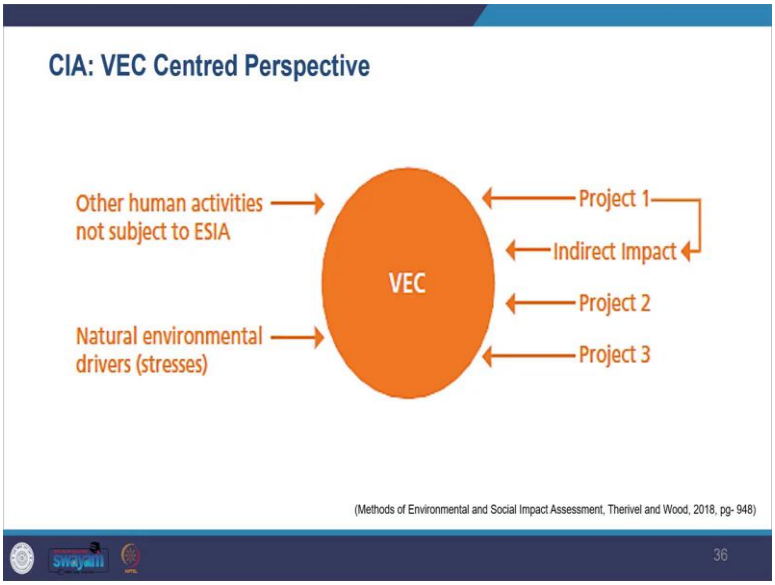

Here you see the area considered is the area in which the value ecosystem component is there. So, our focus is on VECs, which is where other stresses because of the development of human activity for all these may affect them. So, we focus on the recipient more than the project. So, once the other impacts have been identified, the cumulative impacts are assessed as resulting changes in the condition of VEC. So, we try to see what is happening with the VEC rather than trying to see with the project, we here in cumulative impact assessment, try to see what is happening to VEC because of Project 1, project 2, project 3, human activities, natural environment, drivers and stress from all perspective what is happening to VEC.

So, that is what is the key difference between cumulative assessment. So, further, you see, in a similar line IFC tells like there are two components to cumulative impact assessment.

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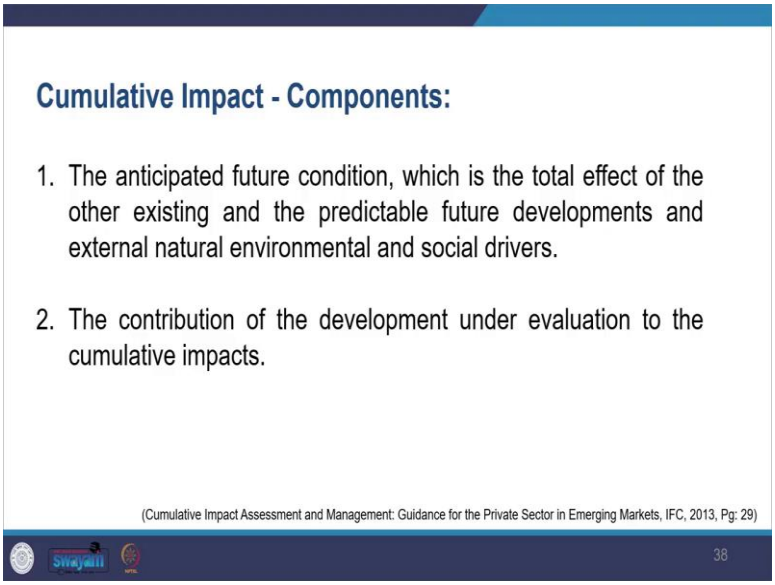

So, one is about anticipated future conditions like what is going to happen, which is the total effect of the other existing and like, what is there and what is going to happen, and also the external natural environment and the social drivers just now what you saw in the diagram. So, that is the first stage, the first component of cumulative impact assessment. And the other component is the contribution of the development under evaluation to the cumulative impact. So, whatever project you are doing, what is the contribution of that development to the cumulative impact? What is going on what you are evaluating?

So, overall thing, what is happening to EC plus, how your project is going to impact or change positively or negative change to overall, what is happening to that particular VEC? So, that was about definitions, now looking at some of the mechanism and typology.

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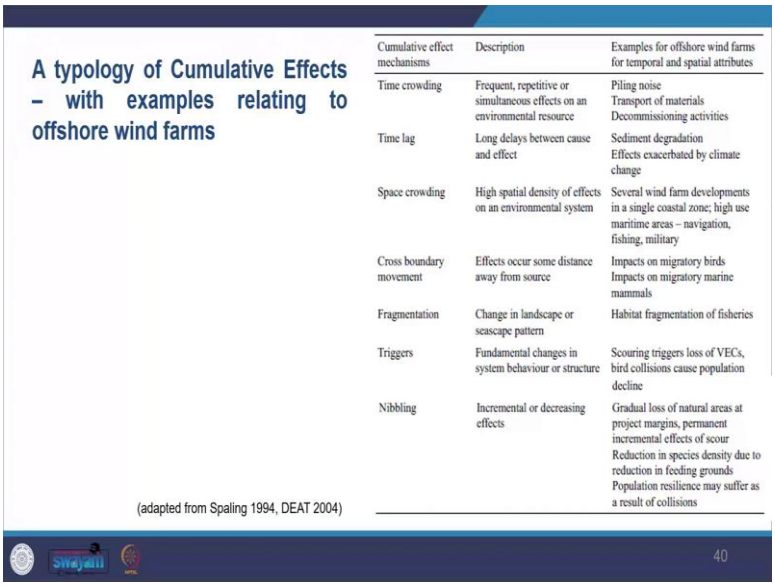

Cumulative effect mechanisms	Description	Examples for offshore wind farms for temporal and spatial attributes
Time crowding	Frequent, repetitive or simultaneous effects on an environmental resource	Piling noise Transport of materials Decommissioning activities
Time lag	Long delays between cause and effect	Sediment degradation Effects exacerbated by climate change
Space crowding	High spatial density of effects on an environmental system	Several wind farm developments in a single coastal zone; high use maritime areas – navigation, fishing, military
Cross boundary movement	Effects occur some distance away from source	Impacts on migratory birds Impacts on migratory marine mammals
Fragmentation	Change in landscape or seascape pattern	Habitat fragmentation of fisheries
Triggers	Fundamental changes in system behaviour or structure	Scouring triggers loss of VECs, bird collisions cause population decline
Nibbling	Incremental or decreasing effects	Gradual loss of natural areas at project margins, permanent incremental effects of scour Reduction in species density due to reduction in feeding grounds Population resilience may suffer as a result of collisions

So, looking at the mechanism that causes cumulative effects, they are put into categories in several different ways according to the spatial and temporal attributes. So, the typology of cumulative effects, which incorporates temporal and spatial attributes, we can see some of the typologies here. So, you see, we have partially covered this before as well, you may recollect that, so, you see the typology cumulative effects

mechanism here. So, one is time crowding, which means that in a way it occurs in time as the kind of frequency with which it occurs repetitively or simultaneously affects the environmental sources.

So, if there is noise happening from all the sources at the same time, so, that is a piling noise and then in terms of time lag, it is like a long delay between cause and effect. So, like in a cumulative manner, you can have sediment degradation effects, which are worsened by climate change. So, all that can be considered within the time lag. Then you see, space crowding, if you can recollect high spatial density of effects on an environmental system, you can see that the lot of things in the same place, so, that is said to be the space crowding, then you have cross-boundary movement.

So, effects occur some distance away from the source, so what is happening at the project site or beyond the project site? So, impacts migratory birds, and migratory marine mammals. Then you have another mechanism, which you see fragmentation, change in the landscape or seascape pattern. So, we talked about fragmentations also how they get fragmented. So, habitat fragmentations of fisheries and so on, and then you also see the triggers. So, the fundamental changes in the system behavior or structure trigger that behavior, and the behavior changes.

So, you have like, you lose those VECs because of the certain kinds of changes. So, that is what is called about triggers. Then the nibbling, nibbling is about incremental or decreasing effects. So, gradual loss of natural areas at project margins, permanent increments effects of scar, and then a reduction in species density and so on. So, that is that type of logic, you can see here, time crowding, time lags, space crowding, cross-boundary movement, fragmentation triggers, nibbling, so, that was about typology of cumulative effects. It was very specific to the wind farm project can be these examples for specific to that.

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Now looking at the key legislation and guidance. So, in the Indian context, we do not find that is being currently implemented through the legislative tools, but there is a lot of debate and discourse going on.

However, we see that the European Union has EIA directives, which define it and also make it inclusive in the project and also identify those kinds of context that lead to an assessment of cumulative effects.

So, likewise, you also see in the USA, they have addressed in their environmental impact statement itself within their neighbor. So, within that itself, they have recognized cumulative effects and then they have described that it should be included in the process.

