Environmental Impact Assessment
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Lecture No. 55
EIA - Environmental Management Plans

Welcome to the course Environmental Impact Assessments. And in today's session, we are going to cover Environmental Management Plans. So, we have been seeing EIA methods and in many cases, we have also seen mitigation approach as well, domain-wise. So, today we are going to look at the environmental management plans.

And if you look at what the purpose of the environmental management plan is to mitigate the impact of the project. So, we have seen, how we assess various impacts, and when the impacts are there, and then we looked at the significance of the impact and if the impact is significant or it can be mitigated, then, really, what kind of mitigation measures we take and then that mitigation measure is covered in the environmental plan.

So, usually, the mitigation, if we see, have been seeing process mitigation is done through two approaches, one is through EIA, before the project comes up. So, we try to reduce the impact as much as possible, through our process, through the identification of things, and the other is through an environmental management plan.

So, when the project comes up, when the project starts running, then during the operational construction and all the phases of the project, we ensure that we adhere to all the environmental commitments we have made and all the mitigation measures we have committed to adopt for all the kinds of impacts which might happen in the project.

So, we see that the literature suggests that the practice of EMP Environmental Management Plans has evolved through like bottom-up approach. So, it did not come from the legislation or top-down approach. But, it came from the practitioners where practitioners started adopting and undertaking different mitigation approach and started developing related documents for that. So, EMP has been developed through practices where practitioners have adopted a wide range of practices.

So, you will see that since it is coming from a bottom-up approach, there is a wide variety range of practices and different kinds of plans, and even you will see this there are different terminologies also used in this domain. So, you will also see that there is also a difference in the scope of the kind of management plan.

So, even if that is how much they would cover, you will see that some of the management plans cover all the aspects of the project and also take care of all the stages of the project, and then management plan can also be just one stage, you might decide to take only one stage and the documents or you or a specific domain itself. So, it can the way it is prepared for the purpose it is prepared, the scope of the management plan can vary.

And in that also you can see that EMP can also be at the strategic or institutional level, or it can be at the project level also. So, we see that EIA is mostly at the project level, but EMP can be at the strategic level or the institutional level. So, you can take mitigation measures at the higher level, at the strategic level, policy level, and institutional level, as well as at the project level where the exact local impact project related impact or not. So, we are going to look into the details of this EMP today with examples.

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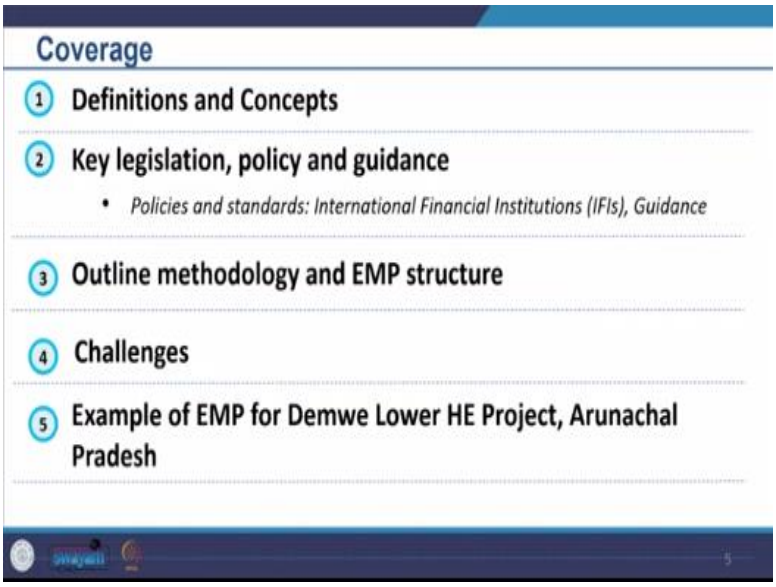

So, our coverage would include as we will look into the definitions and concepts, and then we will look into key legislation policy and related guidelines. Then we will look at the methodology, the (kind) outline it has, and how EMP is structured. And then we will look at what kind of challenges are there and then we will also look at some of the examples of EMP from Arunachal Pradesh. So, we will look at that.

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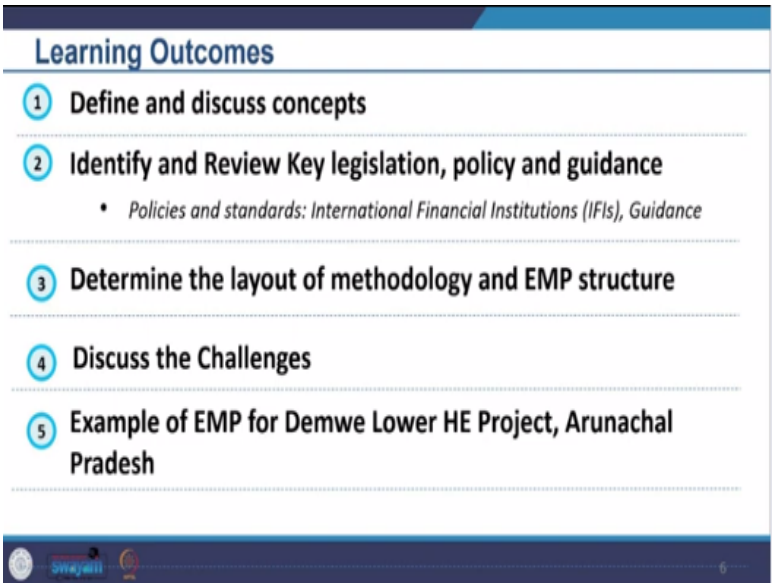

So, accordingly, the expected learning outcome is that after completion of this particular session, you should be able to define and discuss concepts, and you should be able to identify key legislation, policy, and guidance. You should be able to review what is happening in terms of EMP, and what kind of legislation policy and guidelines are there.

