Environmental Impact Assessment
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Lecture 38
EIA Methods for Ecology (Baseline Study)

Welcome to the course Environmental Impact Assessment. In the previous class, we saw and familiarized ourselves with the definitions and concepts of ecology. And in this particular session, we will look at the methods used for undertaking a baseline study.

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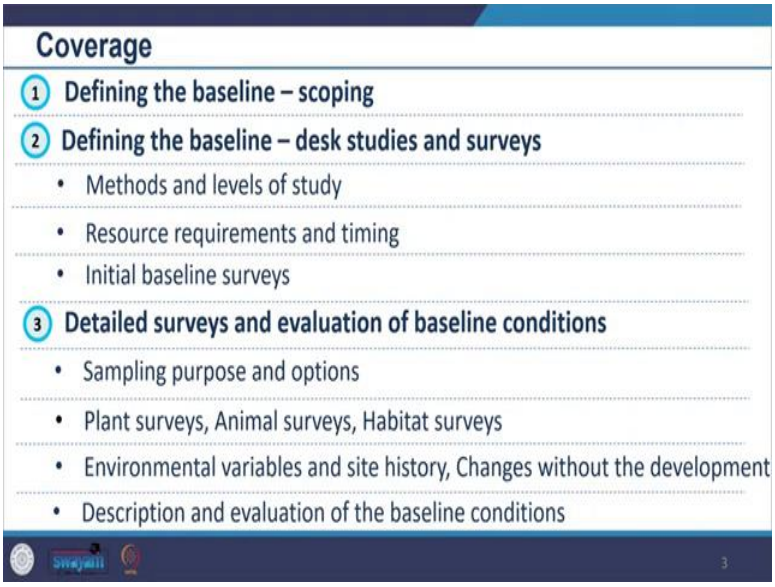

So, accordingly, our coverage will include that will look at like what we do at the scoping stage, what methods are used for the scoping purpose, then at the desktop study and survey, what kind of methods are available for that, and what kind of resources and timing will be needed, and what kind of initial baseline surveys have to be undertaken.

Then we will look into the detailed survey and evaluation of baseline conditions. So, what kind of sampling has to be done, what options are available and what is the purpose of sampling? Then will look at various kinds of surveys one has to undertake for plants, animals, and habitat surveys.

Then we will look into like how one also uses environmental factors and looks into site history and how we look into the changes with or without the development of the proposed project, and then how we present, describe, and evaluate all these baseline conditions.

So, accordingly, your learning outcomes expected from you include that you should be able to discuss the scoping stage and then able to identify different methods that are available to undertake scoping within your baseline study. Further, you should be able to identify various text studies surveys, and methods and should be able to understand what kind of resources and timing will be required and what kind of studies have to be undertaken.

Likewise, you should be able to identify various methods for surveys and evaluation for baseline conditions and what all has to be done and then you should be able to understand how the information has to be presented.

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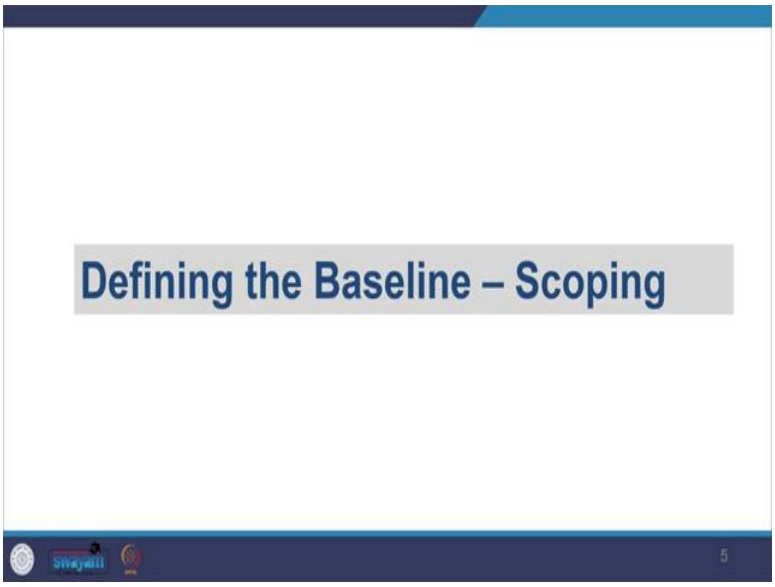

So, looking at the scoping stage, what is really, what you do in the scoping and when we deal with that. So, an ecological baseline study is important and has to be undertaken with accuracy. So, it is a very important component and it needs a lot of accuracy to undertake this it requires good knowledge of the ecology, of the site, and also its interaction with the nearby areas. So, what is, what is happening within the site, and, how does it interact with the surrounding areas?

So, many times in the screening level itself, we are looking at a later stage where we are doing the impact assessment. In the screening state itself of EIA, you will need to understand whether, whether your study needs a particular ecological study or not that time itself you will understand that.

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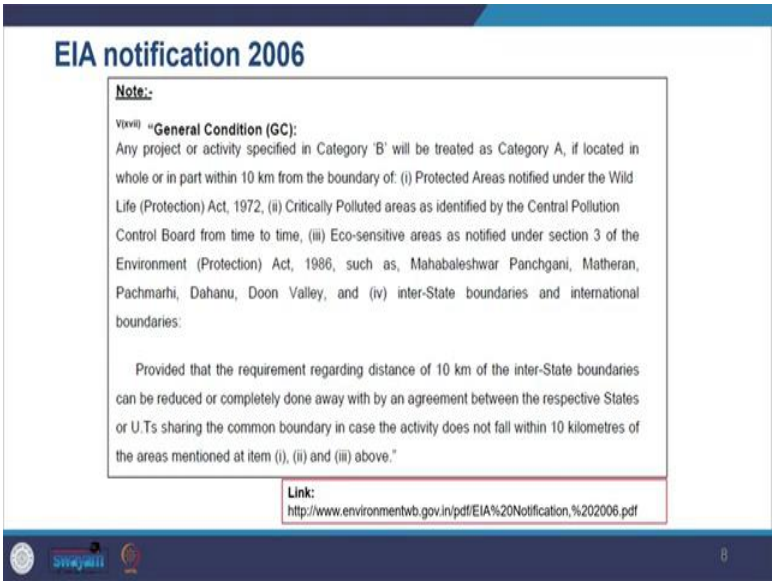

So, like in India if you can recollect we saw the EIA notification 2006, you can see under the schedule that any activity categorized in B will be treated as A, if the particular project, proposed project partially or fully comes in the radius of the protected area or echo sensitive area. So, at the screening stage itself your category will change further what kind of detailed study would be required will be decided here.

So, you can see part of the notification snipped for you here. Also at the international level, as we see at the equator like you have seen the equator principles, international finance corporations, and regional development banks, all are required to undertake this ecological assessment.

It is important for these agencies as well that a very clear-cut understanding is developed at the scoping phase itself where how much severe sensitive is the wildlife and natural environment in this particular area. So, all of these international, all these agencies at the international level also require that, so you can see how important it is.

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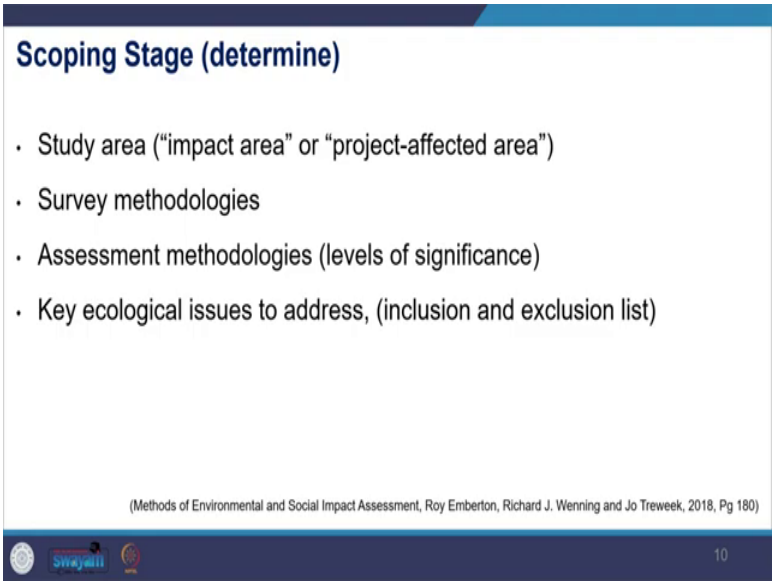

So, at the scoping stage, what do you determine, what do you try to find out? So, at the scoping stage, you try to find out the study area. So, what will be the impact area, and how much area do you have to study, you can call the same as the project affected area, so the impact area. So, you need to identify that, delineate that, you need to understand how much area one needs to study so that you will come to an understanding with the agency and then you will see how much area I need to cover in my baseline assessment.

And then you also need to fix the survey methodology like what kind of methods, what kind of approach you are going to use, and what kind of methods you are going to use in your particular survey so that all is undertaken at the scoping stage itself, you fix it at this stage. And then also what kind of assessment methodologies you will undertake.

So, certain methods for survey purposes and it has to be aligned with what methods you will use for assessment purposes. Then also you will look at what is the significance of that as well, as what kind of methods you will use. You also need to identify the key ecological issues to be addressed what issues you

will include and what issues you will not include in the list, so all that has to be taken care of at this particular stage.

In the scoping stage, you should involve experts, and consultants from the domain and should refer to the international best practice as well and then you have to also refer to all the national instructions which are covered here. And in many practices mainly you will see in the international that they define the area to be studied. So, in many cases, they already define it like how material you have to cover.

For example, you can see in the UK they specify that a 2-kilometer radius has to be taken from any polygon or the area of your study, so the entire 2-kilometer radius of the study has to be done. In the case of any linear project, for example, a rail line project a road project, canal project all you have to take along 1 kilometer study area along the linear element. So, some of the studies like legislation or the guidelines already ask you to cover that way, so you can also see that.

So, depending on which area you are studying, and which country you are studying in and then you can refer to those guidelines here. You also note that the data required can be very extensive, intensive, and sense-like, so therefore, you should in the scoping stage you should know what are your main concerns.

So, because every main concern has to be undertaken in the form of a detailed study or intensive if data has to be collected, you cannot take care of everything, so you need to understand what is important and what is not important. And particularly it is of importance that you focus on these species of conservation values.

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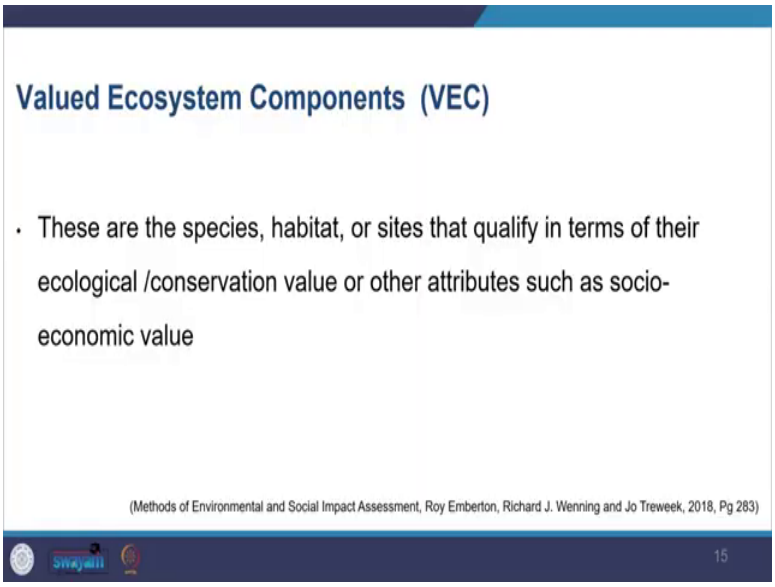

So, when we say that species of conservation value, we also call it like valued ecosystem components, we see valued ecosystem components. What do we mean by that? So, valued ecosystem components mean that there, these are the species or they can be habitats or sites that have ecological and conservation value or other attributes such as they have a socio-economic value to the people who are affected by the project or who are in the project area. So, any significance it has so that those species, habitats, or sites have to be identified. So, valued ecosystem components.

So, the best way to identify these value ecosystem components is one very basic simple step to look at the country's protected list of species, habitats, specific priority, species, and habitat, so most countries retain that, so that is the best way to check that if any of those are in your category you need to first identify them.

So, in any case, you should also include all the receptors that may deserve further investigation in the scoping stage. So, you need to identify what are the receptors when I say receptors whatever impact will happen which are the species that are going to, will be on the receiving end of those impact, so that all you need to also identify in the scoping stage itself.

So, at the scoping stage, you will agree with the authority of like what will be the scope of EIA, and what you are going to cover within the EIA, so when you start your work before starting you will come to an agreement with the authority, like these are the things, these are the studies which will be undertaken in this.

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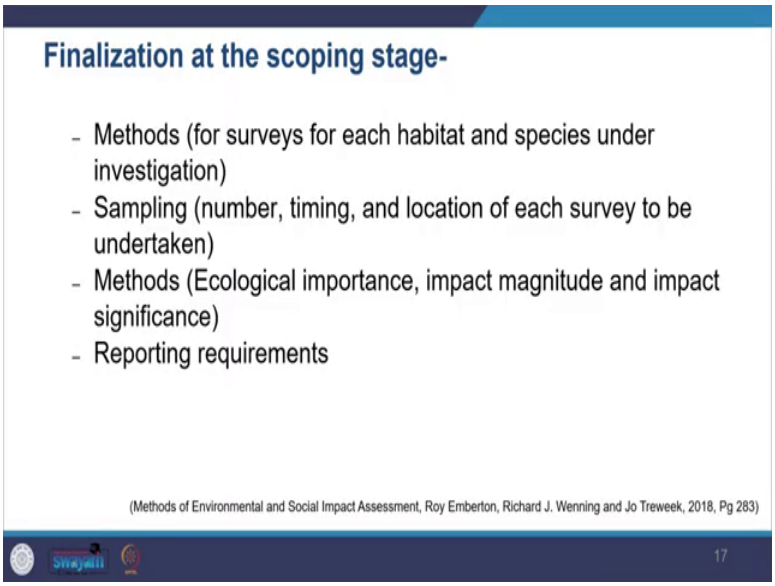

So, you would be required to fix the methods to be used for the survey, what kind of method you will use for each habitat and species and investigation, for what you will do what, like for flora what kind of service you will take, for fauna what kind of service you take and within that also you might have little further details which have to be spelled out here.