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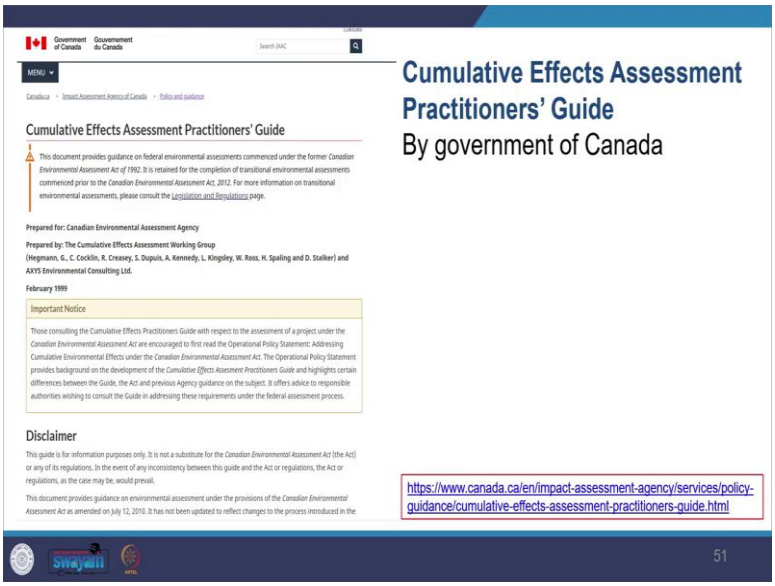

Then you also see in Canada, they have an assessment of cumulative effects, which has to be undertaken. It is specified in the act, and then the act requires the EIA to take into account any cumulative effects that are likely to arise from the designated project in combination with other physical activities that have been or will be carried out. So, Canada has that in their legislation. So, that is a very brief about the key legislations here, looking at the guidance and standards, so there are a lot of guidance and standards which are available.

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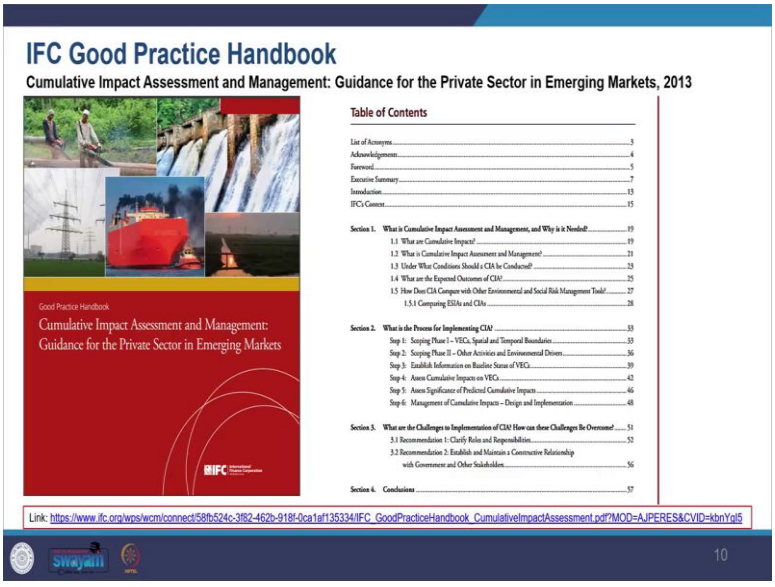

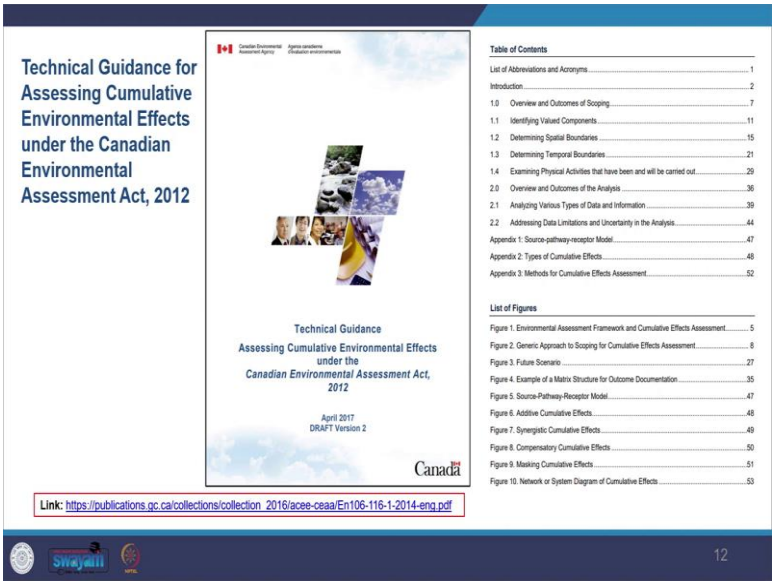

So, you can see IFC has given guidance. Then you can also see here, cumulative effects assessment practitioners guided by the government of Canada. I have also given you the link so, that you can browse to this.

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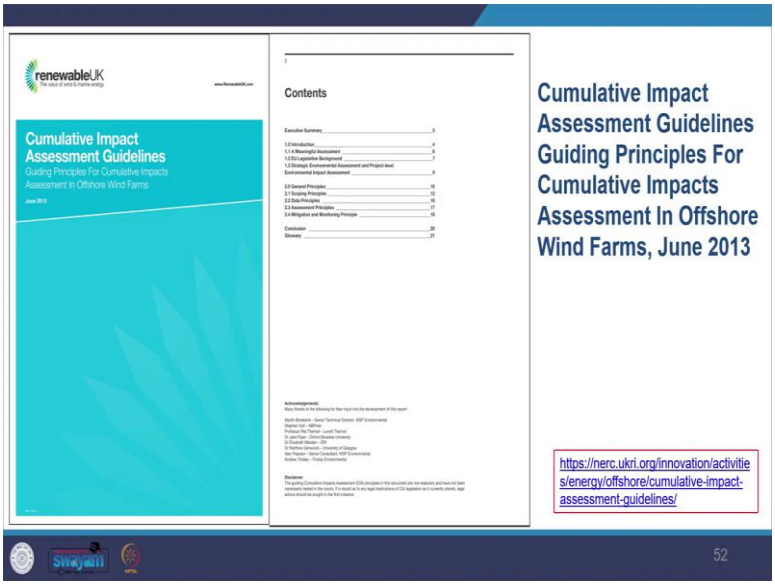

Then you can also find sectorial base guidelines which are given here, you can see that the renewable energy cumulative impact assessment guidelines are very detailed, and you can see how cumulative impact assessment has to be undertaken for offshore wind farms. So, if you are interested in this particular domain, you can look at it, but it also helps you to see how cumulative impact assessment is undertaken.

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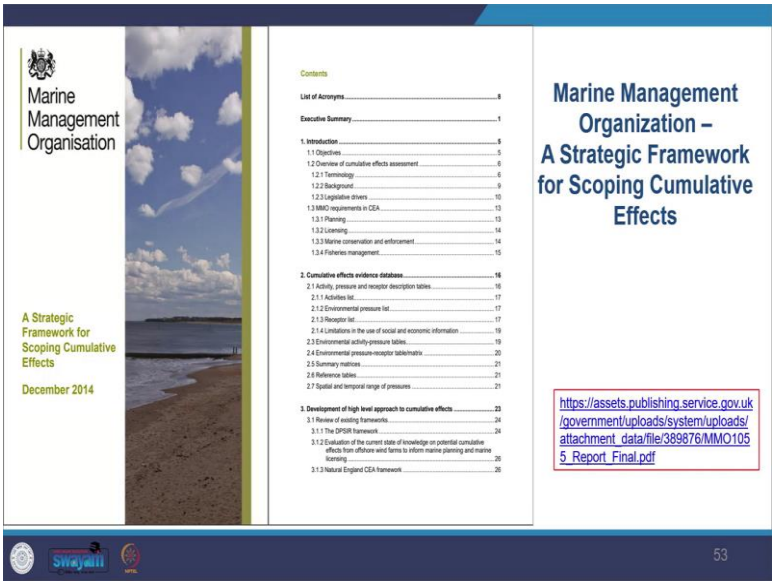

So, you can see another guideline which is by a marine management organization, I have given you the link here, which gives you a framework for how to undertake scoping to identify cumulative effects. So, you can see here within the content they have talked about how they have explained cumulative effect and then they have talked about for a marine management organization, how you take care of different requirements with that, and then how you take care of database and the within this and then what kind of approach you adopt and the framework used for this particular area.

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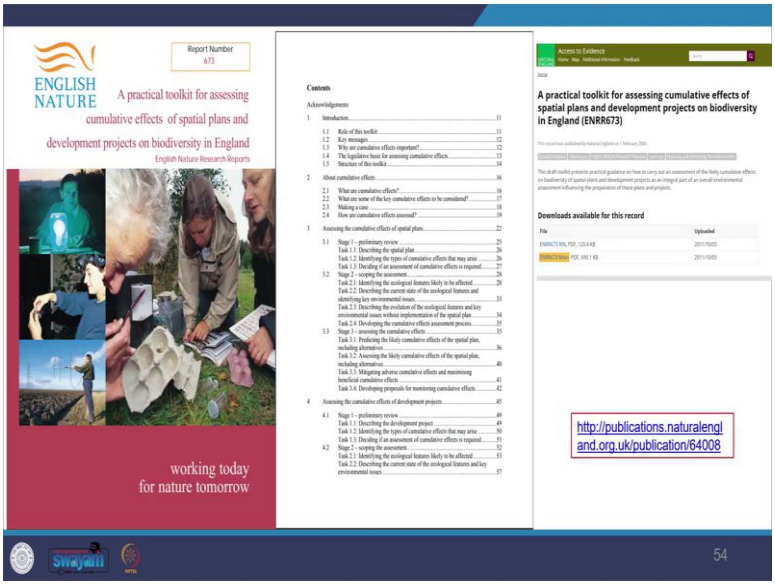

So, you will also find another toolkit, a practical toolkit for assessing cumulative effects, our spatial plans and development project, and biodiversity in England, I have given you the link for downloading here. So, you can see that it defines the cumulative effect, it tells you about the key cumulative effects, that should be considered in the case of biodiversity and then you can see, how you take care of spatial plants, what stages you follow, and then it gives you all range of how do you assess cumulative effects. So, these guidelines are available for domain-specific areas.