Further, you should be able to determine the layout of what kind of approach you have to adopt, and then what structure you would undertake for preparing EMP, and then you would be able to discuss the challenges involved. And then with the help of a case study, you can explain EMP, and how it is undertaken. So, that is the expected learning outcome.

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So, now looking at the definitions and concepts. EMP, EMP, if you look at EMP, it is the outcome of the EIA process. So, when you are doing the entire EIA process, you, as it is part of the output of the EIA process, are trying to identify what are the different impacts that are happening because of your activities, and then which impacts you can, are not significant, but there are certain impacts significance, but which can

be handled with the mitigation measures. So, what measures you will take, becomes very much part of the EIA process.

So, it is the EMP also summarizes mitigation, compensation, what kind of compensation would be given, how it will be monitored, and how, what kind of improvements are happening in the environment are also measured here. And this EMP is a document like the EIA report we have been talking about. So, EMP is also a document, it can be a document part of EIA, or it can be an independent document. This document indicates the actions needed to manage environmental and social effects, which are linked with the construction, operation, and decommissioning of a project.

So, it also importantly includes the schedule for each activity, like what kind of activities are going to undertake, and when you will undertake plus, it also gives you the responsibility matrix, like for a certain activity, who will be responsible for undertaking that activity.

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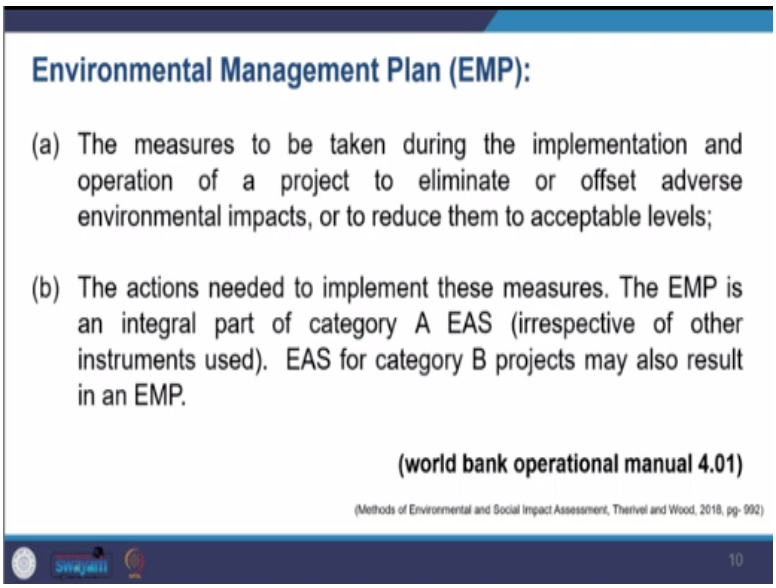

So, the Environmental Management Plan as per the World Bank Operational Manual, we see it says that it is an instrument that provides you the details, details of the measures to be undertaken during the implementation, and operation of a project to eliminate or offset adverse environmental impact, or to reduce them to acceptable levels. So, it gives you the details of all the measures, which you are going to implement during the project.

And then if Part B, we see that it includes the actions needed to implement these measures, the ANP is set to be an integral part of Category 8. So, if you remember, Category A and B, are also the major projects that will be dealt So, for that an EMP has to be an integral part of an environmental assessment report. Irrespective of other instruments used you have to make EMP part of the IEA and EIA for Category B projects may also result in an EMP. So, for Category B also, you might need EMP. So, this is what we see here. So, that was about the definitions and concepts related.

So, if we further look out at the historical context of this, we see that EMP as I also mentioned before, has been a practice-led initiative, and the World Bank and the Environmental Agency of Europe, introduced environmental mitigation plans into the environmental assessment, and operating directives. So, it all happened in 1991.

And you will see that the concept evolved within World Bank documentation and then it was it came into practice. Here it was referred to as environmental mitigation or management plans and that is how we know about environmental management plans, and they also came up with guidance on what should be covered in an EMP.

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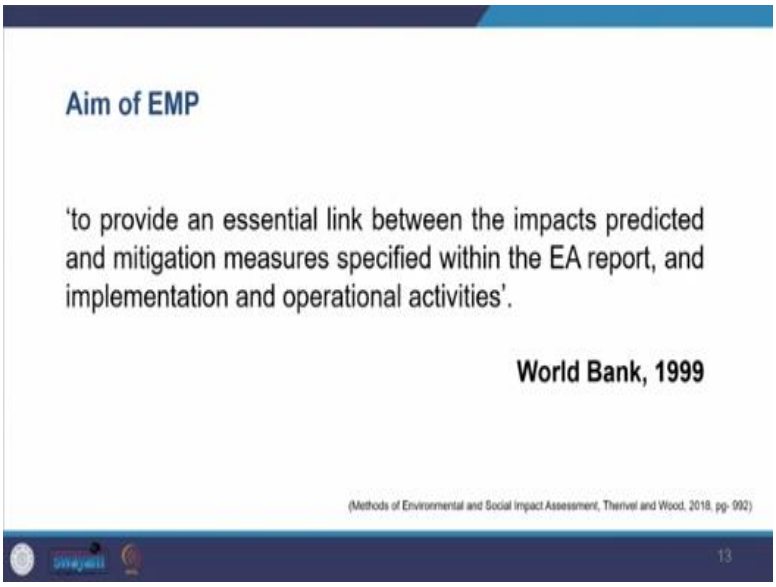

So, if you look at the broader aim of an EMP, the broader aim of EMP is to provide an essential link. So, you see how it connects with the EIA. So, you see that it is an essential link between the impacts predicted and mitigation measures specified within the EIA report. So, this is the EMP this document is the link that allows you to connect the impact and the mitigation and it allows you to take care of the implementation and operation of various activities.