And then you would also express what number or timing and location where you will do this survey. So, that can be very important in these cases because many of the seasonal migratory species with that all it is very important that when you survey, you do not miss out on very key elements.

So, other methods are to be used to assess ecological importance, impact magnitude, and impact significance. So, how, what kind of method you are going to use, how you are going to make that decision that whether that impact, what is the magnitude of that impact and what does the significance of that impact?

So, this may differ for each species and habitat and also where species are permanently resident or migratory. So, that it all might differ so you need to be very careful how you are making these commitments and what approach you are adopting. And then you also need to fix how you are going to report all these

things, what you find in the study, how you are going to report, and what would be the reporting requirement. So, at the scoping stage, you fix all of this and you enter an agreement with the authority.

So, in India, we have terms of reference and we have sector-wise terms of reference, so I will be providing you some examples, so you can look at them various sector-wise as per your interest, as per your domain you can look into that.

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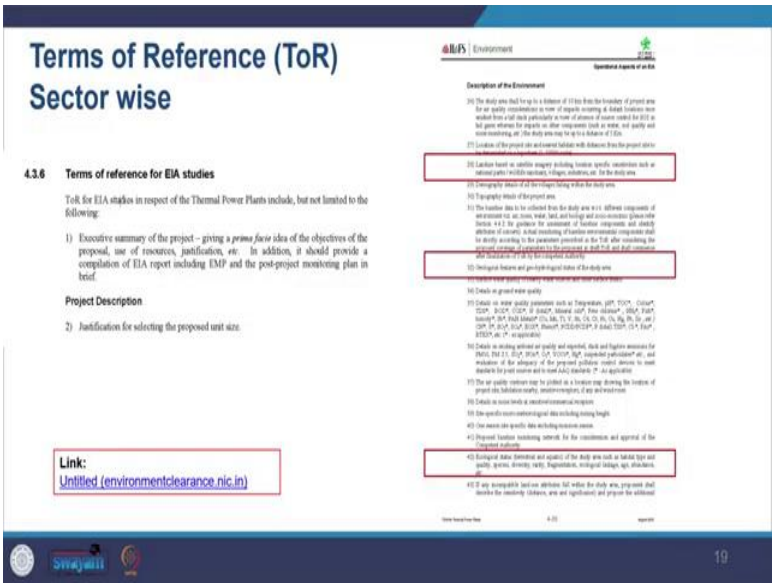

So, I have just left one of the examples here, you can see how in terms of reference it is mentioned I have highlighted that in the box, you can see that how land use based on satellite imagery including locations, specific sensitivities such as national parks, wildlife sanctuaries, these all need to be described.

Then you need, number 32 you can see the geological features and geohydrological status of the study area has to be given and also surface water quality of nearby water sources and other drainage has to be given. And then you also see number 42, you can see the ecological status of the study area such as habitat type, quality, species, diversity, rarity, fragmentation, ecological linkages, age, abundance, and so on has to be provided. So, this is taken from the thermal power plant TOR, so in this way, all sector TORs are there. So, for the particular sector for which you are working, you can look at what will be the terms of reference.

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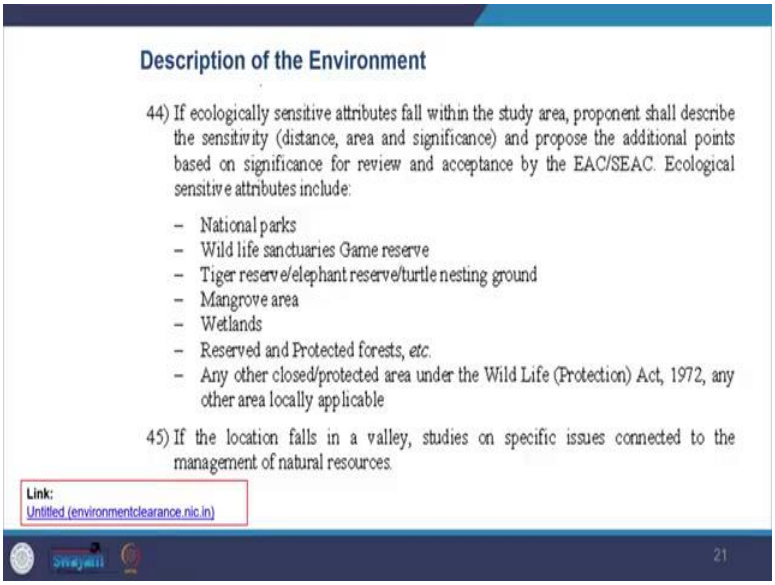

So you also see that additional points are required based on the sensitivity of the area and the study. So, there will be certain standard procedures but based on in which area you are studying you have to give certain additional requirements would be there when we say sensitivity of the area under study like you have sensitivity in terms of how far it is from certain ecological sensitive areas, how much is the area and what is the significance of that area, how important it is to the community, to the nation and for the entire system what you are studying.

So, mostly how do you find out ecologically sensitive areas like you might already, the nation might already have identified a list of national parks, and wildlife centuries, then you have tiger reserves, elephant, and turtle nesting grounds, then you have mangroves wetland reserved, and protected forest wildlife protected areas. So, all these lists you can see can help you to identify that area.

So, that was about the scoping stage where you, we had studied in the EIA process that that is one stage where you determine what all you are going to cover, what all you will not cover, and what methods and other things you are going to involve. So, that was about the scoping.

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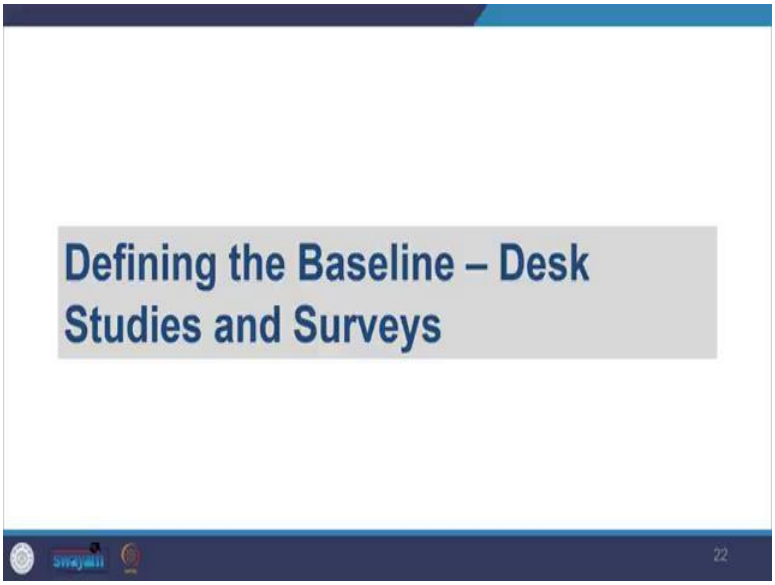

So, now moving on to the desk studies and surveys, where you will start undertaking study, you will start undertaking survey and study.

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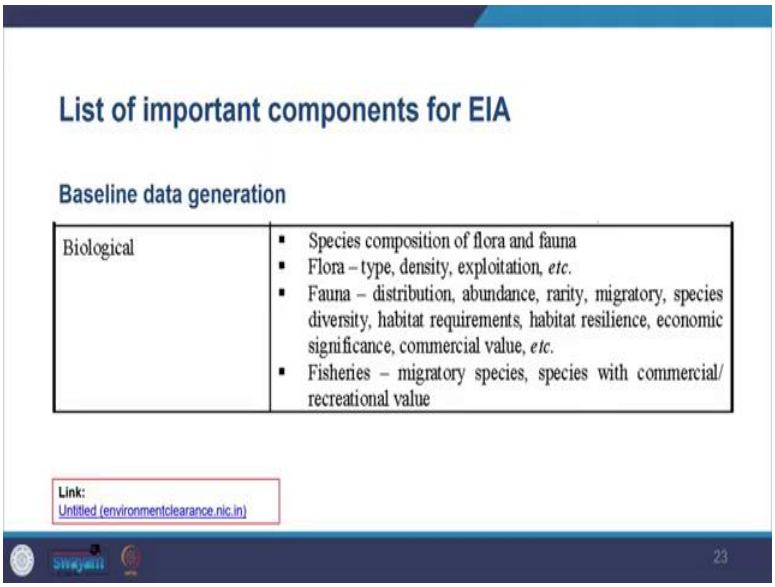

So, here you can see the list of important components for EIA I have taken it from the manual for the thermal power plants. So, here you can see what kind of studies are suggested to be undertaken in this biological domain, you can see one needs to undertake species, and composition of flora and fauna, and one needs to undertake flora type density exploitation.

For fauna you need to look at the distribution, what kind of distribution is there, what kind of varieties are there, what is the abundance, how, what is the number of each kind, which are the rare species, which are the migratory and what kind of diversity is there, and what kind of habitat is required, what is the resilience of the habitat, what is the economic significance and then the commercial value and so on you need to find out.

Similarly, for the fisheries, the migratory species, are species with commercial and recreational values. So, this is already given.

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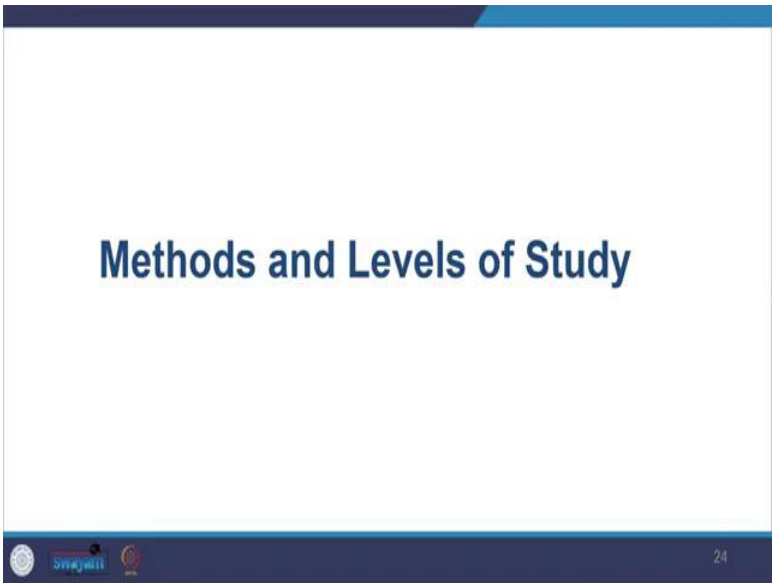

And you will look at the methods and levels of study. So, when you undertake desk studies and do the survey, you have like at every stage you might have to adopt some methods, some methods can be very detailed and intensive, so you might not take it at the primary stage but only to get a basic idea you might take a simpler method in the beginning and when you are sure that these areas have to be looked into after your basic study then you might go for a detailed study, methodology.

So, it is important to have a phase-wise strategy like in the initial stage what you are going to do, at the later stage when you have to undertake a detailed study of what you are going to do. So, it is important that you have identified strategies of phase wise strategy for what kind of methods you are going to adapt for the baseline survey. So, anything that requires detailed studies so that kind of methods can be taken up at a later stage when you have much more clarity on what has to be done.

So, there are a lot of data sources that hold a lot of suitable ecological data. So, when you are collecting data you need not collect all the data from the primary survey but then there can be a lot of secondary surveys. So, for example, you can see ecological natural history, and data centers, and then there can be local history centers, and you can have internet data sets.

Like you have global biodiversity information, you also have IOC and red lists of threatened species, national red lists you will also find the national list, you will also see national natural history, nature conservation ecology or environmental authorities keep information and local museums and libraries would also have information.

And then many of the academic institutions and universities would also have information, so these would be very very regular places for you to look for ecological data. So, even for that matter, you can have national park authorities, NGOs, and then various interest groups who might retain data. So, here in this, you can see

as per the manual from where I have again taken it from the thermal power plant manual. Then you can see what are the different sources of data for ecological purposes.

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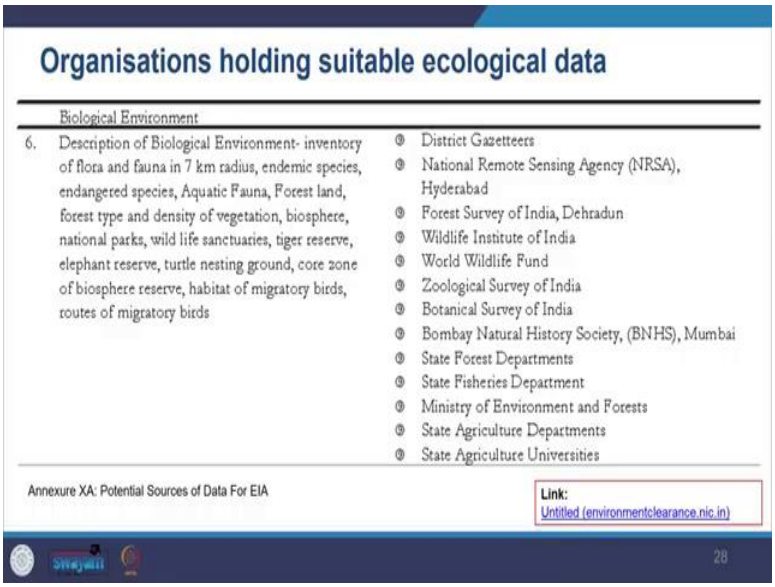

So, in biological environments, you can see that you can inventory flora, and fauna within a certain radius and then identify all kinds of species, endangered species, aquatic fauna, forest land, forest type, density of vegetation, and so on. The source of information is district gazetteers, you can look at the national remote sensing agency NRSA and then you can also look at the forest survey of India, wildlife institutions of India, and the wildlife fund.