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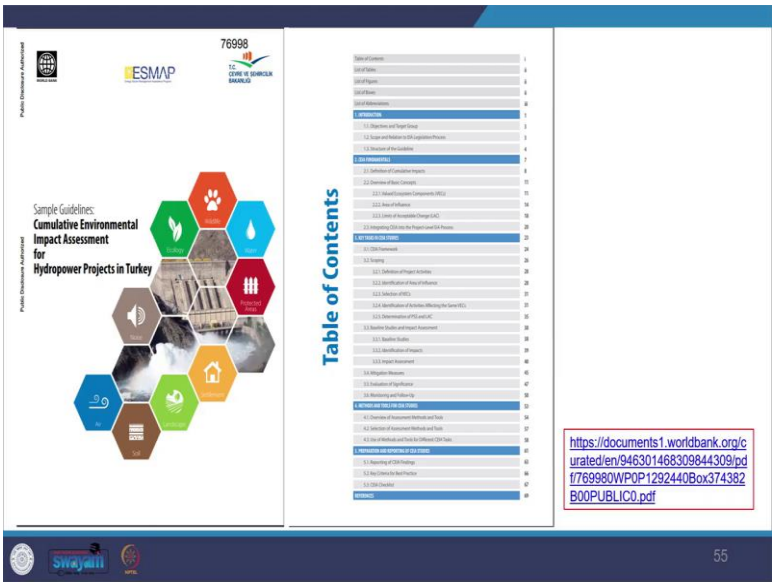

Then you also find sample guidelines on cumulative environmental impact assessment for hydropower projects and this is in the context of Turkey. And this guideline has been done is developed by World Bank, so, you can see that. And I have also given you the link here, and then you can see again, how they define cumulative impacts here, and then what kind of key tasks you have to undertake while you do the cumulative assessments. So, like from scoping baseline studies and mitigation measures, evaluations of significance, monitoring, and follow-up. So, how you will undertake all of these when you deal with hydropower projects? So, you can refer to this also.

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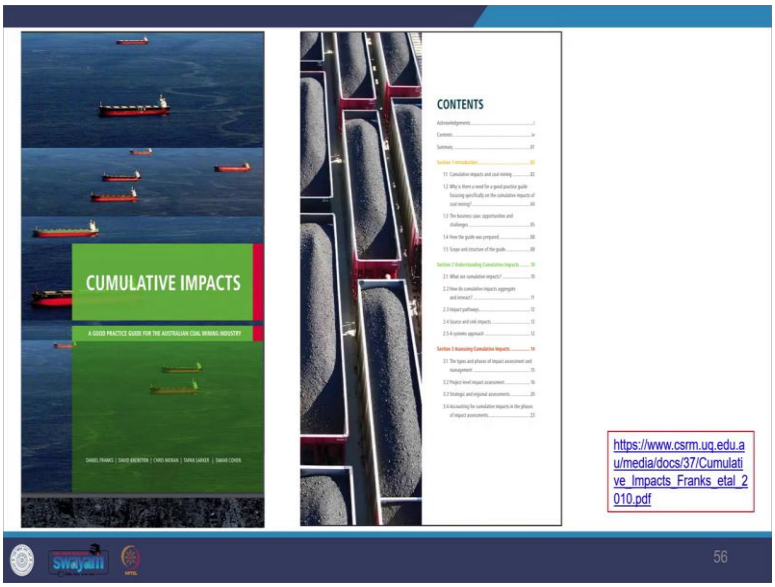

And then there is another guidance which is available on cumulative impacts, you can see here, how they are giving in terms of this one is related with Australian context and it is related with coal mining industry. So, you can see how they are defining cumulative impact and then how do you like, assess cumulative impacts? So, all that is given I have also given you the link so, that you can download the document. Further, you can see another framework for understanding cumulative impacts.

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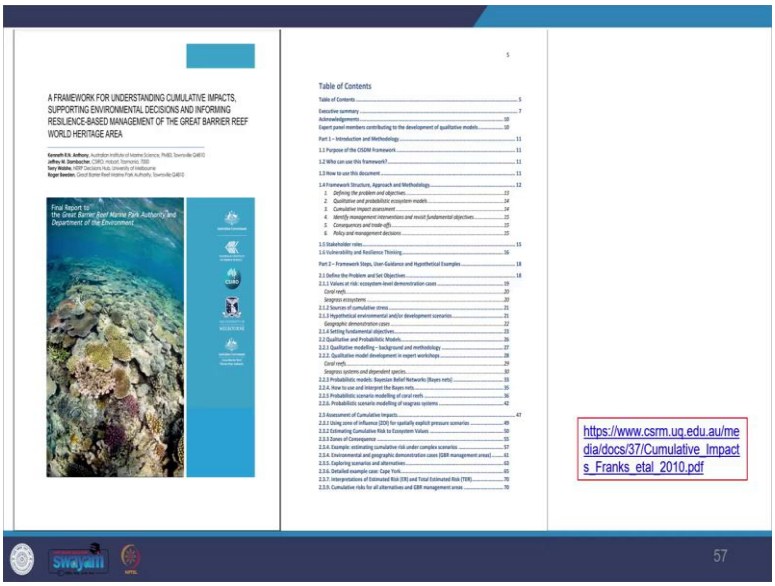

And then how do you decide with regards to this case coming from the Great Barrier Reef World Heritage area? So, how do you undertake that, you can have a skim through a table of contents, you see, they have given you a framework structure approach methodology as well as they have given you what is what are the risks involved here and then you look at various models which are available for usage for this particular domain and assessment, how do you undertake an assessment of cumulative impacts and then they are also using zone of influence which we have already studied and then also estimating cumulative risk to ecosystem values and have also identified zones of consequences. So, you can see all that here.

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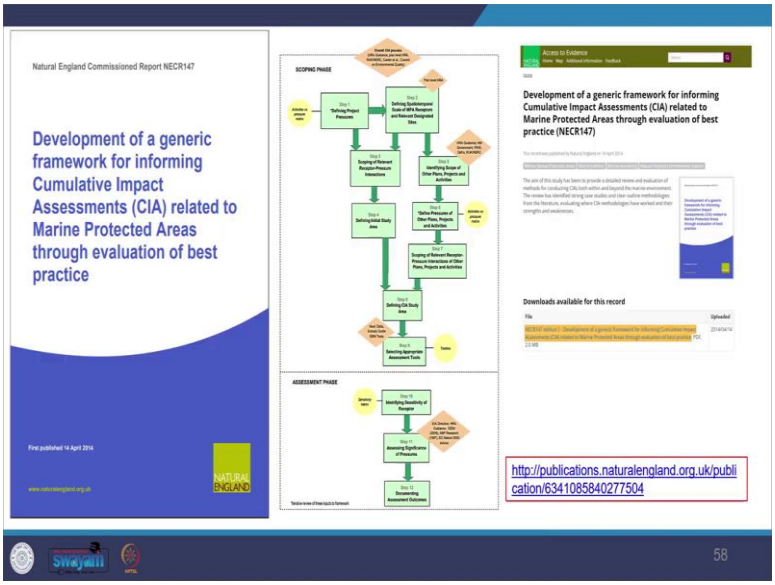

Then you also see another guideline which is natural by the Natural England Commission. So, you see the development of a generic framework for informing cumulative assessment related to marine protected areas through the evaluation of best practices. So, you can also see how they give you the process and process and the details given.

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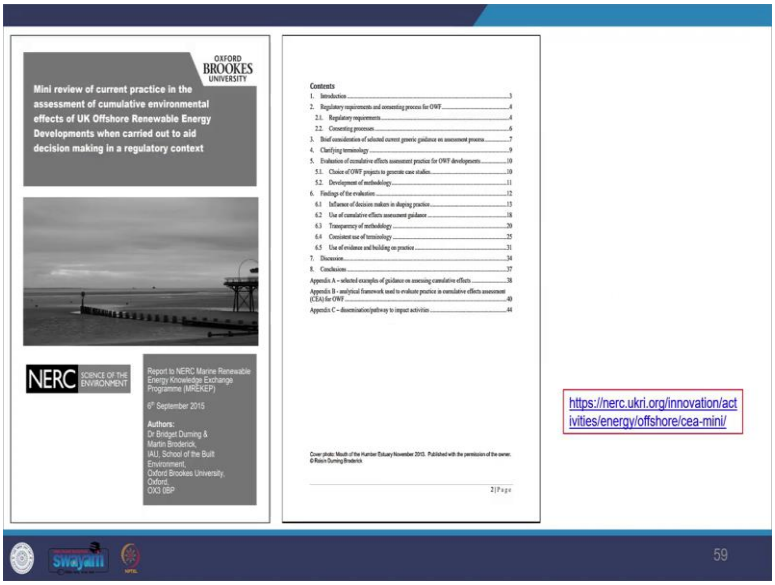

And then there is another guideline you can see a mini review of current practice and assessment of cumulative environmental effect of UK offshore renewable energy developments. And then you can see here that is also given.