So, you would also find the term Environmental and Social Management Plan. So, you would also see ESMP which would not just include the environmental aspect, but also what kind of management plan will be prepared for the social aspect as well. So, that term also you would find, and these both EIA, or you call it ESMP, they are seen as a bread element of bridging the gap between EIA and the real world implementation of the project.

So, whatever you are doing process on the table you are doing, but it helps you to really implement on the ground through the project, and then take care of all the environmental aspects. So, within this EMP, you also try to incorporate the social dimension, like I said it is also called ESMP, Environmental, and Social Management Plan.

So, social impact assessment is like we have already seen, we have looked into the legislative aspect, and we have looked into new methods aspect for social impact assessment. So, that we have seen, but when we look at the social management plans, that is like the idea is very recent, but it is evolving, and it is being reinforced a lot. So, you will see that now social management plans are becoming stronger, and they have been reinforced a lot too, even though they are very recent developments.

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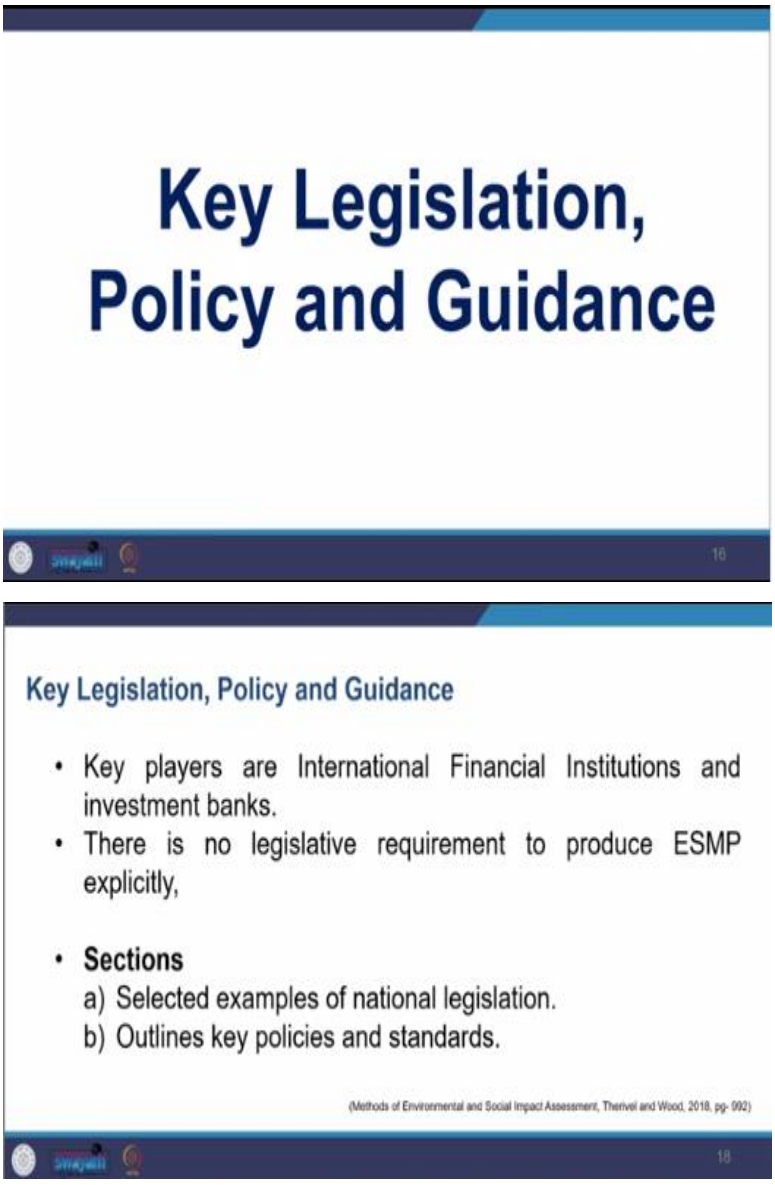

So, now looking at certain key legislation, policy, and guidelines, that deal with the EMP. We see that the key players in this domain are again, the IFC World Bank, the institution here, and all the investment banks. So, you might not find very strong legislative requirements in countries, but also because of these institutions coming in, it is in practice, translated. So, one key reason is that.

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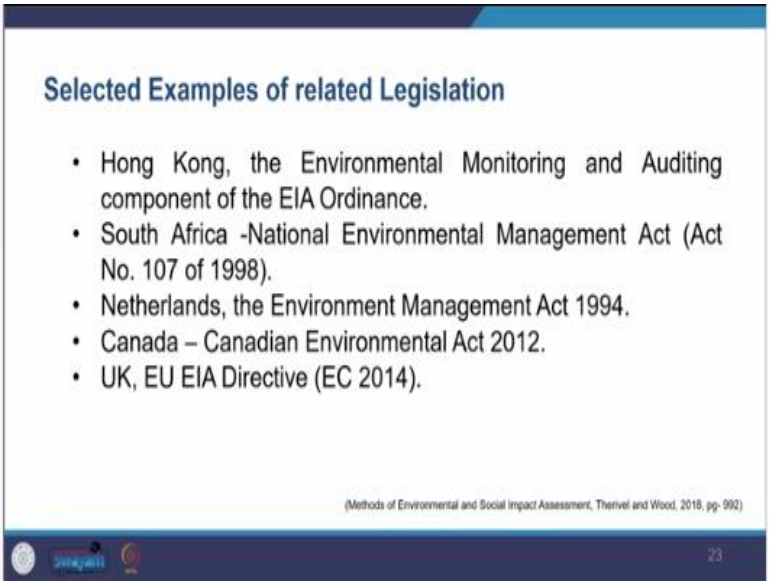

Then you also see that countries like you have Hong Kong, which has an Environmental Monitoring and Auditing Component, which makes provision for EMP. Then you also see in South Africa - the National Environmental Management Act, and then in also Netherlands, the Environmental Management Act of 1994. All of these make provision for EMP. So, you also see in Canada that, the Canadian Environmental Act 2012 has also made provision for EMP. Likewise, you can see in the UK also the EIA, a directive EU EIA directive also has included mandatory monitoring for significant adverse effects in their specified articles.