Zoological Survey of India, Botanical Survey of India, Bombay Natural History Society, State Forest Department, State Fisheries Department, Ministry of Environment and Forest, State Agriculture Department, and agriculture universities. So, these are the possible sources of data that you see here.

So, you should check whenever you get data you should check the strength and the potential of that particular data. How robust is that particular data that will also affect how you, what kind of analysis you can undertake? So, if there is inconsistent data probably you will not be able to undertake many of the analysis.

So, you may also use experienced ecologists to understand some of the data requirements. That was about the sources and how you have to different levels of study you might have to take and then how, from where you can get what kind of data.

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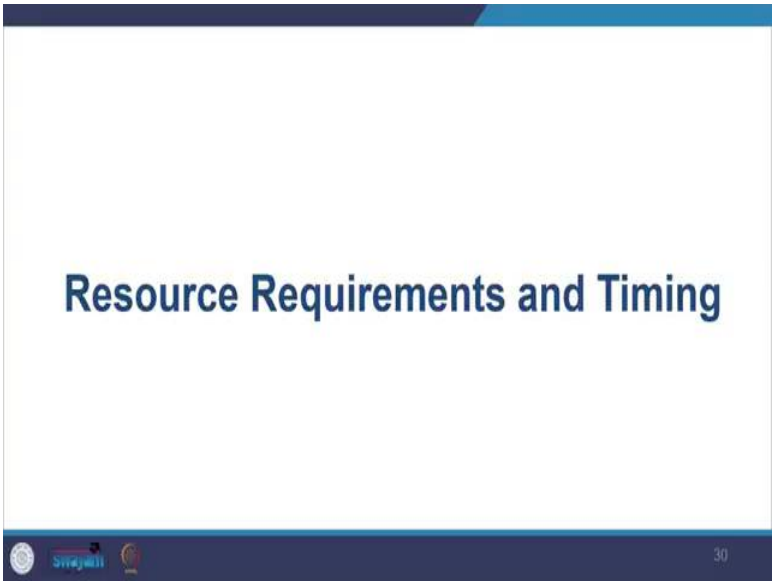

Further looking into resource requirements and timing.

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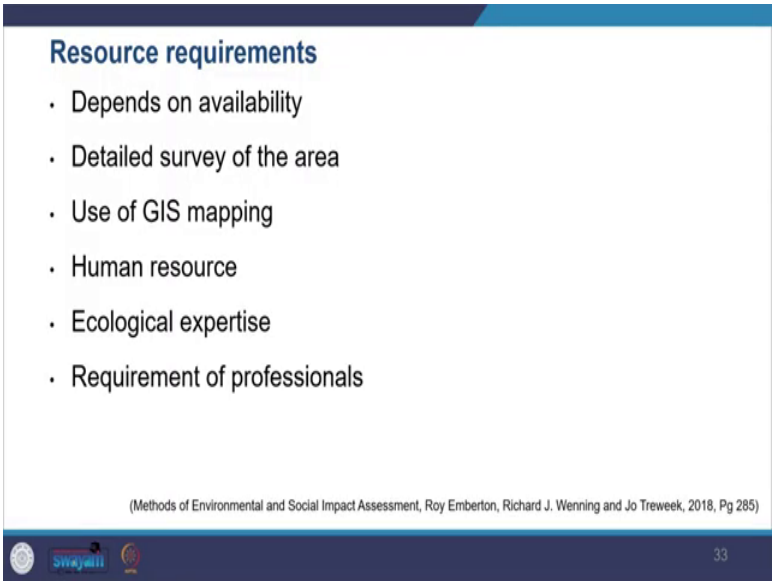

So, there will be a lot of variation in terms of what kind of resources are needed and what kind of time is needed for EIA and it will all depend on what kind of information is already available for your study area. So, if there is no data available then you might have to undertake a lot of primary study, you have to go and survey, and doing that would consume a lot of time and, a lot of money. If a lot of information is already available then it would reduce your period for collecting all those information. So, one has to be very careful about like how much they can commit.

There are a lot of suggestions on using the GIS mapping for this purpose that also helps and it is suggested because GIS allows to integrate all the information and then it also allows for the further analysis part. You also need to look into the human resources, what kind of human resources you have and then you might also need ecological experts for your purpose, and you would, in this particular case you might all need licensed experts, so experts, ecologists, professionals who have licenses so that would be the requirement, who have certificates and licenses so then they can only undertake this kind of studies.

It is important because then those people can identify species take appropriate samples and undertake analysis. So, they would be able to identify what kind of species have to be taken, what kind of samples have to be taken, how, from where they have to be collected, and how those data will be analyzed.

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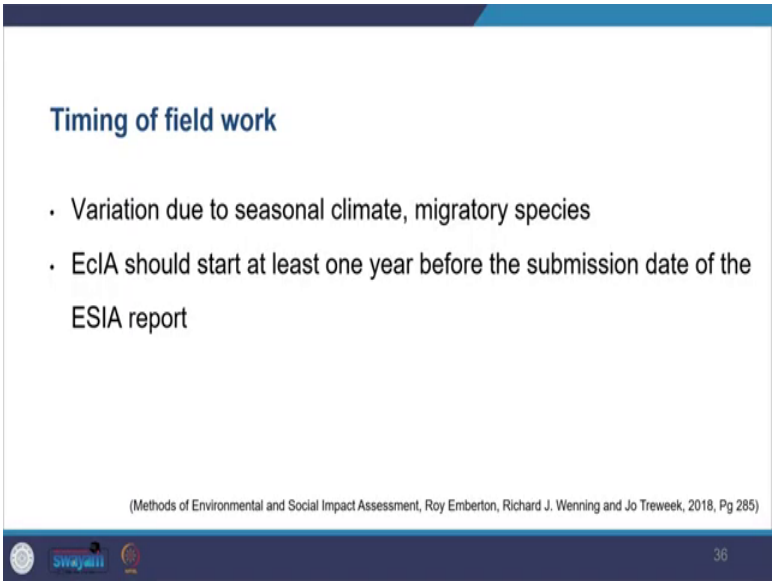

You also take note that the timing of the fieldwork is also an important factor, a very important factor because there can be a lot of variation in terms of what happens in one season and what happens in another season and then there can be migratory species as well. So, you need to carefully plan and observe all the variations.

It is usually suggested that when you are doing ecological impact assessment you should start one year before the submission date of the EIA report. So, you would at least take one year to undertake this study. So, as per the suggestion one needs to plan at least one year to undertake the complete study.

So, you also see that in some countries there may be specific requirements and procedures to follow for protected or threatened species and these can cause like considerable delay, so you need to take care of that, what kind of, what kind of suggestions are made in your advice are made or requirements are there in your particular country.

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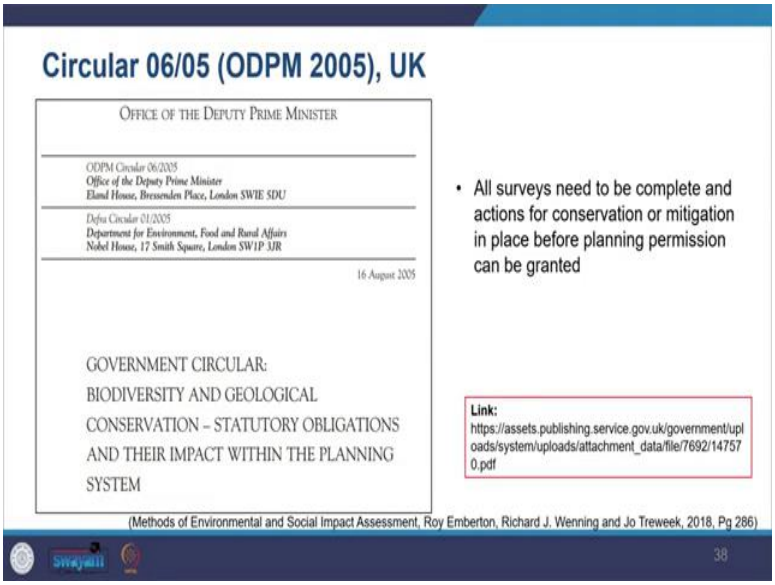

So, you see that the UK has its considerations, what has to be covered, and then you can also find others like internationally they have other parameters which have to be considered. So, that is about the resources and timing, and then if you look at the initial baseline surveys.

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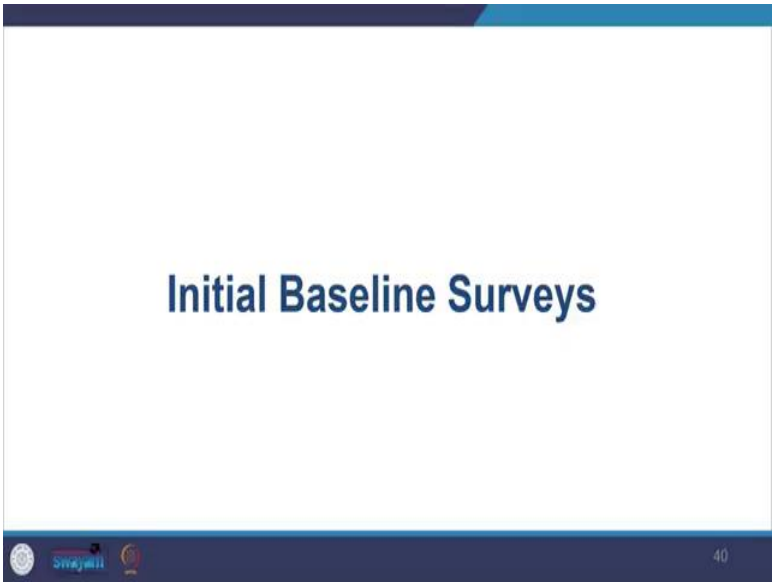

When you look at the initial baseline surveys if you see that species and habitats in each region of the world are different then for that region national requirements should be referred. So, you need to first see in the country you are working in what kind of national requirements are there.

So, it is important to engage with the local ecological specialist also so that they know what is, what has to be followed and they will have local knowledge and also expertise to deal with all the authorities and then also have good knowledge about the local, national legislation and what are their survey requirements.

So, in the case of the initial survey you should be able to identify like what are the main ecosystems, what are the main habitats and species populations that might be affected by the proposed project and then what is

their interdependency also, so you need to look at that. Then you need to identify what are the species, what are the rare species, protected species in your study in terms of flora and fauna you need to take care that.

You also need to look at the potential role of the affected features and process in a wider landscape context. So, if whatever impact is happening on the flora and fauna you need to also understand the role those particular species, what role they play, because if in, what kind of impact is happening and then what kind of secondary impact it might have or cumulative impact it might have.

Further you need to find out important ecosystem services and their different properties, you have already seen different ecosystem services so you need to find out what are those ecosystem services and then you need to find out like also express what kind of gaps are there in the knowledge and identification because whatever survey and study you would be doing there would be a limitation about what kind of methods you are using plus what kind of information is already available so that all needs to be spelled out.

For this purpose, for the initial stage you can use very simple techniques such as ecologist field walking, so you can simply walk in the study area, you can also take visual assessments of the development sites, so you do the visual assessments, you can do photography, you can make notes, field notes, and then you can also do recording and mapping of the area and see like mapping can be thematic mapping and you can look at like what kind of habitats and vegetation types are there and then for this purpose you might use relevant classification system also.

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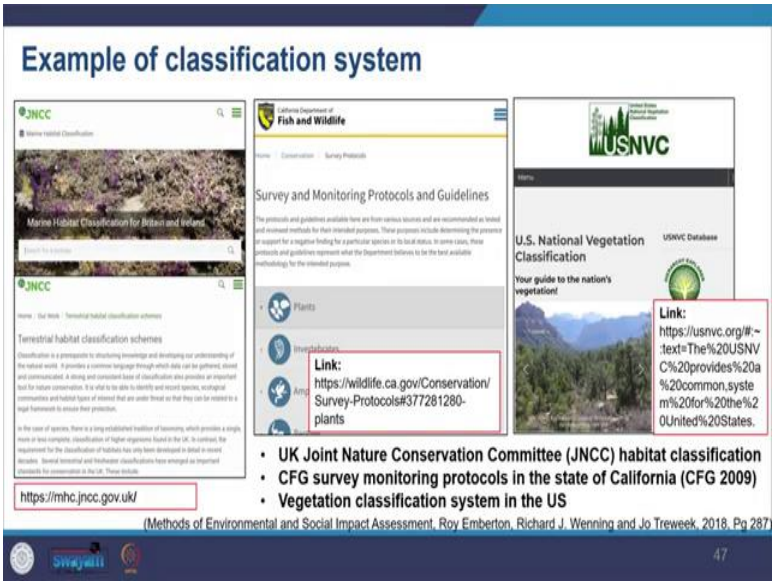

So, looking at some of the classification systems you do find the UK Joint Nature Conservation Committee has habitat classification, they have a system of death, then you also find CFG survey monitoring protocol which is used in the state of California. Then you also find the vegetation classification system in the US. So, you can find all these classification systems which are there.

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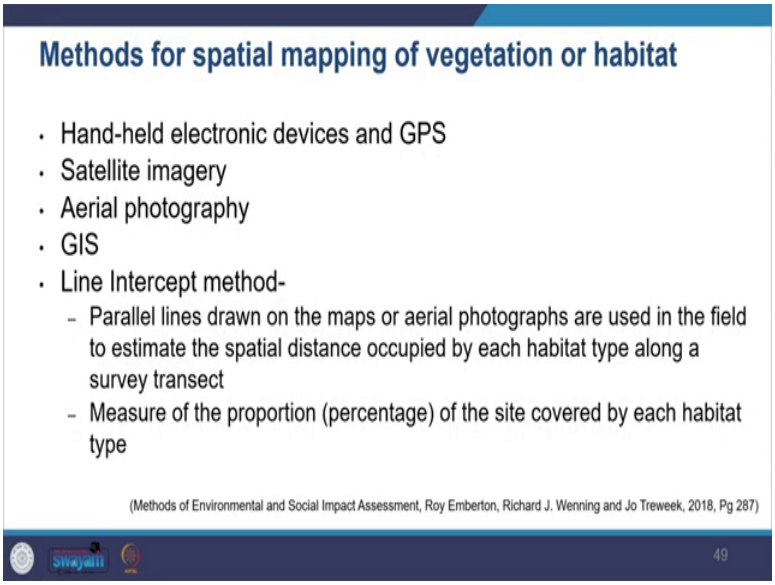

So, looking at what kind of methods are available for spatial mapping of vegetation. So, you can use handheld electronic devices and GPS so you can use that, you can also use satellite imagery, you can use aerial photography, and GIS can be used. Then there is the line intercept method, where you along any project area draw parallel lines on the map or aerial photography and you take stock of what all things are crossing and or are there in that particular range, so that is the line intercept method.