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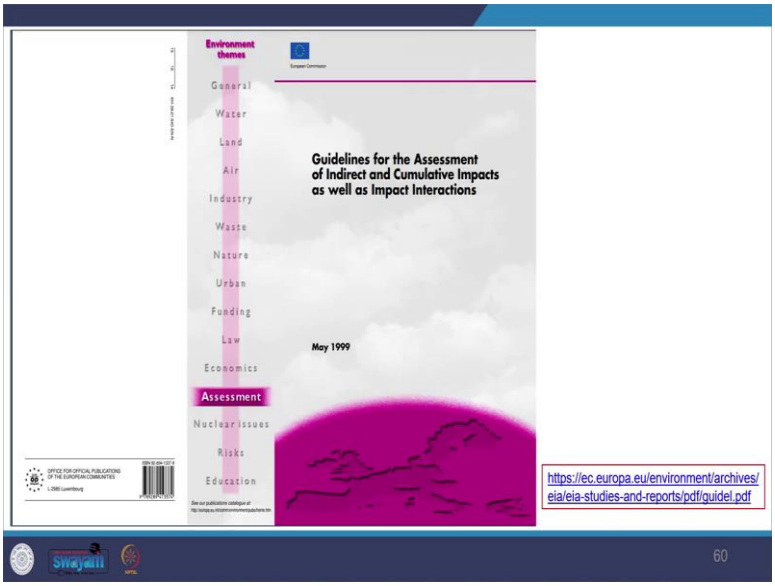

You can also find another by the European Commission here it gives you guidelines for the assessment of indirect and cumulative impact as well as impact interaction. So, it also gives you very thorough guidance in this area and it specifically deals with assessment. So, those are the guidance which are available. So, you can see through those like, how different stages can be done.

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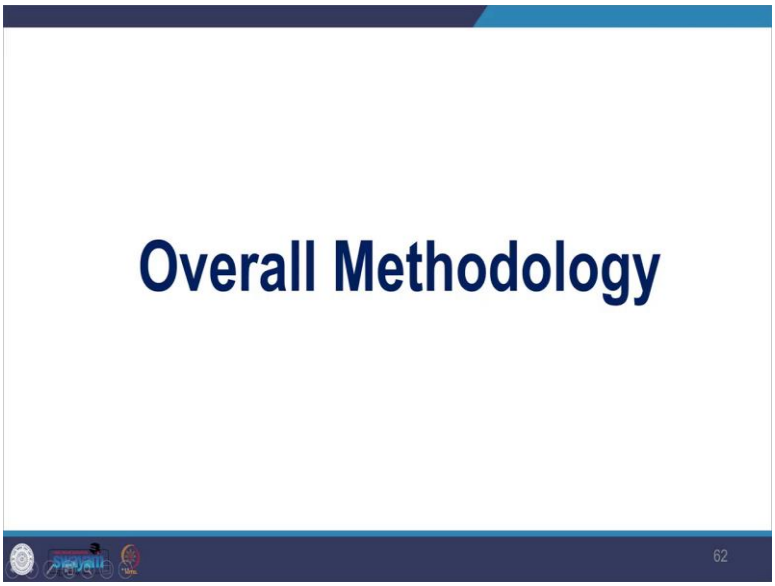

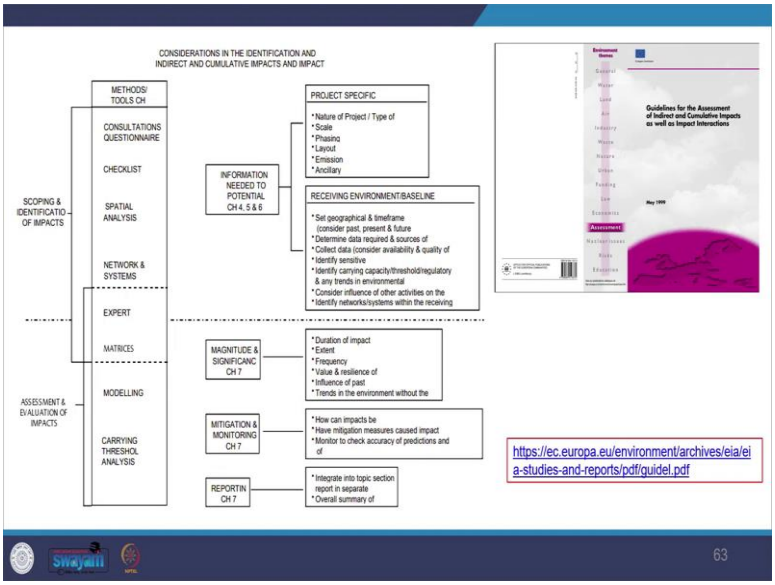

So, now, very briefly looking into the overall methodology. So, here I have taken from the guidelines for the assessment of indirect and cumulative impact from the European Commission guidelines which I just showed you. So, you can see here, how the overall framework is. So, if you see here, you have seen that majorly the first stages scoping and identification of impact, and then you do the assessment and evaluation of impacts. So, here you see in the scoping and identification of impacts you see different like during the scoping you have to take care of like you have to take inputs, you have to consult different stakeholders.

So, you have a consultation process in which you use tools like questionnaires, checklist and then you also undertake spatial analysis and can also have network and system analysis, you can also undertake expert and metrics analysis. So, these methods and tools are available. And then based on this what kind of information would be required, so, you for undertaking this you would need project-specific information like what is the nature of the project the scale of the project phasing, layout, emissions, and slurry and then you would also need the receiving environment baseline.

So, this is what is unique here, what you see here set of geographical and time frames, data mining the data required with collection data, identifying sensitive areas identifying carrying capacity. So, carrying capacity becomes one key element here considering the influence of the other activities and identifying networks and systems within the receiving environment. So, you undertake that within the scoping and then assess and evaluate the impact. So, you will see that experts and metrics are falling in both categories. So, that is not a very strict line here you see.

So, for assessment and evaluation, you use you can use expert metrics as well as modeling and caring threshold analysis. So, you know how much is more and how much is less. And then for this what kind of information you need is the duration of impact, extended frequency, value and resolutions, the influence of the past, trends in the environment how the can impact be handled what kind of mitigations have to be taken and what kind of how you are going to report it. So, all this is given in this particular guideline as well and we have been discussing all this.

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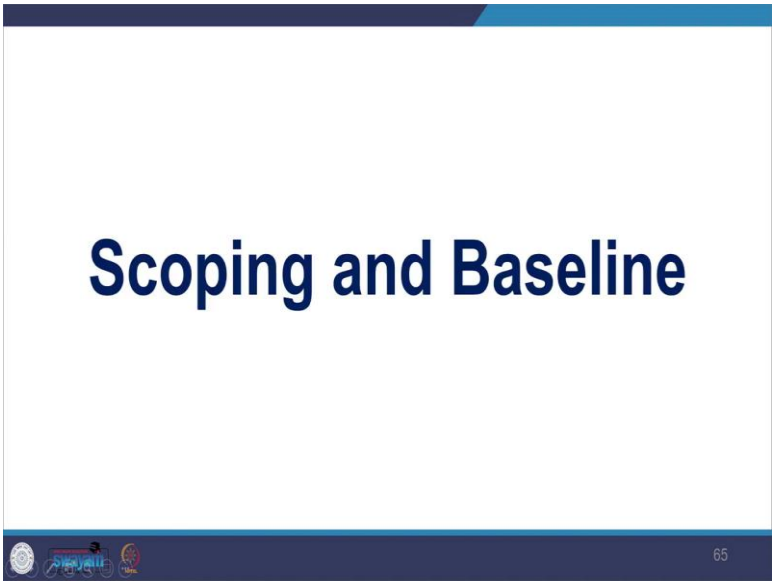

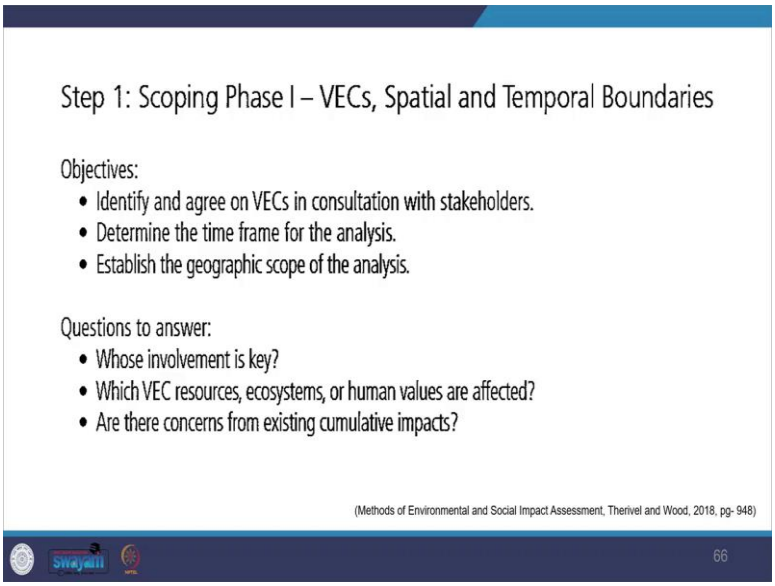

So, looking at scoping and baseline. So, this is as per the IFC document, you see scoping there, they have identified two phases in the scoping when we deal with it and then the prime objective, why we do a scope, and what things we need to take care of when we are dealing with cumulative effects. So, the prime purpose is to identify and like agree on the VECs in consultation with the stakeholders. So, there can be many VECs which VECs you will pick up have you come up with the right VECs or have you identified the right VECs or not? So, that is what you need to ensure during the scoping stage of one.