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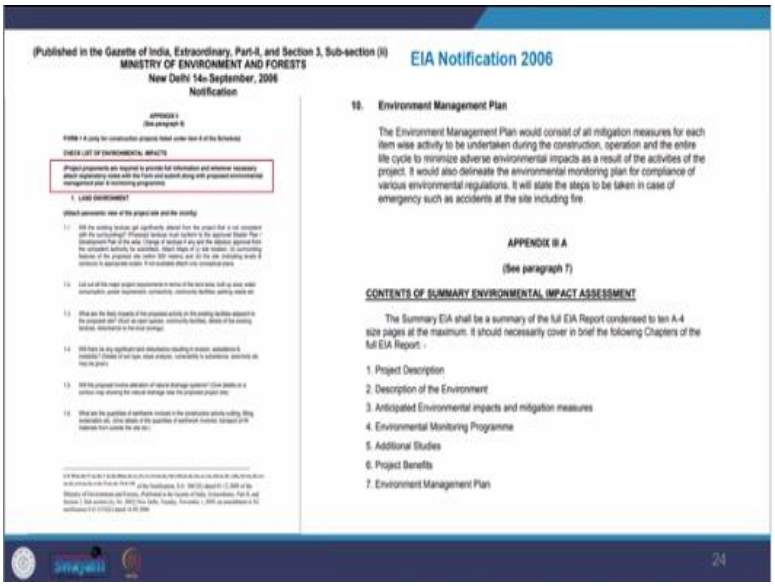

So, in India, if you look at in India, if we look at EIA Notification 2006, you can see that it identifies and says that within its checklist environmental impact, environmental management plan, and monitoring program have to come and it defines if you look at number 10 here point 10, it defines Environment Management Plan, Environment Management Plan would consist of all mitigation measures for each item-wise activity to be undertaken during the construction, operation and the entire life cycle to minimize adverse environmental impacts as a result of activities of the project.

It would also delineate the Environmental Monitoring Plan for compliance with various environmental regulations. It will state the steps to be taken in case of emergencies such as accidents at the site including fire. So, you will see how all mitigation measures for each item-wise activity have to be (under) whatever has to be undertaken in different phases have to be detailed in the Environmental Management Plan.

And then if you also look at Appendix 3 A, you will see that content of the summary Environmental Impact Assessment, you would see that the EIA needs to have all these 7 components which you can see project description, description for the environment, and in the last you can see Environment Management Plan so, it becomes very much part of the EIA report.

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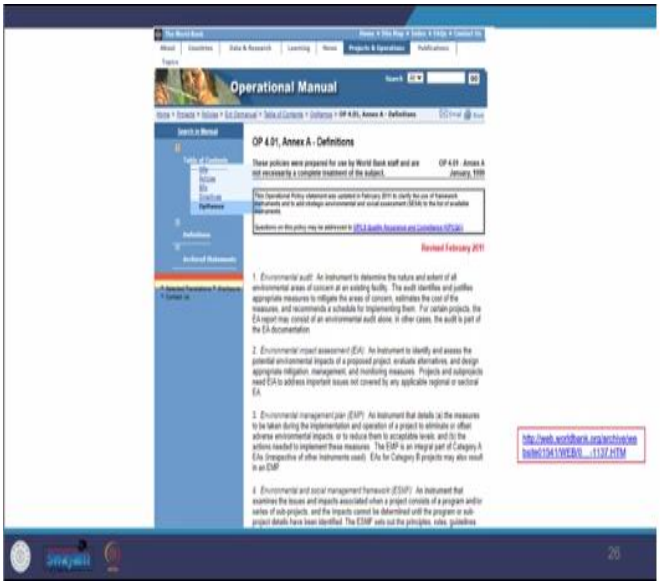

So, you would see that, as I mentioned before also EMPs are listed and operational procedures are manual of 4.01 as an instrument used to were used for compliance with the bank's environmental assessment requirements. So, within that, I have given you the link to this you can look at this and you can see point number 3 which describes the Environmental Management Plan which we saw in the beginning where we define Environmental Management Plans that also gives you an operational manual.

So, the projects that seek all this international funding have to adhere to this. So, in particular, you can review International Finance Corporation Performance Standards 1, 2, and 8, which all highlight the importance of EMP, how to manage the environment, and also look at all the performance environmental performance and social performances. So, EMP is also interlinked with IFC Environmental Health and Safety Guidelines. So, you see how it is interwoven within if it is how, why it becomes mandatory almost practically, to design EMP and to implement it.

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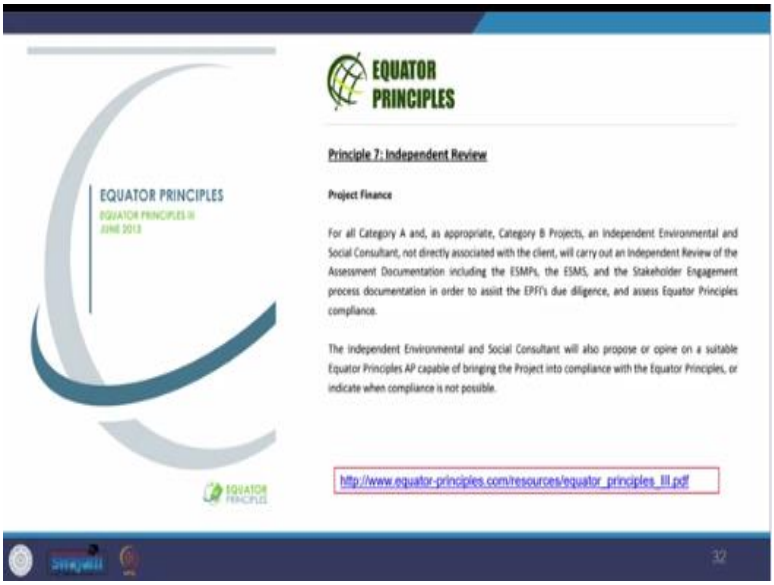

So, that as well you can see the Equator Principles. We have also seen this before, so the Equator Principle also provides a financial industry benchmark for determining ways to assess and manage social and environmental risk, and wherever they do the project financing and then one needs to look at the key principle here which deals with Environmental and Social Management System and Equitorial Principle Action Plan.