This approach provides the measure of proportion, so like you look at the percentage of the site covered by each habitat type. So, you get an idea about what is the proportion, what kind of varieties are there, and to what extent they are, so that all is provided here.

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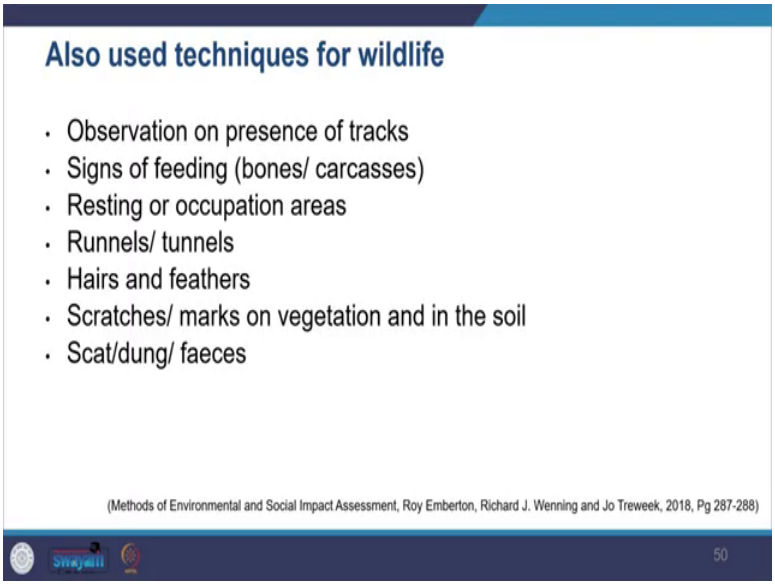

You also find some more techniques which are used for wildlife purposes, such as observation on the presence of tracks, so you can find the wildlife tracks, you can see, you can make notes of what kind of ranges you are seeing, you can see the sign of feeding, so you can see the bones and carcasses if or you can find on-site.

Then you can also see the resting or occupation areas, you can see runnels, tunnels, then you can see hairs and feathers, then you can also look for scratch marks on vegetation and in the soil and then scat and dung feces, can also be seen for finding out what kind of varieties are there. So, you would also find a range of guides in this. So, here we can see that you have some of the available measurement systems.

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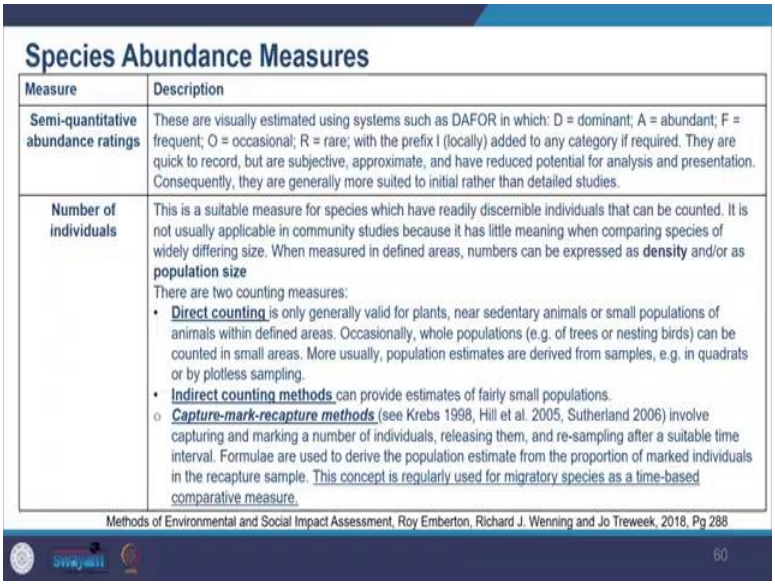

So, there are like semi-quantitative abundance ratings which are there in which you have visual estimation system, so you visually estimate and it is also called as DAFOR, ‘D A F O R’ in which D is like dominance you see what kind of species are dominant and then you see what is like abundant, abundant, A for abundant and F for frequents which you see frequently and O for occasional and R for rare and then you can have locally or if it is required if it is locally available material.

So, the advantage of this particular system is that it is very fast but the disadvantage of the system is that it is very subjective you might and it gives a lot of approximation if it is very approximate then you cannot have a lot of analysis which can be done. This particular system is very suitable for the initial kind of study, so we are looking at the initial study stage here.

And then further you can look at the number of individuals. So, several individuals is the measure which is taken so you see how many numbers of individual species are there and you can count and keep a number of that and this is particularly used for the individual species, however, this is not suitable for the community study where you study all the entire community and it is not found suitable for that.

But it gives the numbers and it can be also expressed as density number per unit area you can tell what kind of species is available per unit area. Then you can also give the population size, and what kind of population is there in your study area and you find that there are two counting measures, one is direct counting and the other is indirect counting.

So, direct counting as a measure is usually valid for plants because they are stationary so you can count them really and then the animals that are not very mobile can also be taken by direct counting and other small populations of animals within the defined areas can be surveyed using the direct counting method.

Then indirect counting method can provide estimates for a small population and, you use like capture-mark-recapture method, where you capture the animals in the area. This involves capturing the animal and marking several individuals and then you release them and then you re-sample after a suitable time interval then you count them back.

So, you have certain formulas that are used for this and we are not going into the details of it but just to know that this method is available capture-mark-recapture method. This method is regularly used for migratory species as a time-based comparative measure, so you take care of that.

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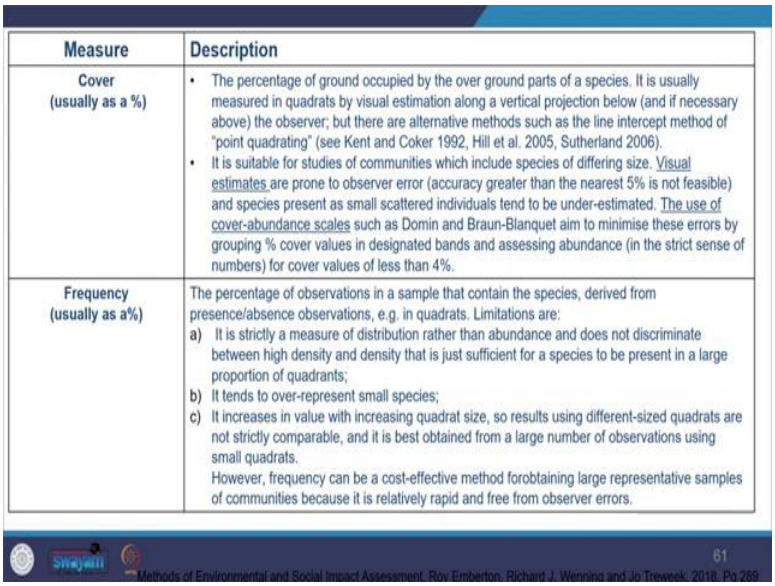

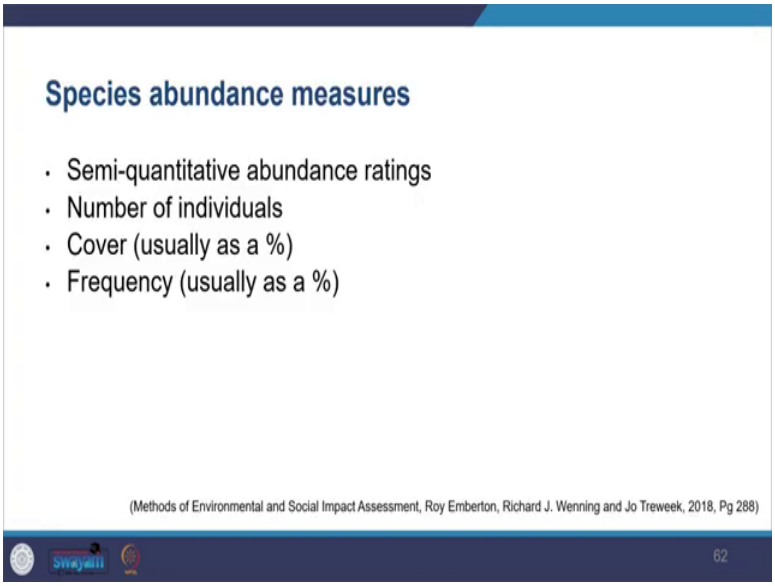

The other measure is cover which is usually given in percentage like how much percentage of area is covered. So, the percentage of ground which is covered by certain species and the percentage of it like out of

100, 30 percent, 10 10 percent is covered by certain species, so that is what you give the cover in the forms of percentage.

So, you use quadrats to make rectangles and then you do the visual assessment and then you can also use the line intercept method., this measure is important for studies of communities, so this one is the particularly important cover method you can study communities and then like visual estimations are done here but the limitation of visual estimation is that one can make an error and they can be lack of accuracy in this.

But there are other methods to take care of the errors, so there is like something like cover abundance scales which can be used for minimizing the error part. I am not going to get into the details of the scales here. So, another measure is frequency which is again given in percentage. So, here you see the percentage of observation in the sample that contains the species.

So, how frequently you are finding that and by seeing that how, what is present and absent observation so you make that. The limitation of this is that it measures the distribution, and distribution how the species rather than the abundance and does not differentiate between the high density and density and it is just sufficient for species to be present in a large proportion of the quadrants.

So, it does not give you the abundance but only lets you know how the distribution is and then it tends to over-represent small species, so there can be small species that can be over-representative, so you find this. So, that was about some of the methods that are available for the initial survey.

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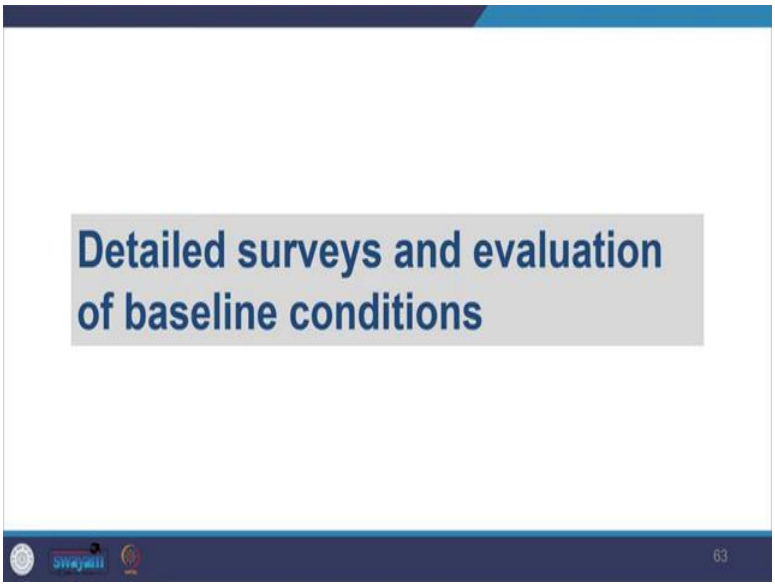

Now, looking at the details survey and evaluation of baseline conditions.

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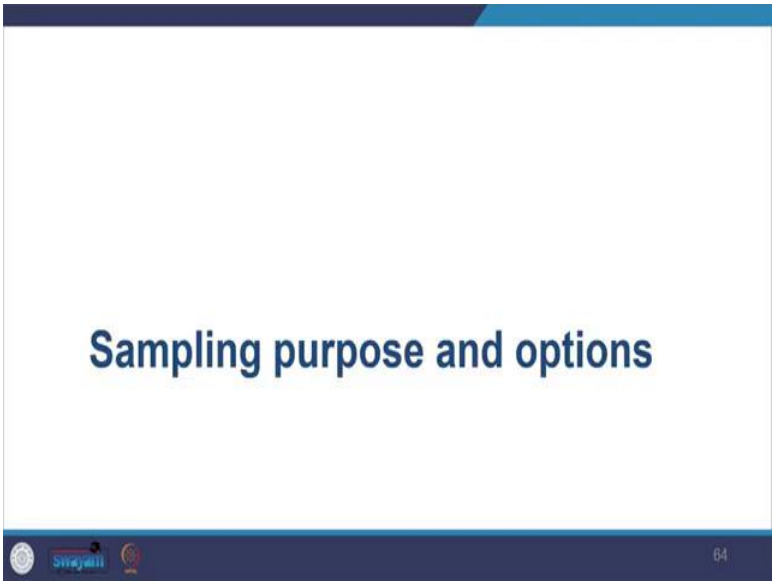

So, now just to take a moment to understand what is the purpose of sampling and what the options available. So, you, so far in the initial stage you saw what kind of data, secondary data we can collect from different sources, what kind of initial simple studies can be done.

But when you take the survey you are going to undertake a very detailed study. So, the main purpose is why you do that because you need to have quantitative data, you need to have detailed study, detailed numbers for specific segments which you identify are of importance to you. So, only when it is not there that information is not there or that is a very important aspect then you undertake those detailed surveys.