And then you also need to determine the time frame for the analysis how much time you have and establish the geographical scale of the analysis. So, when you saw cumulative, you said past, present, and future so you need to define how much future and how much past you are going to take and then how much geographical area you are going to take because we are talking about not just one project but a range of projects and range of activities. So, you might have to define a boundary geographical boundary for which you are going to work. So, for this, you have they have given range of questions to for which you should look answers to.

So, whose involvement is key? So, you need to find out who are the stakeholders which are important for your thing important for your understanding and findings, and then which VEC resources ecosystem or human values are affected. So, you need to identify them, and then are there concerns from existing cumulative impacts, so, that you need to see.

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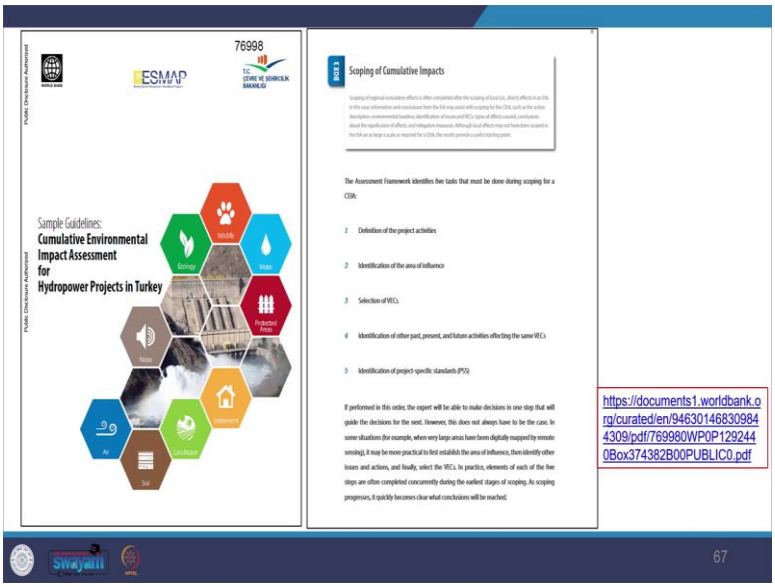

And then again, you see that from the sample guidelines, what they talk about scoping of cumulative impact, you can see this says that in the scoping stage, you need to define the project activity, so, you need to tell what is going to happen in your project activities. Then you need to do the identification of an area of influence, you need to find out how much area we are going to take and which VECs are going to cover and then you need to find out the past, present and future activities, and not all the activities, but the activities which will be affecting the VECs and then identification of project-specific standards. So, related to that, what standards will be involved? So, this is as per the sample guidelines.

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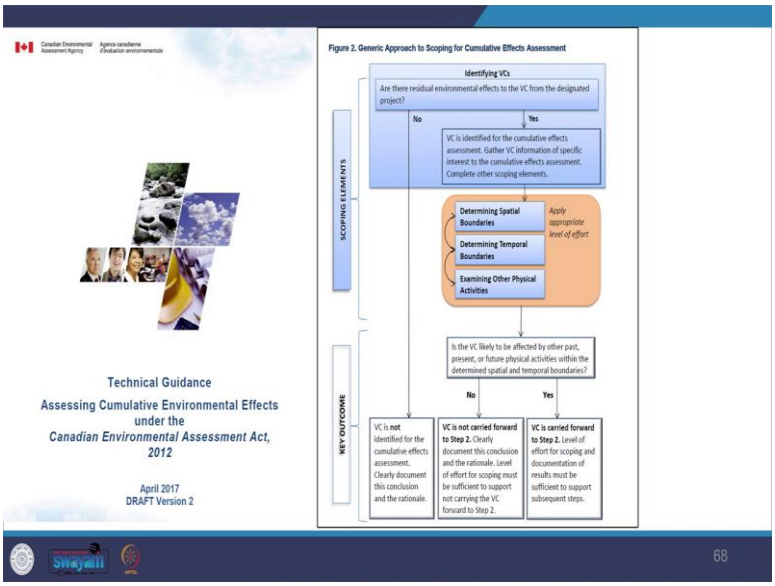

Whereas you see from the technical guidance, they give another layout framework for how you should approach cumulative effect assessment. So, you see that identifying VECs is a very important here valued component, and then whether there are residual environmental effects to the VECs from the designated project, no. Then you can VEC is not identified for the cumulative effects if the answer is no. But if it is yes, then VECs are identified for the cumulative effects, assessment and you have to gather information on the VEC and then you need to further take it like what will be the geographical boundary, what will be the temporal boundary, and what will be the physical activities involved?

And then you will look at whether VEC will be affected by all of these. If yes, then you need to move to step 2, if not, you can wind up there.

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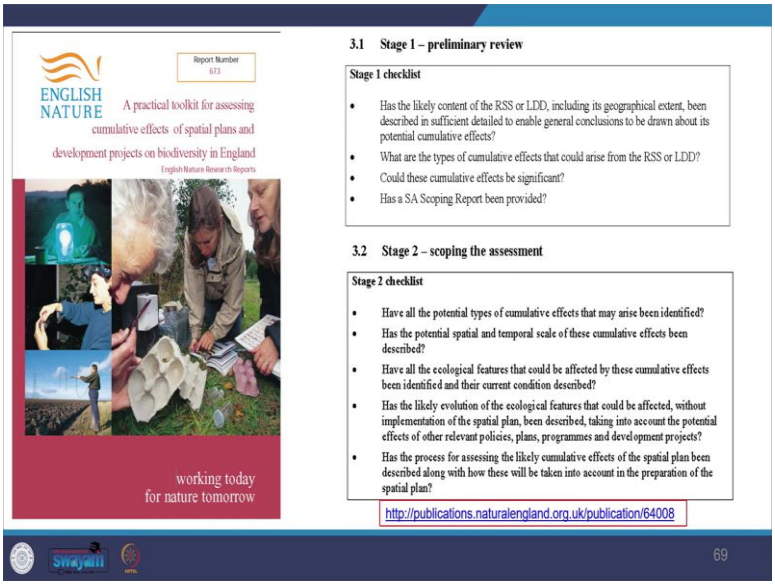

So, in this, if you look at steps 1 and step 2, you see that this toolkit provides you with two stages and the checklist has questions like has the likely content of the project and the geographical extent have been described in sufficient detail to allow general conclusion what types of cumulative effects that could arise in

this particular zone? And then could these cumulative effects be significant? And the scoping report been provided or not? Then likewise, you see the stage 2 scoping assessments where you look at whether all the potential types of cumulative effects have been identified or not.

Spatial temporal scales have been addressed to non-ecological features have been addressed or not. So, all that has to be seen, and how the evolution of ecological features has been through, and then you also need to see the process for assessing the likely cumulative effects. So, what process you are going to adopt that needs to be decided here. So, you see that scoping and baseline deals with you finding out what are the key effects, what are the key VECs, and then you will also notice that a lot of back-and-forth work has to be done. So, you need to have when you are preparing something for scoping, you need to define what cumulative effects mean in your context.

So, all the range of guidelines which we were seeing all the sectorial guidelines, we were seeing, everyone was defining cumulative effects. So, it might slightly be, the conceptual, it might be the same, but it might be very much specific as per the different sectors. So, you need to define cumulative effects when you are dealing with it, and then also define the temporal and spatial limit.

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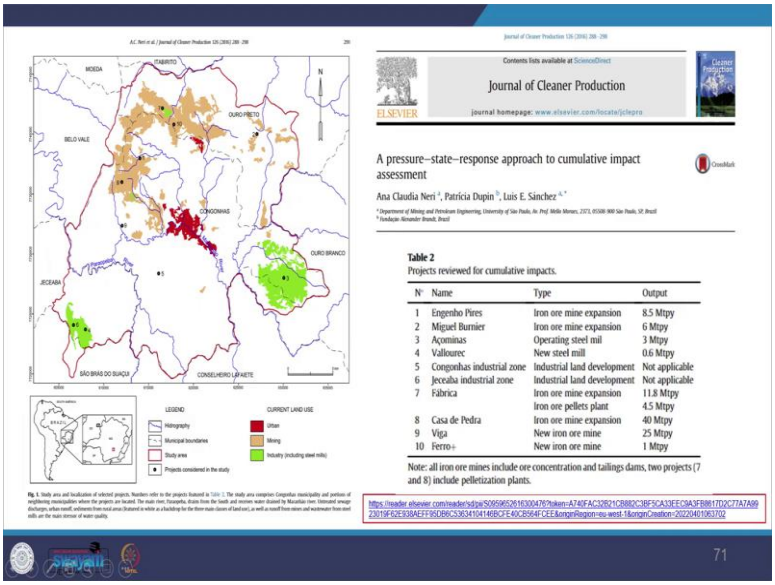

So, I have got the example here. I am also giving you the link to the journal article which you can see. So, you can see the spatial outlook here, and even if you read the map and you can see the red study area boundary and all the dots you can see the projects considered in this study. So, you can see 0.5, 0.9, 0.8, 0.1, 0.7, 0.10, 0.2. So, you see how many projects they have considered within this study area. So, you see that this is how one example indicates how the range of projects are taken.