So, you can also see under principle 7 also, there is an independent review, which also deals with the due diligence process. So, where you have you create assessment documentation, where you need to, or where you when you provide assessment documentation, it involves EIA report, it involves EMP report. It also involves a management system and further how you are engaging with the stakeholders in the entire process also needs to be documented. So, looking at this due diligence process and all these self-assessment documentation, within that also you see EIA and EMP become important documents.

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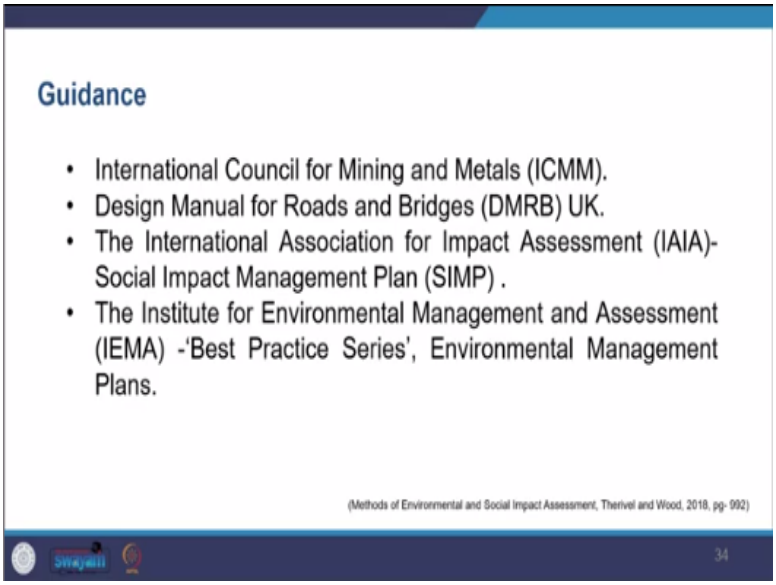

So, a lot of institutions give guidance on how to prepare for EMP. So, you will see International Council of Mining and Metals also provides guidelines within their sector. Then you also see Design Manuals for Roads and Bridges also provide input on this. As well as you see International Association for Impact Assessment IAIA also gives you input guidance on the Social Impact Management Plan, though they have not developed anything on EMP, they do give input on the Social Impact Management Plan, plus you see Institute for Environmental Management and assessments, 'Best Practice Series', so they also give inputs on Environmental Management Plans.

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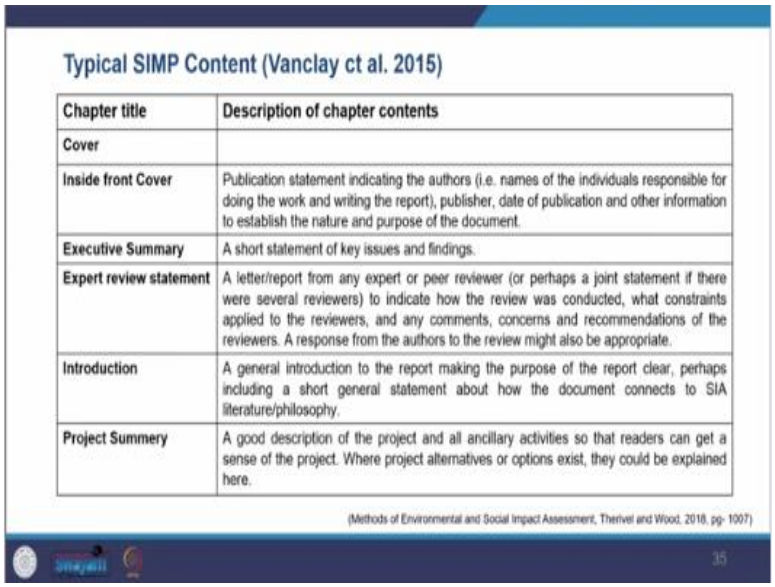