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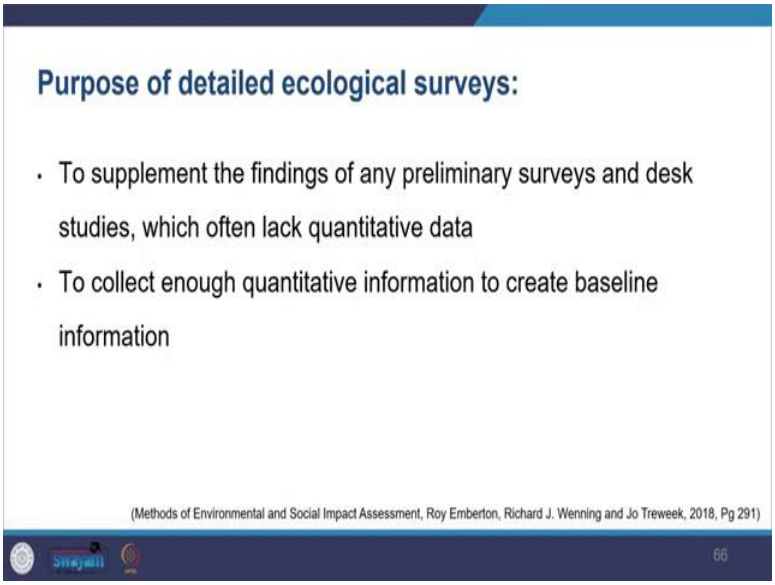

So, the purpose of a detailed ecological survey is to support whatever finding you have undertaken in your primary survey, so you support it with the detailed study and you give the numbers to it, so you might have an initial study, you might already only have descriptions that such kind of things are happening but then with this survey, you can give detailed information. So, this will help you to create a baseline information.

You also need to have a spatial scope, when I say spatial scope that means how many boundaries you will cover for your detailed study and then it will also help you to see what kind of direct and indirect impacts will happen. You may need to study more than one survey season so you might not only do it in one season but you might do it in other multiple seasons and you may note that such kinds of studies can be expensive and also time-consuming. So, you have to see what studies have to be done.

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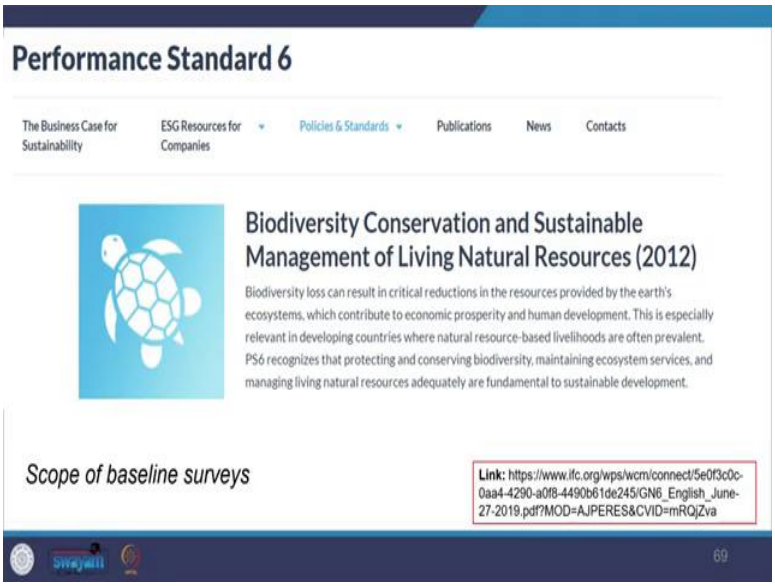

So, you will find IFC performance standard 6 guides the baseline survey. So, you can see the snip of the IFC survey here.

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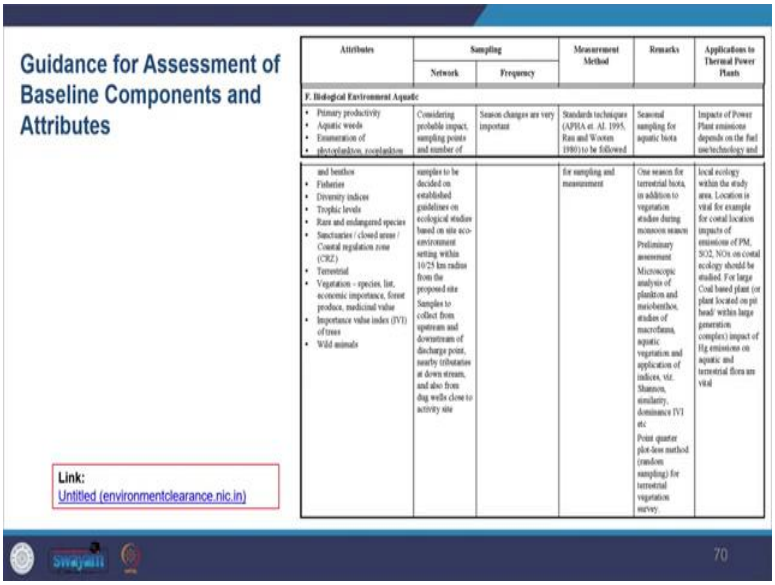

Further, I have added the snip from the manual, where you can see what kind of data has to be collected, so this is again from the thermal power plant, you can see that how for the biological environment aquatic you need to have all primary productivity aquatic weeds, numerations of phytoplankton, zooplankton and so on and benthos, fisheries all that and then what kind of sampling has to be done.

And then how that has to be collected, what kind of measurement method you will need and then you can see in the remark you can see seasonal sampling for aquatic biota, one season for terrestrial biota in addition to vegetation studies during monsoon season, primary assessment, microscopic analysis and then how it would be applied to a particular project, application to the thermal power plant as you can see here.

So, those kinds of guidelines are already given and I will be sharing, one or two examples with you. So, that is already given on a ministry website all these sectoral guidelines are there.

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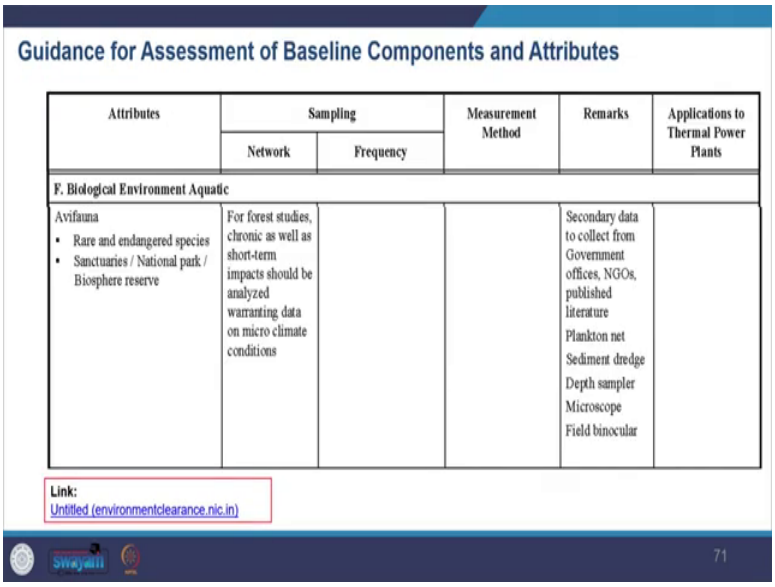

So, appropriate sampling methods have to be taken depending on what guidance is available in your country and also you have to decide this based on the what kind of data analysis you are going to perform.

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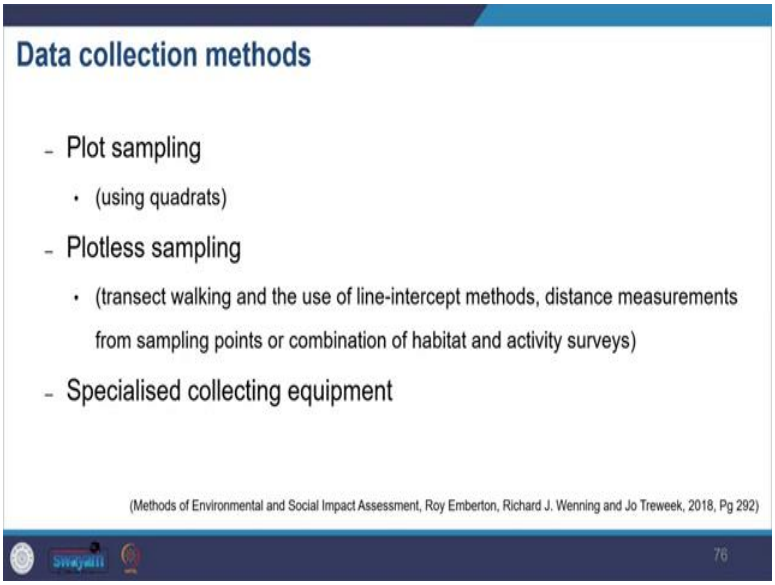

So, data collection methods if you see include plot sampling, so plot sampling involves taking observation you usually use plant species with defined plots, so you would define the plot and then you would have quadrats for those plots and then you would take observation. You will also have plotless sampling, it is, it is

a method in which sampling is not conducted within the defined area so you do not have a defined area but you can pick samples from any of the areas.

So, a simple method includes transect walking so you would just walk along and you will use a line intercept method to record all the plant species and the abundance along the transect line. So, you might just draw a line and then you might just make observations. So, this can be applied as a habitat measurement method for the estimation of vegetation and then plotless methods if you involve distance measurements from sampling points.

So, you might stand in one point and look at the other point and then see what kind of range are there, so that helps that those methods are there for plotless methods. Then you also, the estimation you do like tree density you find out what is the density in a particular unit area, and how many trees are there, then you would also likewise find out what kind of animal population is there and you would use the plotless technique to for like bats, then you can also have certain surveys which can be undertaken.

So, you need to take care of the timing when you are going to do this seasonal thing I have already shown you in the guidelines and then what kind of sample size has to be taken so that also you need to see through the guidelines, it will depend and vary from place to place.

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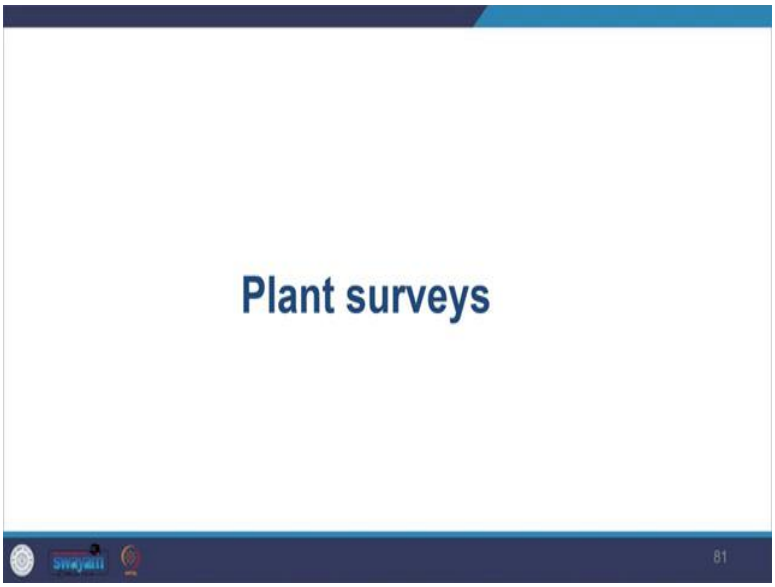

And then just quickly looking into different plant surveys, now the kind of surveys. So, for plant surveys, you will need a plant survey so you can do a vascular plant survey which will be required and you might need a taxonomic expert for this.

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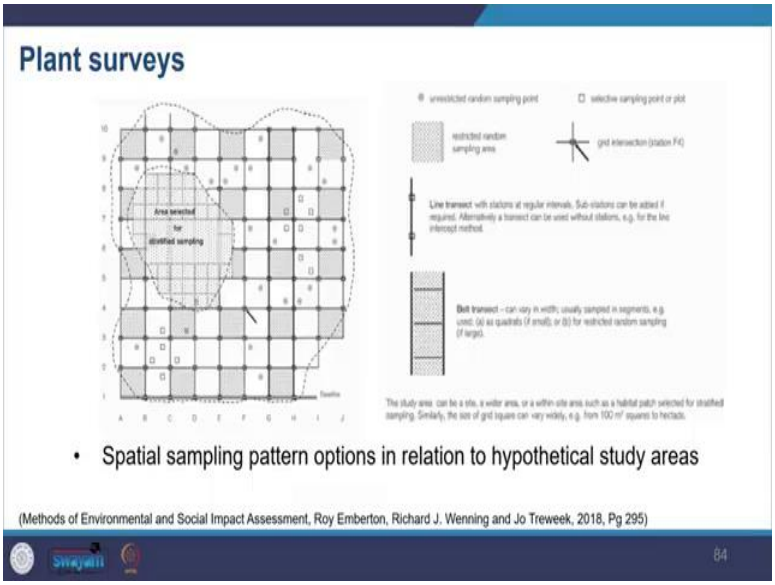

In the diagram here you can see the special sampling pattern option based on the hypothetical study area. So, you can see here how the grids and plots are divided, and then the small boxes you can see from where the samples are collected. So, likewise, you would be doing for animal survey.

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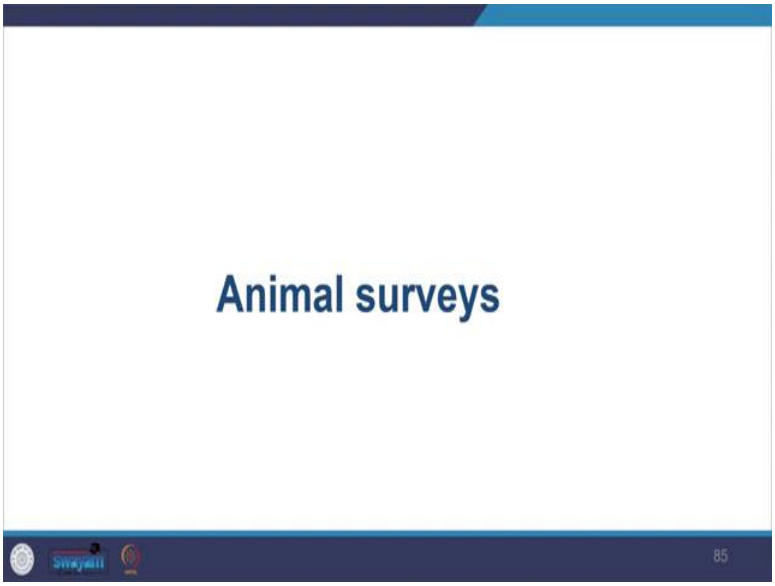

So, animal surveys it is said to be very difficult it is also said to be time-consuming and require careful planning. So, survey mythologies would also be different from animal to animal, and animal surveys should use mythologies accepted in the country.