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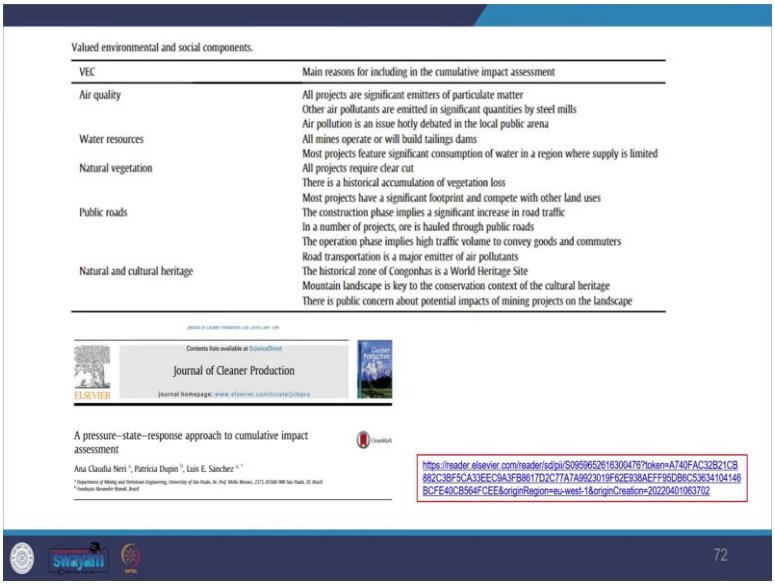

And you see them identify the valued environmental and social components here and then you see how they are looking at air quality, water resources, natural vegetation, public roads, natural and cultural heritage, and why they have taken it up.

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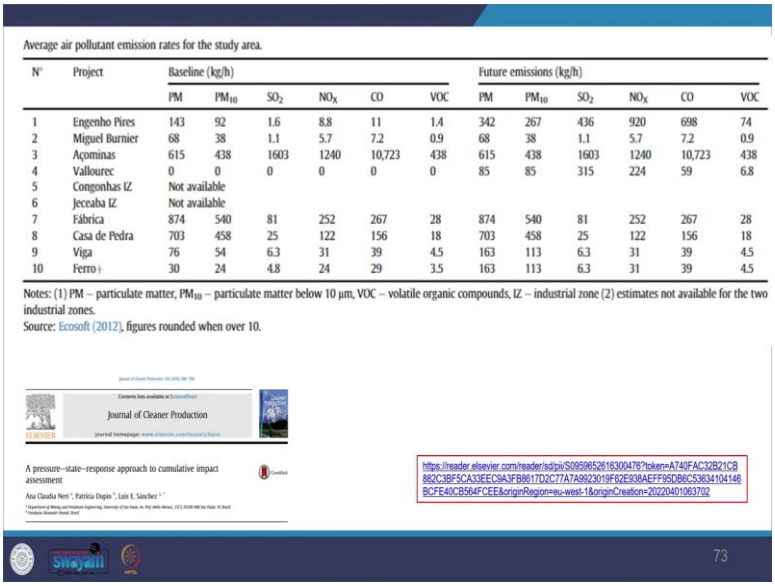

Likewise, you can see how they are doing assessment temporal the baseline, what is in the current stage, what will happen in the future, and future emissions, and then they are trying to take out the likely trends, you can see air quality current stage trend, likely future state. So, you can see red is indicating bad, trend the arrow down is showing a decrease. So, the current state is regular, but you can see the trend is decreasing and the likely future state is red, it is going to be bad for air quality. So, that is how they are undertaking it.

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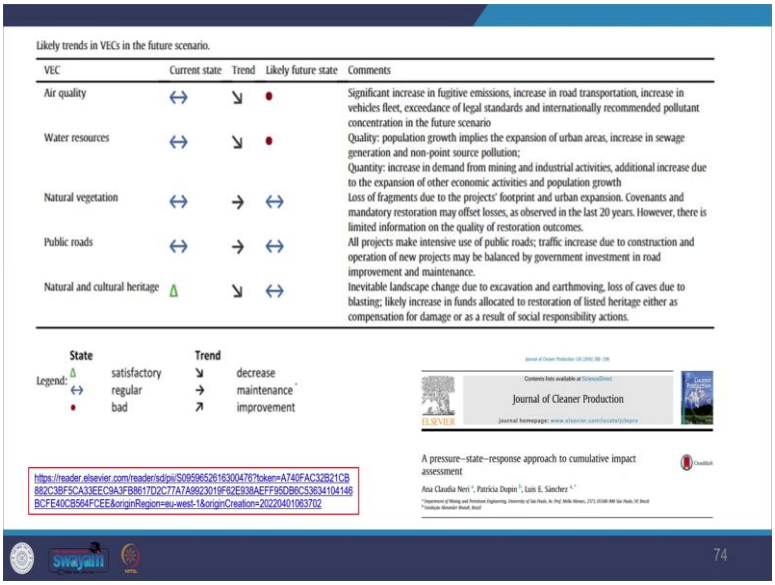

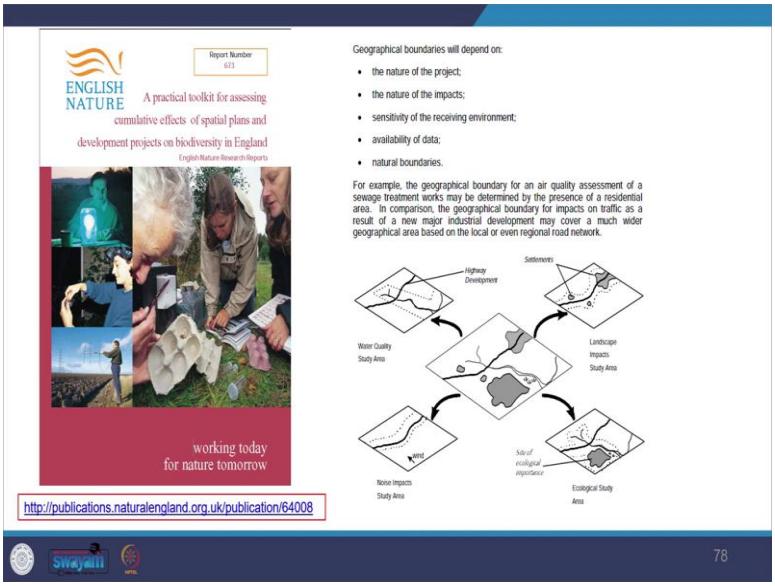

So, here in the example, you can see, again, from this practical toolkit I have taken, how they are looking at the geographical boundaries, and how from various projects, they would then integrate, merge, and find out a common boundary.

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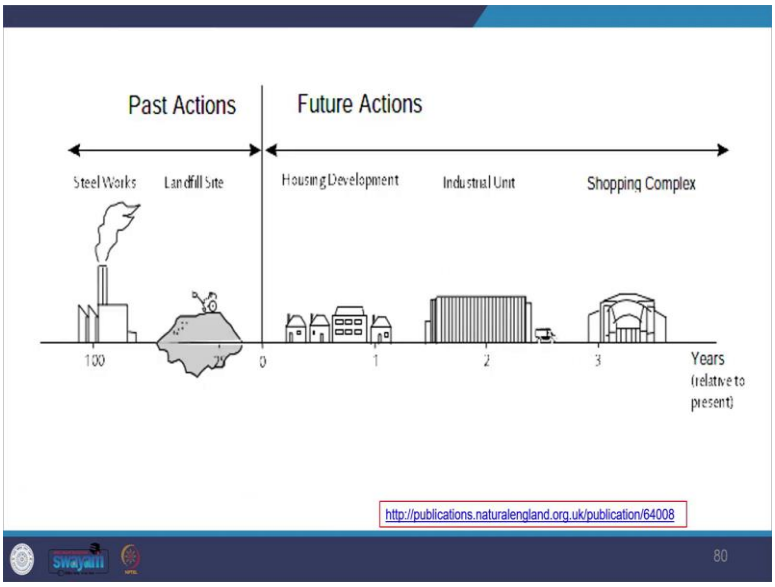

So, while you are doing this, you have to take care of reasonably foreseeable future projects, so how much you can cover future projects? So, you need to look at that. So, you need to get help from the stakeholders and the authorities there, which would have an impact on the VEC. So, you cannot really take all the future projects, but the projects which are likely to impact your VECs, you might only take that and you might also consult with the authorities in this regard. So, there is also the concept of physical proximity to other actions that have to be taken in the project.

So, while you are looking at it, you need to look at like or you need to see source pathway receptor reasoning. So, you see how it happens, we have studied this source pathway receptor before, so, what is the source from where the impact is transferred, and then who is the end receptor of it? So, you need to see that while you look at the proximity, physical proximity, or define the geographical area, and then you also need to look at the sensitive receptors. So, you need to take care of that and then also the threshold value.

Further, you need to look at all these you need to undertake based on the evidence, and what data tells on that basis, you are going to look at it. So, how what areas you would cover would depend on that. So, for all these, you need to take judgment for the context and situation. So, you see that whenever you are doing cumulative impact assessment, it needs to be proportionate, you should be focusing on the key effects, and then you should look at the sensitive receptors.