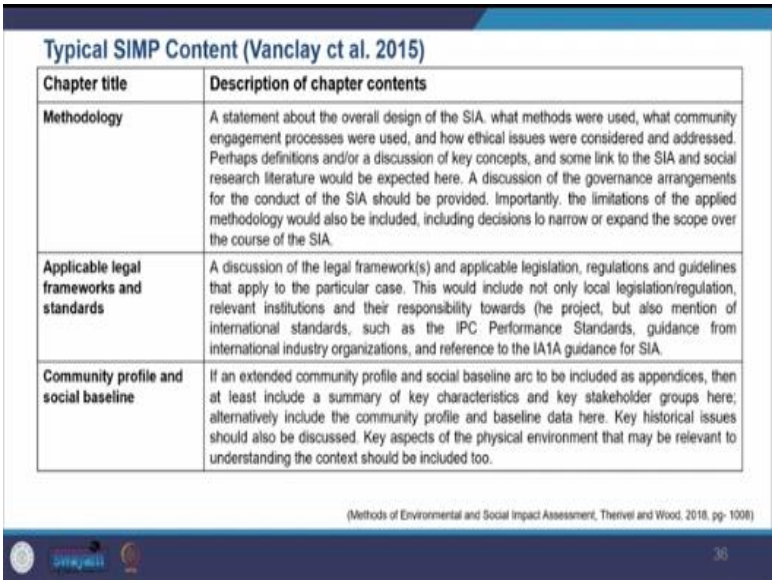

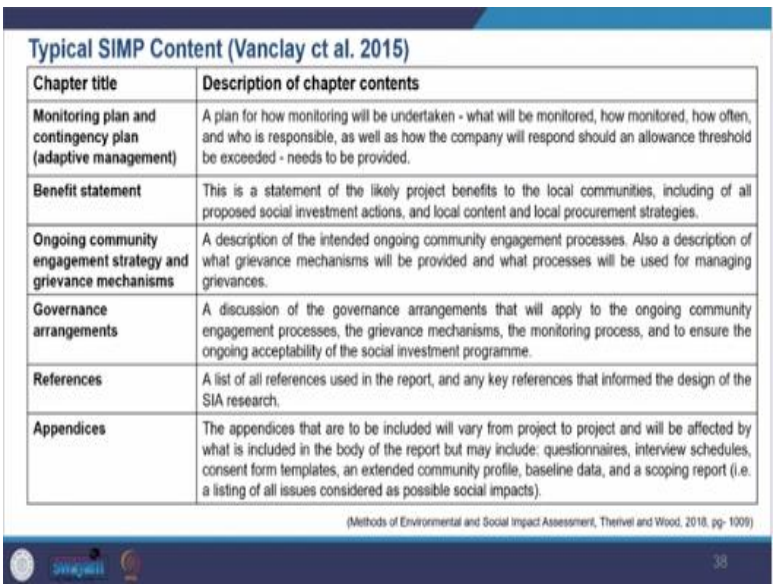

So, we can just go through this, we can see the typical content of Social Impact Management Plans. So, here you can see that it is the structure of the report, which you prepare which has the cover in where and then like all the details about the publication statement, then you might you would required to have executive summary where you tell what are the key issues and findings and then you would have expert review

statement; the reviewers who would give the statement a letter report from any expert or peer reviewers to indicate how the review was conducted.

Then you would be introducing a general introduction to the report making the purpose of the report very clear, then you would give the project summary of what is about the project that we need to know. And then you need it to give you methodology like, what is the overall design? And then you would also give the legal framework and standards that need to be given and then the community profile where the project-affected area is.

And then what is the scoping report? What did you find out from the scoping? And then what are the key social impacts you are looking into? And then what is the resettlement if it is happening? So, the summary of that and summary of mitigation and management measures, a list of all the measures mitigation, which we will be doing monitor, and then you will prepare monitoring plan and also contingency plans, then you will also provide the benefit statement, the statement of likely project benefits to the local people, including all proposed social investment actions, local content or local procurement strategies. So, this also we had seen when we talked about social impact assessment.

And then ongoing community engagement strategy and how you would be addressing all the grievances and then what kind of arrangement you have for governance and all the related documents and what are your key references have to be given here.

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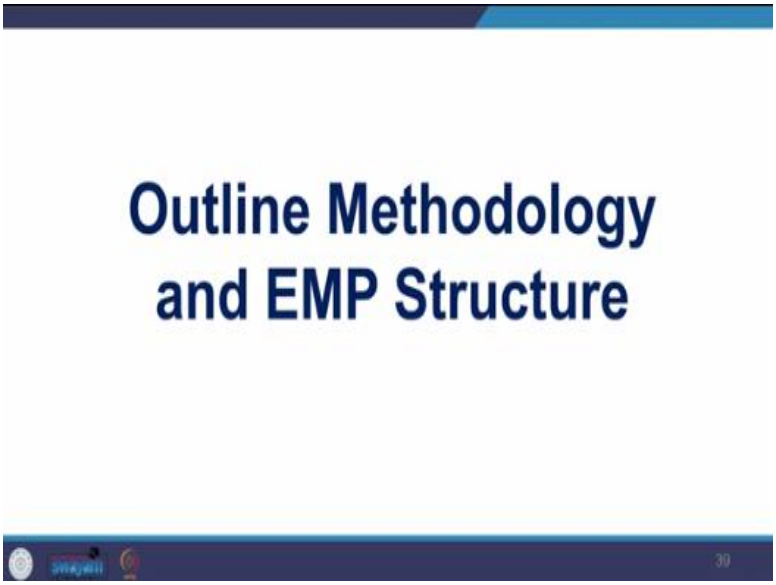

Now moving on to the other segments, we are going to look at the methodology, and how it would be and then we will look at the EMP structure. So, whenever you undertake EMP, certain things have to be taken care of and then have to be ensured in the management plan.

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So, one is that it has to undergo contractual agreements with the involved people because they have to agree to undertake this so there should be contractual agreements, and then whatever mitigation measures have been identified have to be included in the project budget. So, the cost of mitigation and implementation all have to be included, for example, if the training is required, if awareness is required, and all kinds of auditing, monitoring, wherever the cost is involved, that is taken care of, so that it does not fail later, because of non-consideration for those aspects.

Then, you also need to have competent environmental professionals involved in this, who can help you with the regular maintenance and auditing of the things and then you need to collaborate with the stakeholders, you need to have collaboration both with the team members within your project, where you are dealing with plus with the external from the stakeholders, from the authorities and so on, further you need to have

stakeholders engagement entire process while preparing the EMP and also while implementing and also while monitoring so that stakeholders engagement is needed.

Then you need to have a clear-cut distribution of roles and responsibilities, what activities will be undertaken, and who will take it. So, within this, you need to also identify the key documents and references because things have to be monitored and there will be people involved taking care of it.

So, relevant handling and control system has to be worked out as what legislation to refer to, what standards to refer to, and what kind of permits and licenses the development, the project has to be well documented, and what kind of procedure will be adopted for reporting, for monitoring and at what stage it will be adopted that all needs to be given. Plus you need to see if the non-compliance happens, what will be the approach in case of noncompliance So, if noncompliance happens, it has to be taken care of in the EMP as well as in the contractual agreement also, what if the person does not do then what kind of consequences will be there.