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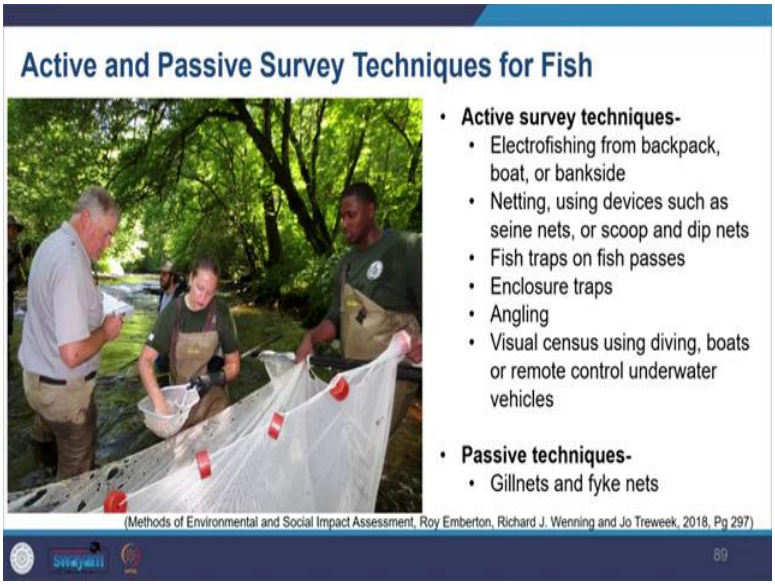

Further, you will see, that you might have to also look into fish and then how you survey fish you have a certain active survey technique which is like electrofishing from a backpack, boat, or bankside, you have netting using devices such as seine nets or scoop and dip nets. Then fish traps or fish passes, then you also have enclosure traps, then angling and visual senses using diving, you can use boats, remote control underwater vehicles. Then you have passive techniques which include gillnets and fyke nets.

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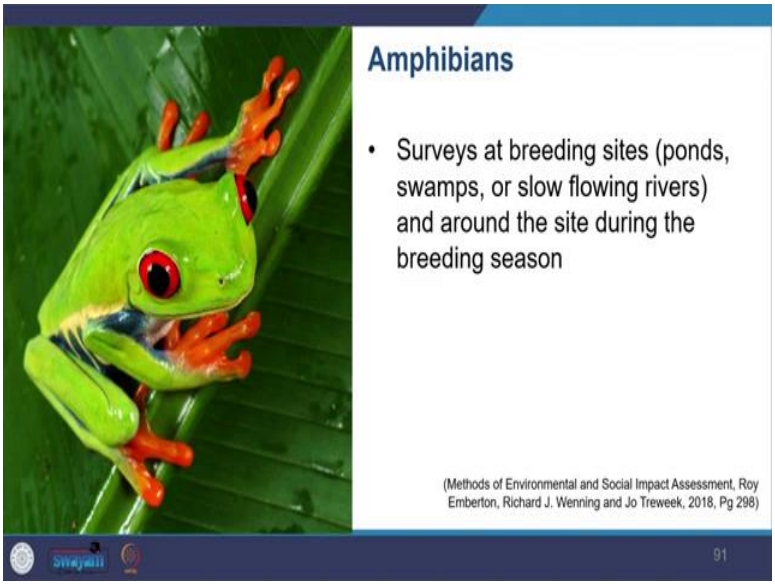

Then you also need to look into the amphibians. Amphibians use both terrestrial and freshwater or brackish and they can be found in both places and then you need to take a survey of this so usually you take at the breeding sites which can be ponds, swamps, slow-flowing rivers so there is where you can see and you might try to take the samples at the breeding season.

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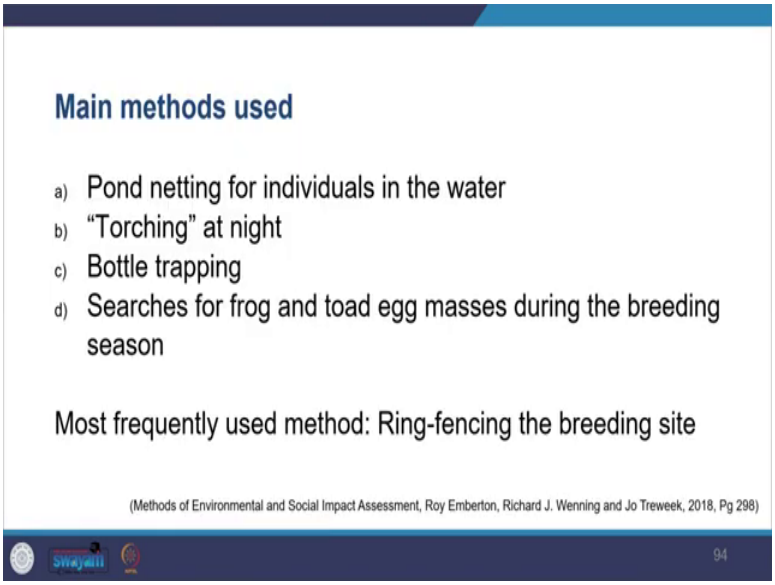

The main methods used are pond netting for individuals in water, torching at night, then you can have bottle trapping, then you can also have searched for frogs and toad eggs, and so on. And then you can also use a combination of survey methods for this purpose. This ring-fencing method is also said to be the most frequently used method. So, you can do a ring-fencing around the breeding side.

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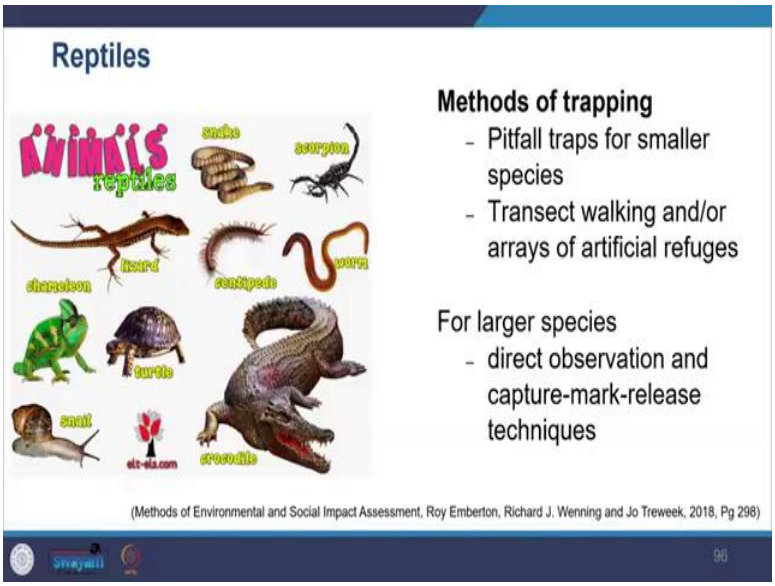

Then you also need to look into reptiles and you can have pitfall traps for smaller species, you can have transact walking, and for the larger species, you can also use direct observation and capture mark release techniques that also you can do.

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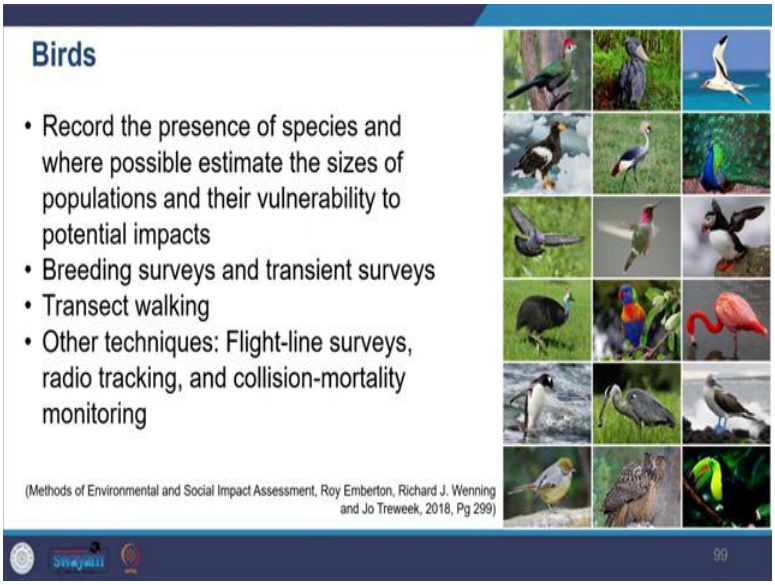

And then you have to make a listing of the birds as well and you would see what kind of species and what quantity, size, and populations are there. So, the bird survey includes breeding surveys and transient surveys and then you can also use transact walking and then there are also other techniques like flight line surveys, radio tracking, and collision mortality monitoring.

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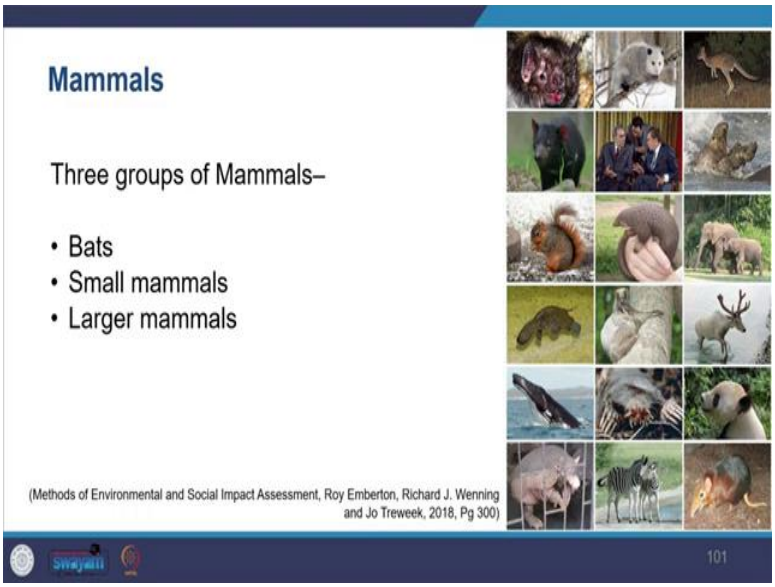

So, you also need to do for mammals, so depending on the range of different groups of mammals you need to undertake studies.

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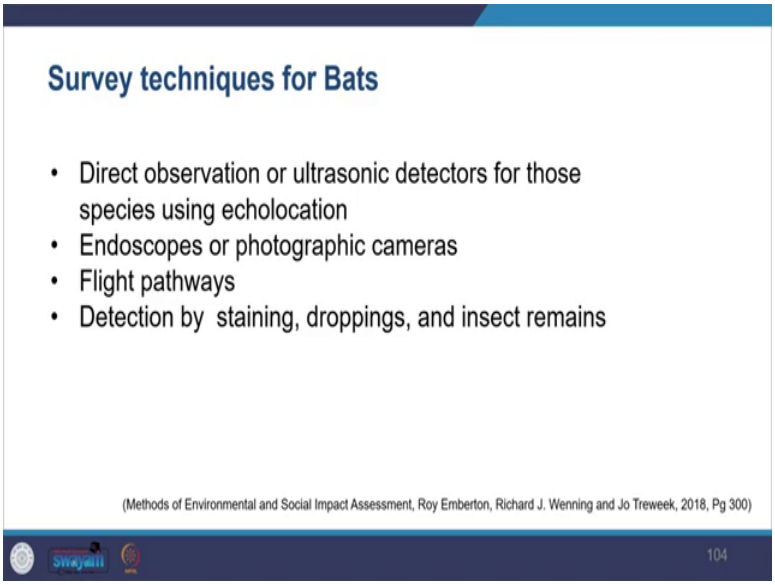

So, you can use ultrasonic detectors for different species, and ultrasonic detectors are said to be useful tools for both identifying the species that are present and also their activity. And then you can also have endoscopes and photographic cameras, you can also have foraging bats using flight pathways. Then you can have a roost structure, roost may be found in places such as buildings, trees, caves, mines, and tunnels.

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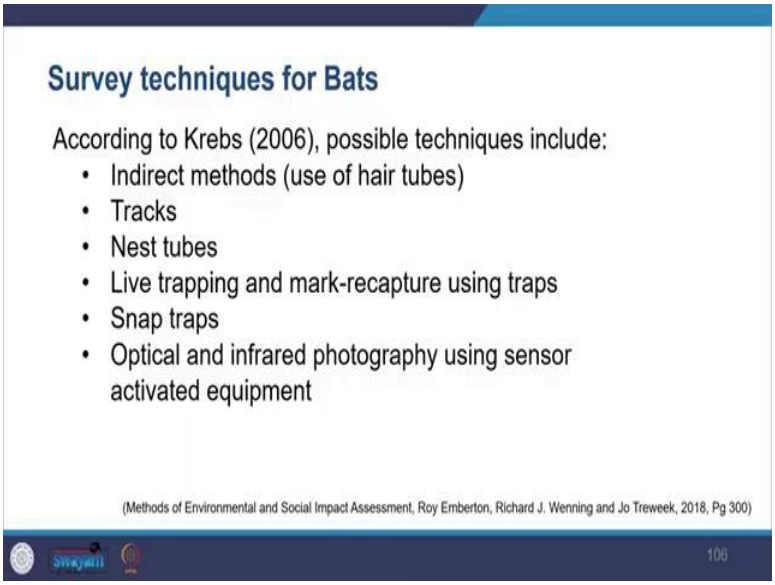

So, certain techniques are given there are indirect methods you can find the list here like hair tubes and all and then you have you can use tracks, you can use nest tubes, live trapping, and snap traps. Then you can have optical and infrared photography using sensor-activated equipment so that all you can use.