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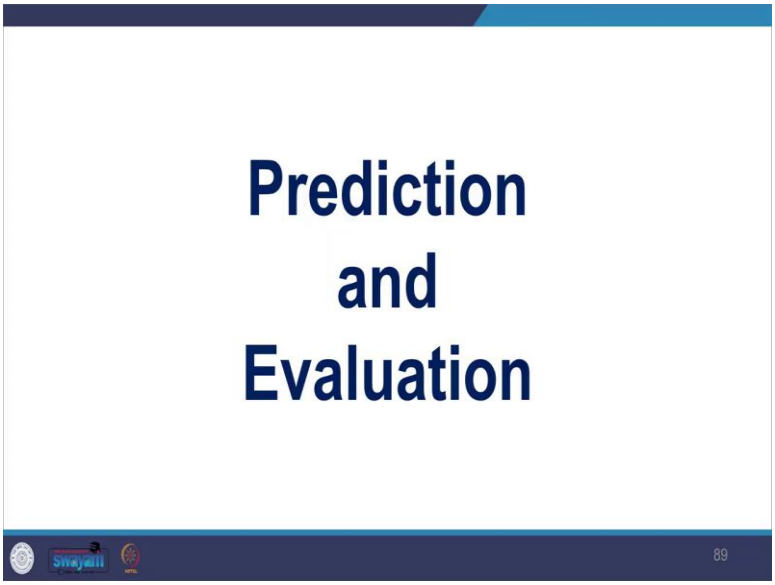

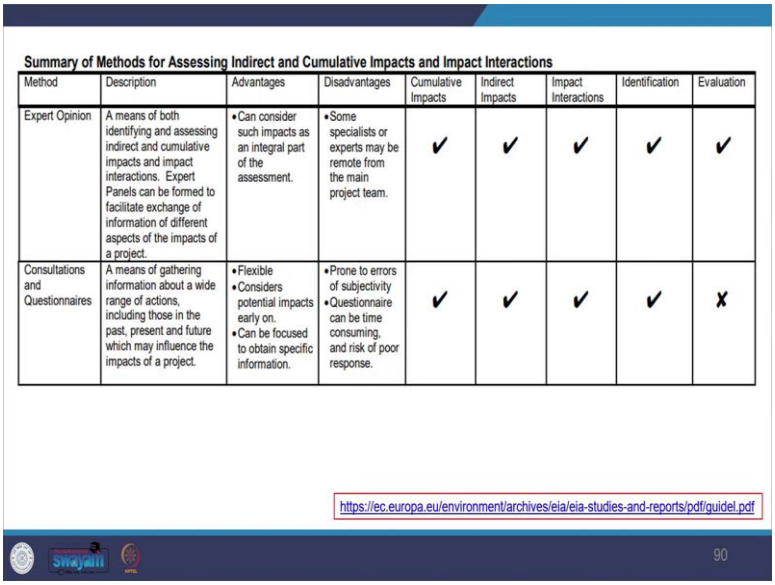

So, that was about the scoping further moving on to prediction and evaluation. There are certain methods for assessing indirect and cumulative impact and impact interaction. This is taken from the guidelines for the assessment from the European Commission, you can see the methods involved. Expert opinion where you take inputs from the expert, and then there are certain advantages and disadvantages of all these methods, but I am not going to get into that you have consultation and questionnaire methods also, which allows you to be flexible and consider potential impact very early in the stage.

Then you have checklist methods and spatial analysis where you can use GIS all these methods can be used.

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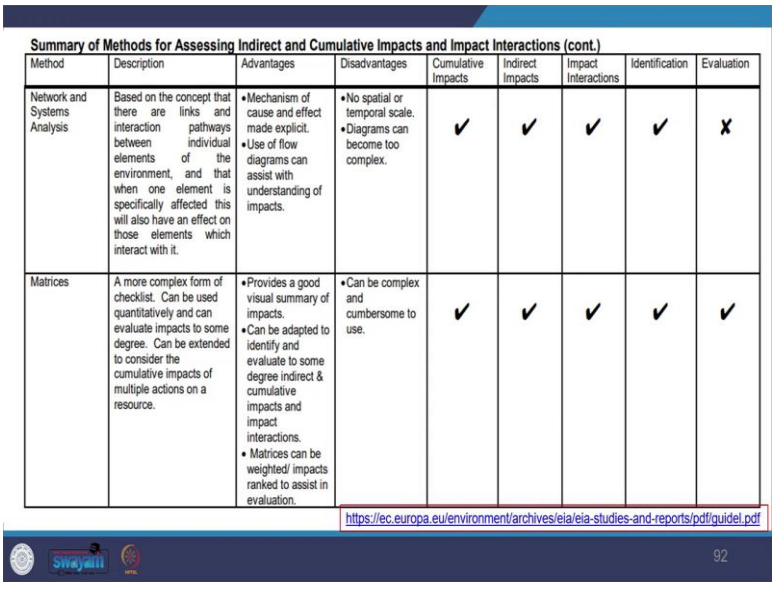

Then you also have network and system analysis, then you also have matrices which can be used here. So, all these are for assessments. Then you can also look at the carrying capacity analysis and then for the higher assessment, you can also do modeling, which can help you to quantify the cumulative effects and then you can also have the geographical extent and the timeframe and you can see for different scenarios. So, those all are available to you. So, looking at the prediction and evaluation, how do we evaluate whether the impact is significant or not?

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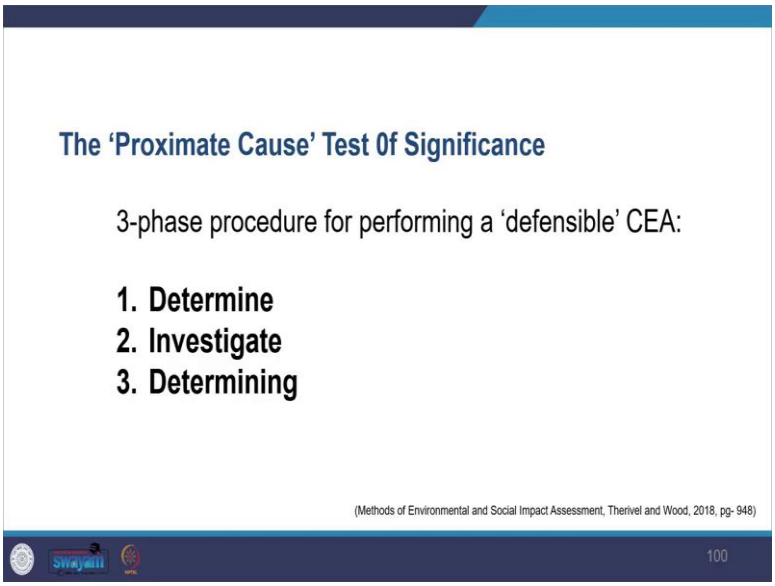

So, there is one you see the proximate cause test of significance. So, you can put this test across, so, this what does this test mean proximate cause test? Proximate cause text for effect prediction is based on the basic concept which is like proximate cause. And what do we see proximate cause means it is an ad for returning injury results as natural, direct, uninterrupted consequences without which the injury would not have occurred. So, that is a proximate cause. So, if that act is going to happen, it is going to lead to injury resulting in natural or direct or uninterrupted consequences. So, that is a proximate cause.

So, you will see that you have a three-phase procedure for that. So, first, you determine whether a proposal would proximately cause a significant effect on the given resource. Second, you investigate how the affect affected environment has reached its current conditions and project, like what is going on, and then you determine what happens to the conditions and trends of the resources. So, what will happen, that is how you decide like, whether the proposal has a likelihood of that happening and how, why that condition is there, and then what will happen to that, so, based on that, you evaluate the significance.

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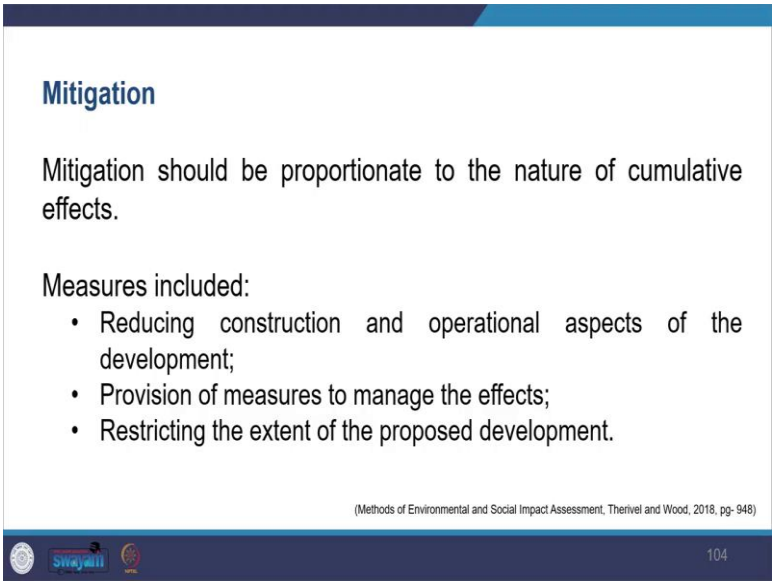

Then moving on to mitigation. So, this is cumulative. So, the mitigation approach will be very different here. So, here you would see that no one particular project is taking care of the mitigation. So, mitigation should be proportionate to the nature of cumulative effects, and then some of the measures very exemplary measures include reducing the constructions and operational aspects of development. So, several development projects, that are happening, might need to be reduced, and then how they might, you might also need measures to manage the effects and also restrict the extent of the proposed project.