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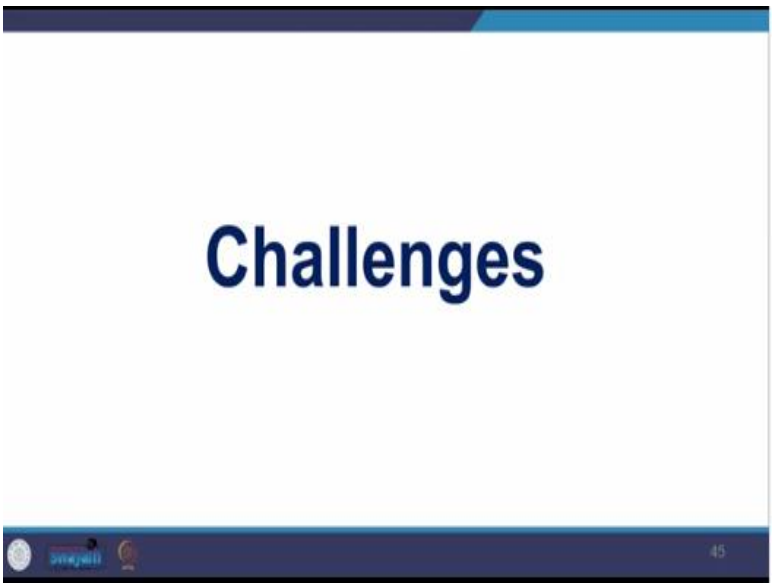

Now looking at the challenges involved challenges, there are several challenges when using EMP. So, one, you will see that it has to be put into practice. So, and you will also see that all the time the standards, policies might be changing in the life period of the project. So, there is still a need for environmental management responsiveness which can adapt to the changing environment.

So, something you are predicting for the future, but things might keep on changing so your EMP also needs to be adjusted should be adaptable accordingly. And then you also need to have a system to manage environmental impacts. You also need a system to carefully monitor and take care of all the requirements and periodic evaluations and what kind of performance, environmental performances are going on, how you will undertake measures and all these are very complex and intricate.

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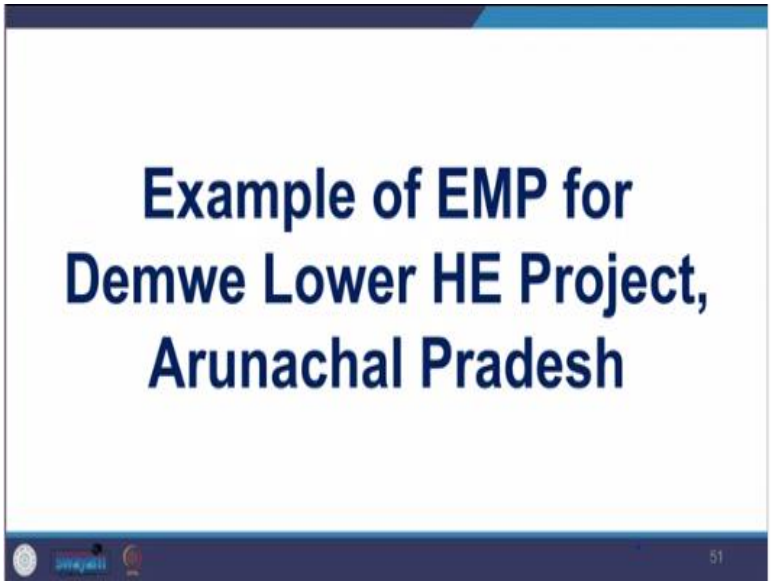

So, now looking at the example of EMP. So, we will look at the example of the Demwe Lower Hydro Electrical Project, which is from Arunachal Pradesh. So, I will be sharing this document with you in the forum.

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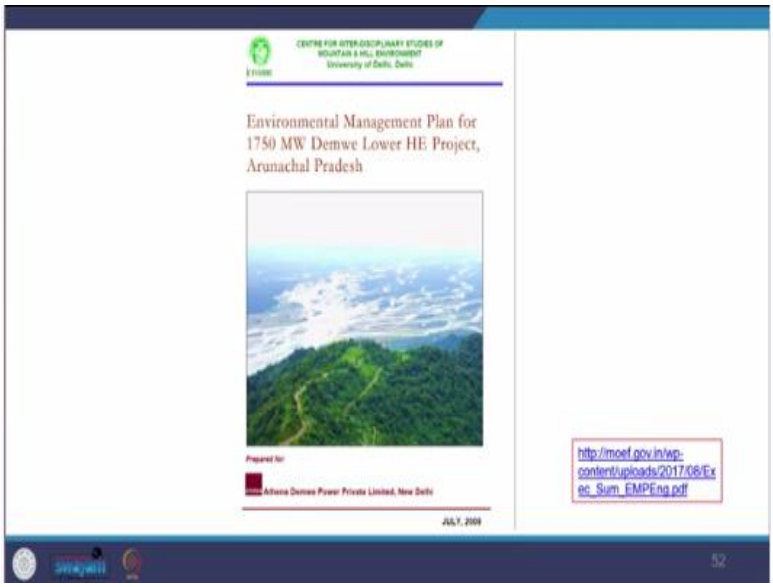

So, we are going to look at the Environmental Management Plan for the 1750 megawatt Demwe lower hydro electrical project from Arunachal Pradesh.