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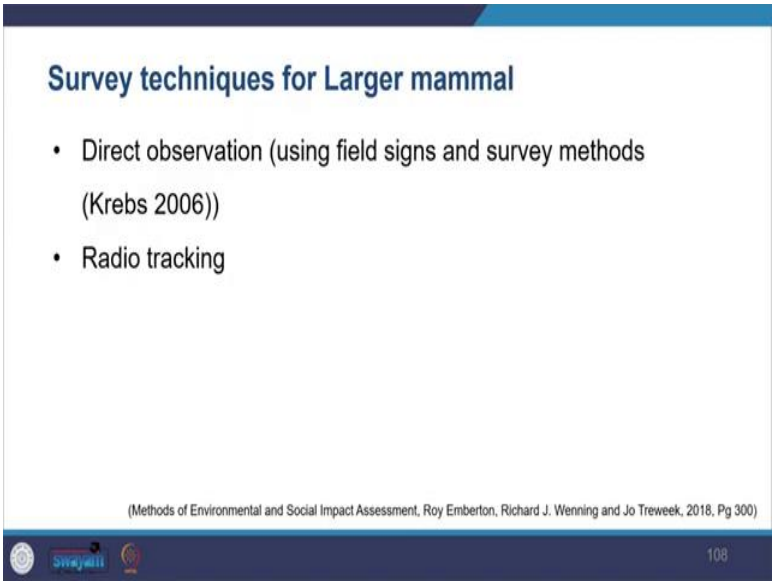

Radio tracking can also be used and field signs can also be used.

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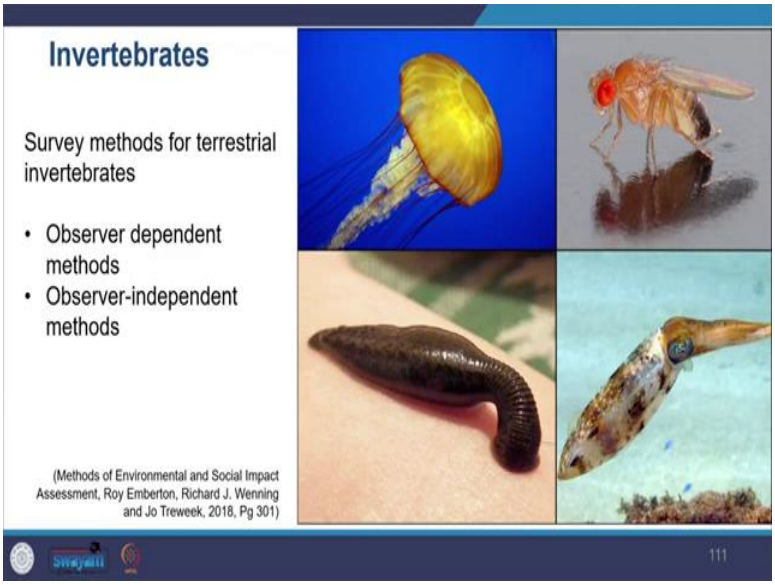

For invertebrates as well you need to do surveys and you can have observer-independent methods such as traps can be used for this or you can have investigators who can visit the site.

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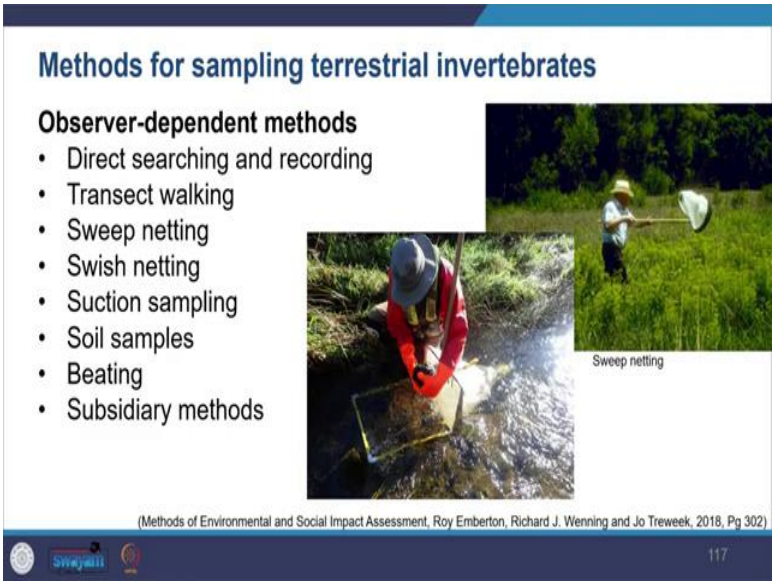

So, you find the entire listing of it so observer-dependent methods like you have direct searching and recording methods, so you have transact walking method, then sweep available netting methods. You also see swish netting, section sampling soil samples, and beating methods. You also see subsidiary methods.

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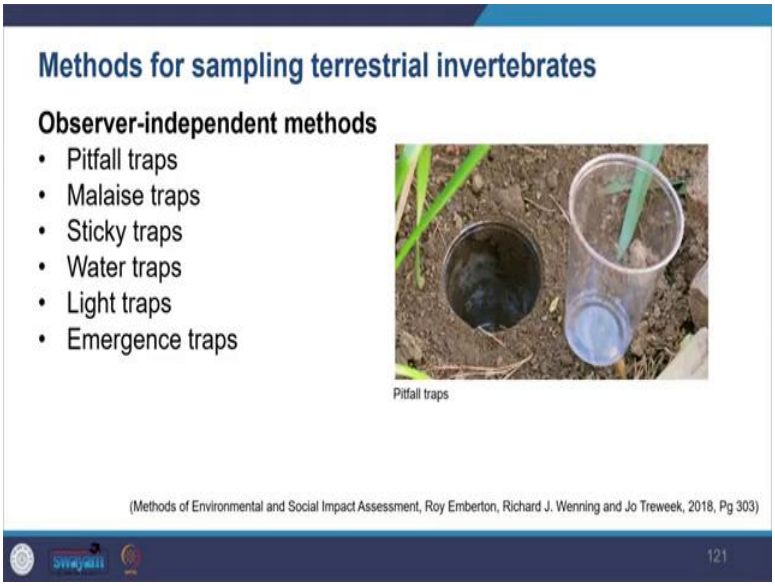

Now, looking at the observer-dependent methods. So, you have pitfall traps and malaise traps, then you also see sticky traps, water traps, light traps, and emergency traps. So, these all ranges are there, so these are helpful for this purpose.

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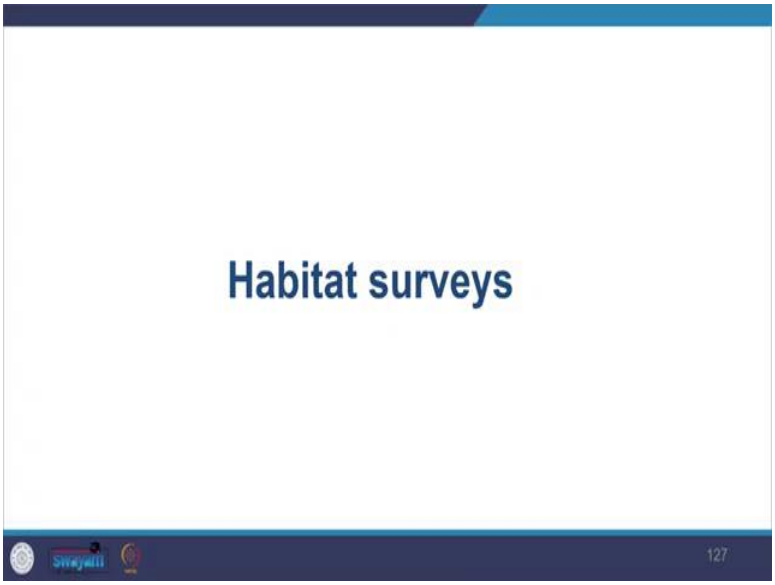

Then you have a habitat survey. So, you undertake a detailed habitat survey, and then mostly when you look at the habitat survey you have to confirm these things whether there is the presence of rare species or protected species or not and what the conservation status that so that all you need to do in this.

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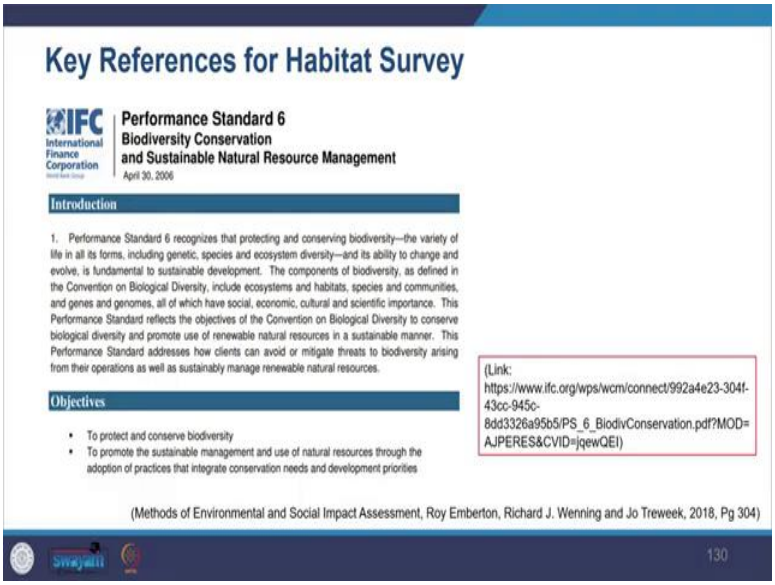

For this you get the key reference IFC performance standard 6 which provides you the guidelines for habitat survey.

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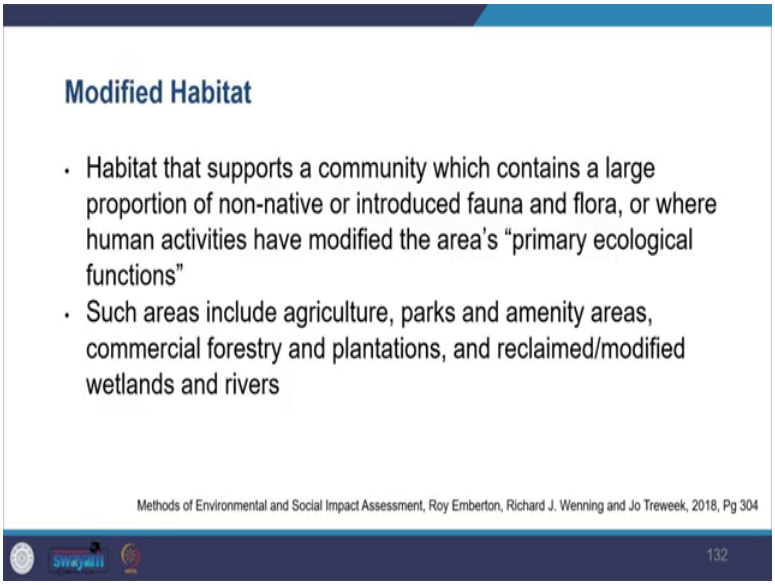

And you need to understand certain terminologies, one is modified habitat. So, these are the habitats that support a community that contains a large proportion of non-native or introduced fauna. So, there is already a modification that has happened here.

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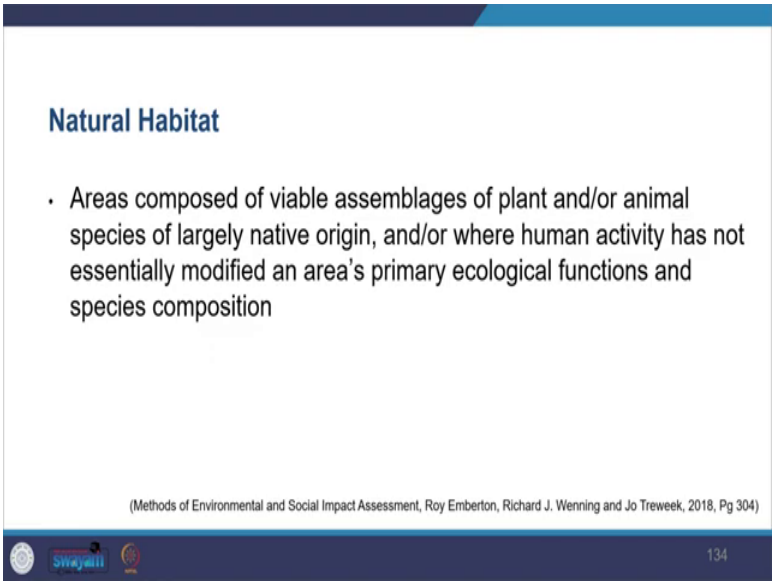

And then you have a natural habitat. So, these are areas composed of viable assemblages of plants and animal species of largely native origin, so they are here naturally.

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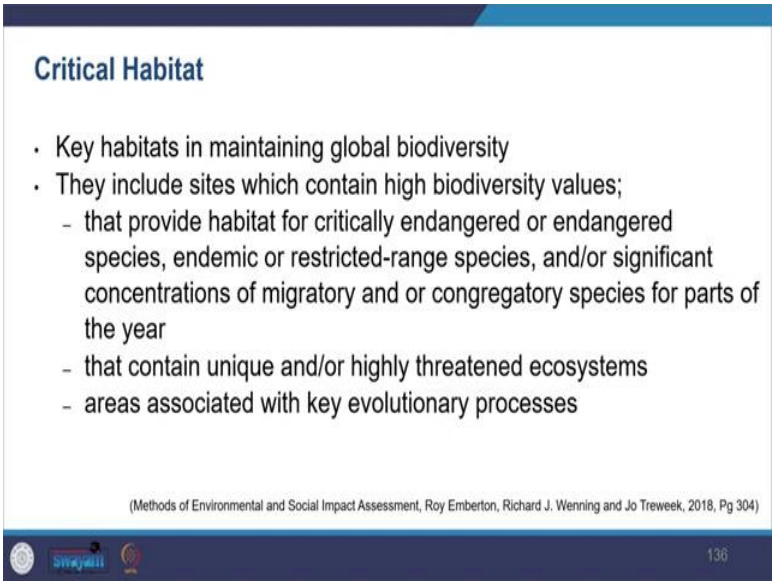

And then you also find critical habitat. So, critical habitats are the main habitats in maintaining global biodiversity, so they include sites that have high biodiversity value. So, those are there. So, that was about how you under, what key terms you take care of habitat survey.