So, how many restrictions did you put on the proposed project? So, the key impact aspect here is that you also need to create headroom means some space between what will happen. It is all the effects which are going to happen, then you should have certain headspace for safety provision, like if there is air pollution, which is going to happen, so you should not try to have it to the maximum level, but you should keep certain headroom so that whenever things come in an accumulative manner, you have space to accommodate all kinds of variations. So, that one is needed.

Certain examples of mitigation include especially in one case from Canada, wildlife management programs, compensation measures, monitoring programs, and then also how you can deal with particular programs. So, all these programs can come here. The other is like you can deal with master planning process where you have a master plan process, you know, the threshold, you know, the carrying capacity, and you know, the impact of it. So, within the master planning process, you will try to curtail these things.

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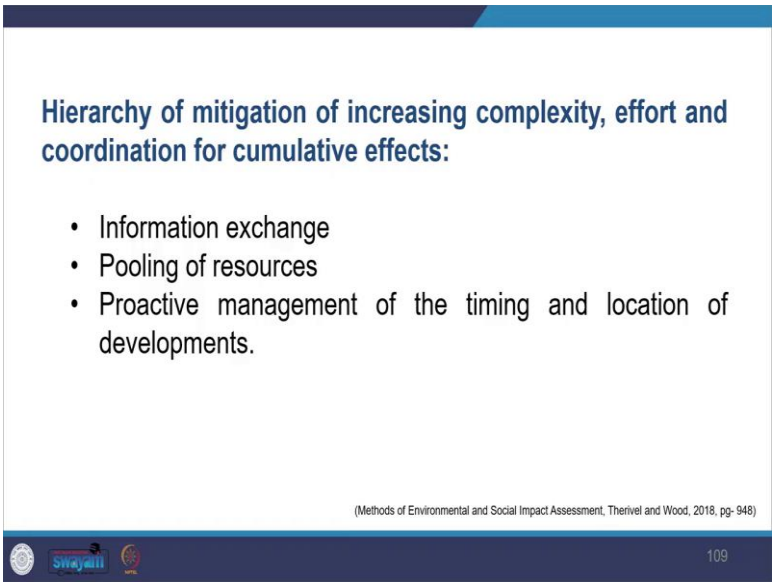

And then you can also have a hierarchy of mitigations. So, also it talks about, how it is important to share information, exchange information, and create information that could be the first step. Then you can have common sources of resources, that you can deal with and then you can take proactive management of timing and location of the developments by staggering it, how you will manage it is the way you can manage all these problems as well. And then another important aspect is monitoring and management. So, it is very important that when the cumulative impact will happen and it needs significant manner, then you need to monitor and manage it well.

One needs to comply with the thing by what facts and standards have to be adopted there. So, that is what we have seen here. So, we will wind up here. So, summarizing what we studied today.

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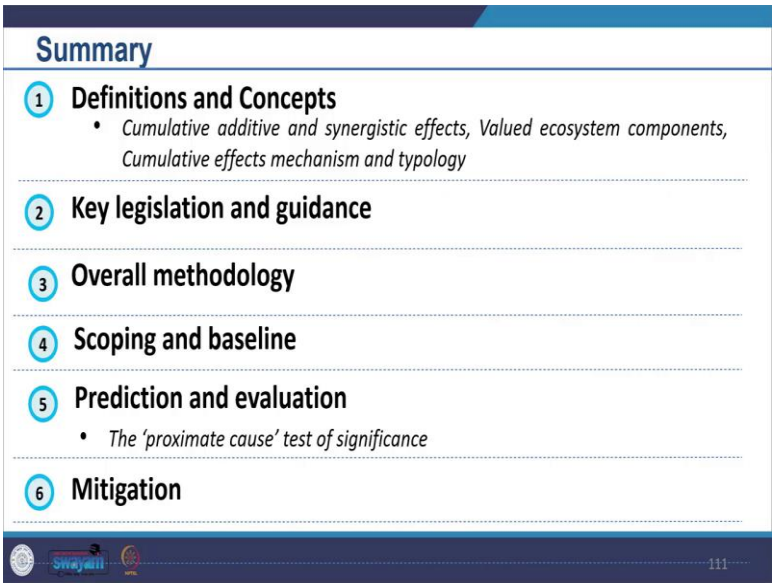

So, we looked at definitions and concepts related to cumulative impact. Then we looked at key legislation, or what is the context scenario about cumulative impact. And then we looked at the overall methodology, we looked at what are the key aspects you need to take care of in scoping and baseline. And then how do you

undertake prediction and evaluation? And then what do you do in the mitigation measures? So, these mitigations are different from what other mitigations you undertake.

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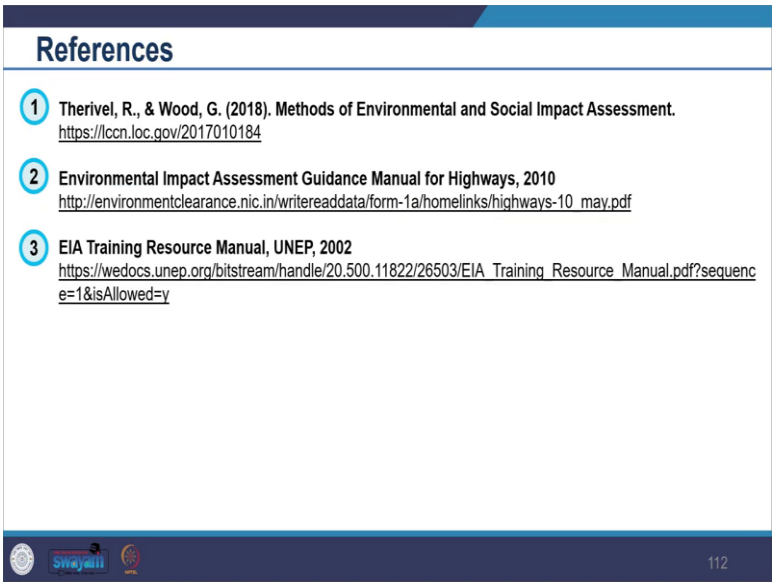

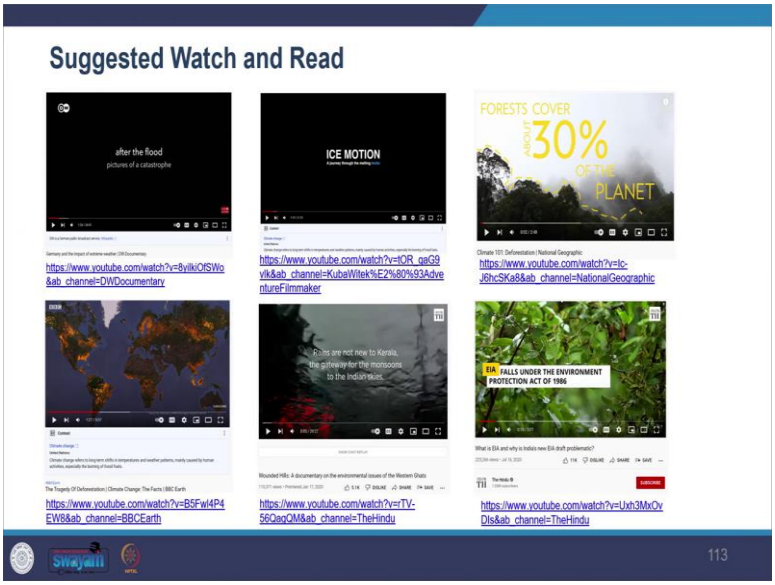

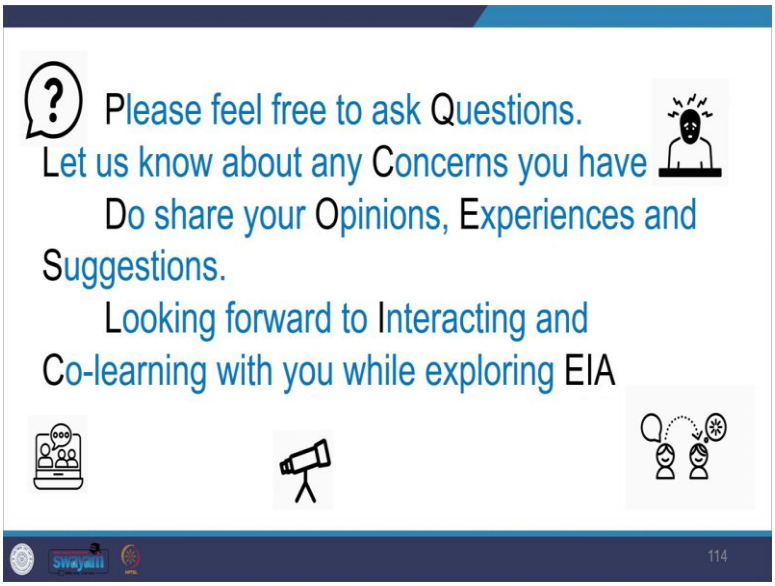

So, this was the key reference in this particular session, and these are the suggested watch and read and winding up. Please feel free to ask questions and let us know about any concerns. You have to share your opinions, experiences, and suggestions. Looking forward to interacting and co-learning with you while exploring the idea. Thank you.