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Further, you also need to look at the environmental factors and site history. So, a lot of things can come from the site history as well as what has happened because when you survey a lot of things you might not find them at that particular time because they might have already undergone deterioration. So, you need to look at the history as well.

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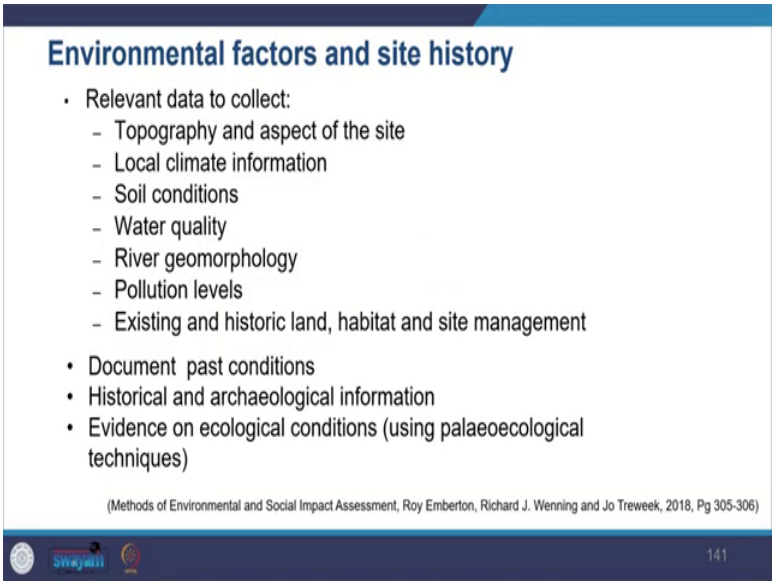

So, when the data you need to collect includes topography, local climate, soil condition, water quality, river geomorphology, pollution level, existing and history, historic land, habitat, and site management, how it has been done and then you need to look at the important documents of the past conditions, historical and archaeological information and all that you need to look at.

So, these are very important elements. And then when you look at these things, when you are undertaking the detailed study you also look at what will happen with the development and without the development, so all those things have to be taken and ecological habitat will tend to succeed over time towards the climax community appropriation for the site.

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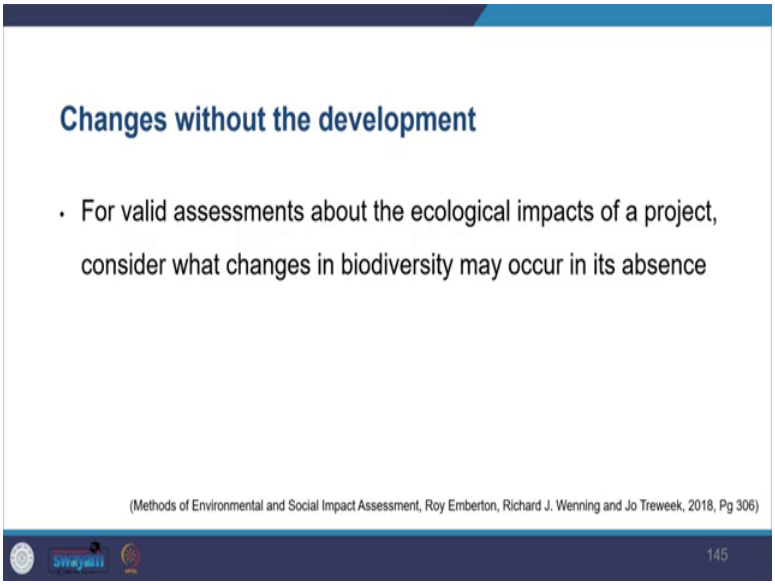

So, like what kind of changes will happen over time and with or without project so that all has to be seen. So you call without project as a zero option so that all has to be checked.

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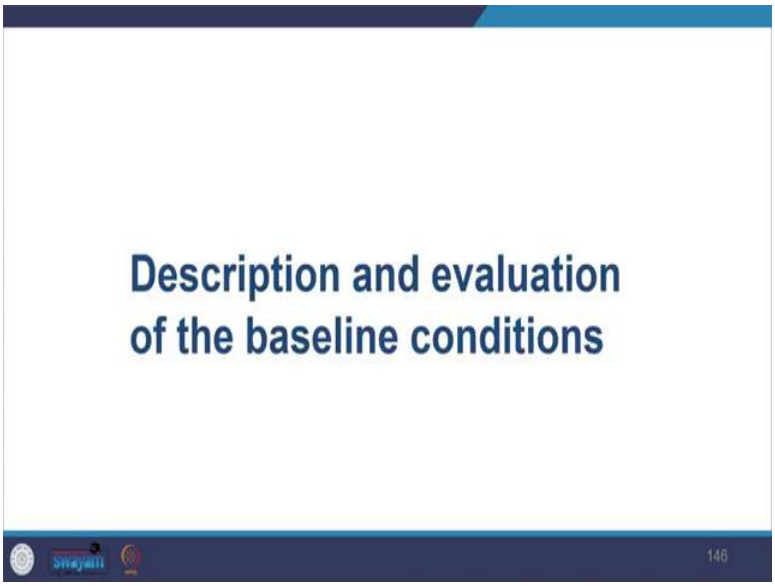

And then you need to describe and evaluate the baseline conditions, so that is the important part.

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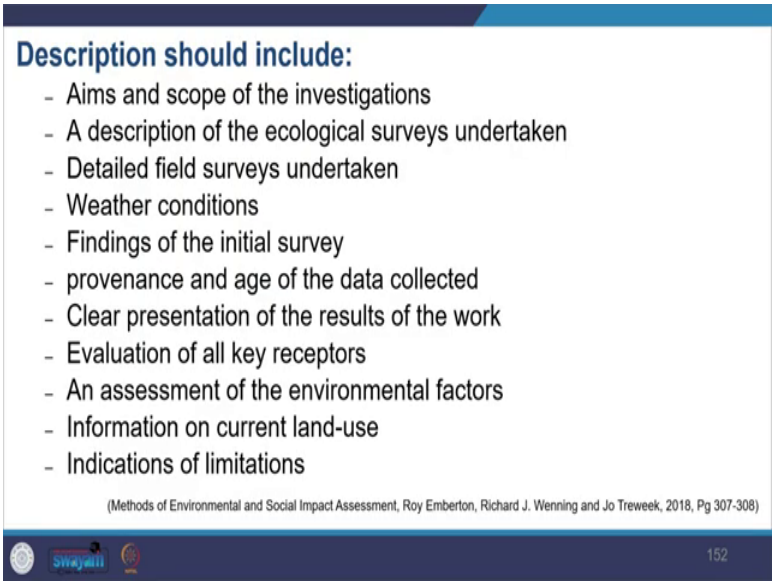

So, when you are providing a description it should include the purpose, the aim of this investigation which you have taken what kind of ecological surveys have been undertaken, what you found in the initial studies, what kind of data was collected, and then what kind of results you found out and what are the key receptors in your study area and what is your assessment about the environmental factors and then what do you say about the current land use and what are the limitations of your study that all need to be spelled out when you do the description. So, that was for this session.

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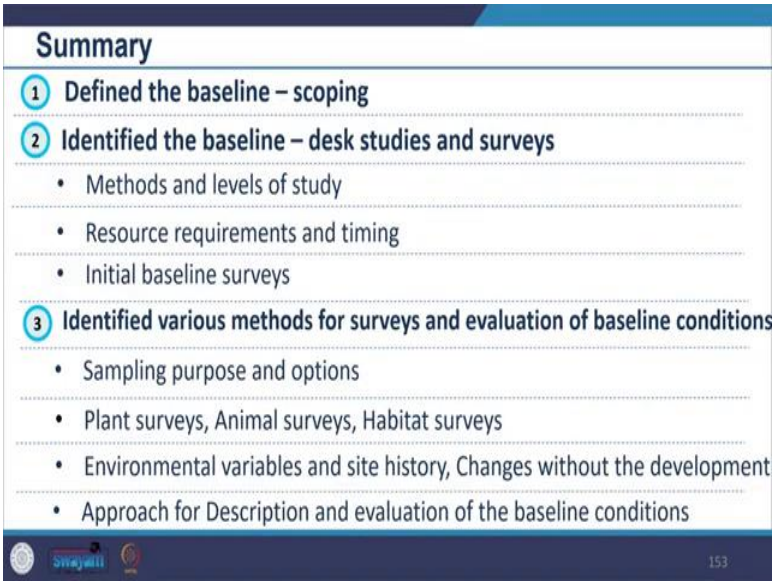

So, summarizing what we looked into, we looked into what kind of methods or what kind of considerations have to be undertaken when you are doing scoping, then we looked into desk studies and surveys, different levels, and what kind of tools are available to you. Then we looked into details surveys and what kind of surveys have to be undertaken. And then how the scenario has to be looked into from the historical perspective as well as with and without the project, as well as how you present this information. So, that is what we covered for today.

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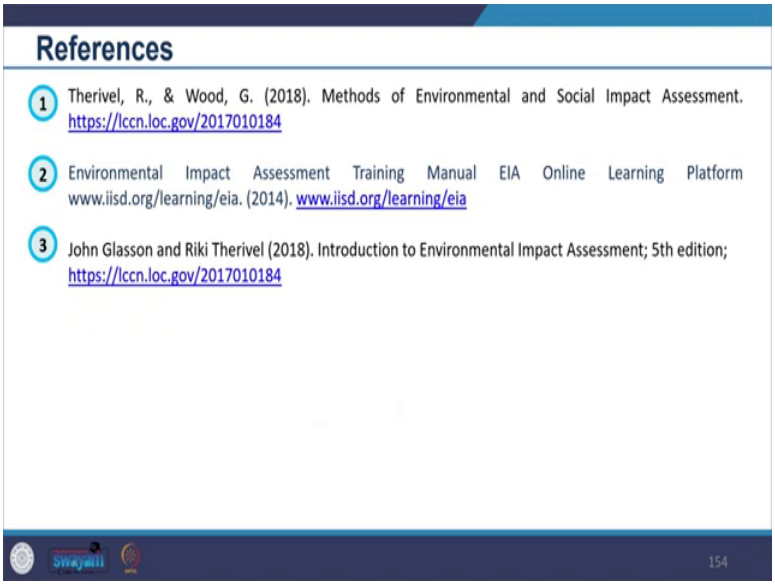

And this was our main reference, our key textbook for this plus we have been referring to all the manuals here.

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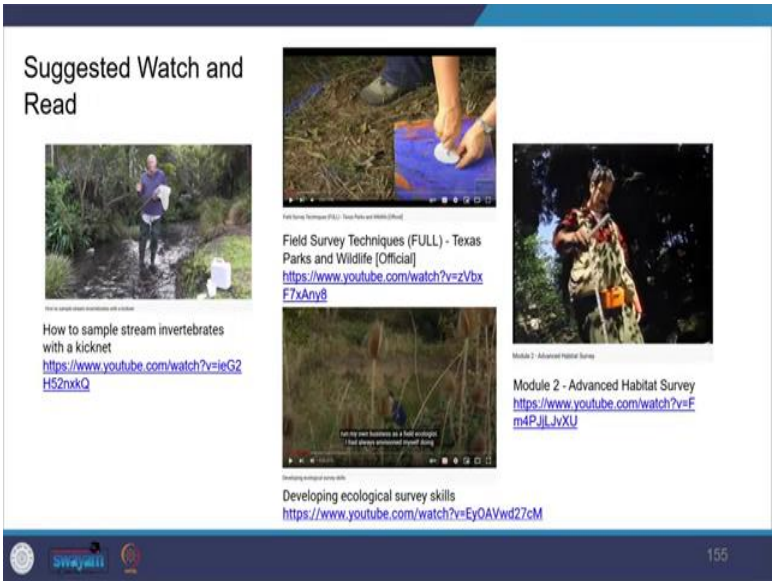

So, these are certainly suggested to watch and read for you to identify more and more of the areas and similar studies here.

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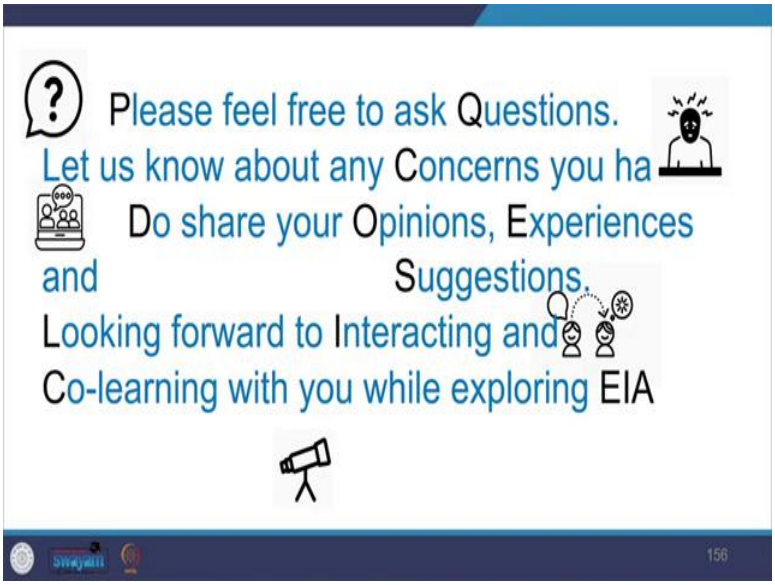

Please feel free to ask questions and let us know about any concerns you have. Do share your opinions, experiences, and suggestions. Looking forward to interacting and co-learning with you while exploring the subject of EIA. Thank you.