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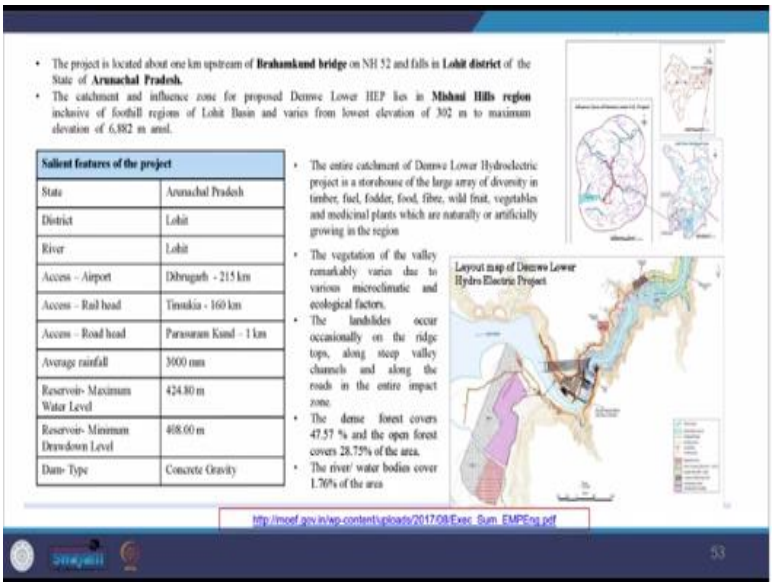

So, this is located and Brahamkund Bridge on National Highway 52. You can look at the maps here in Lohit, district of Arunachal Pradesh. You can also see the layout map of the Demwe Lower hydroelectric project. If you think about the Northeastern area of Arunachal Pradesh, so it is rich in diversity in biodiversity in terms of all the resources it has. Then, it has dense vegetation, forest, and a lot of water bodies, which are there. So, think of any kind of construction coming there and what kind of impact it might have and then how EMP can take care of it.

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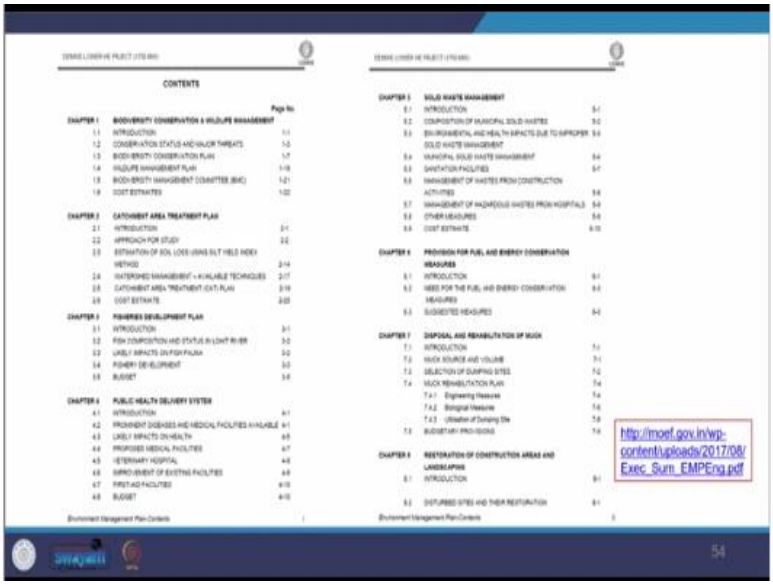

So, I have taken snips from the report and I will be sharing this report with you. So, you just look at the content of it. So, you have, you can see how segment-wise they have created all like for each segment they have specified introduced it, then they have conservation status and what are the major threats, then they have indicated the biodiversity conservation plan for biodiversity, then they have created wildlife management plan and then so exactly what actions would be taken.

And then Biodiversity Management Committee like who will be responsible, and then cost estimation like we said that the cost has to be undertaken within that. So, you see how each component is taken care of you can see the catchment area, and treatment plan here. So, it talks about it introduces what kind of approach they have adopted, and then what kind of estimation of soil loss is happening and they have used a particular methods silt yield index method, we have seen already different kinds of methods.

Then you can see watershed management, and what I kind of available techniques are there. And then what is their plan for cash material treatment, and then what is the cost estimate? So, likewise, you can see that every chapter is handling different, different components and see how intense it is. So, you see that you have a fisheries development plan, a public health delivery system, then you have solid waste management, and then you have provision for fuel and energy conservation, measures disposal and rehabilitation of mark, then restoration of construction areas and landscaping.

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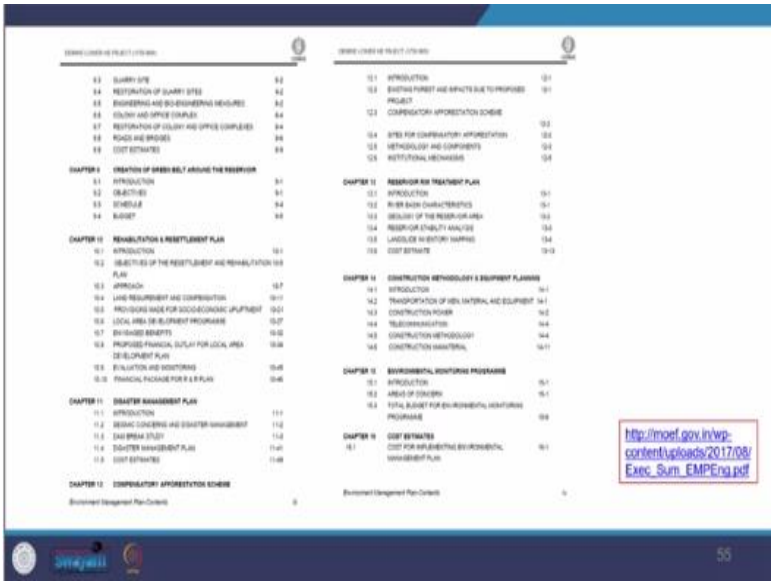

Then you will see the creation of a Greenbelt around the reservoir, you can see rehabilitation and resettlement plan, then they also have a disaster management plan, reservoir, and RIM treatment plan. And then you can see construction, methodology, and equipment planning how they are going to plan that environmental monitoring program, how they are going to monitor that. And all the cost estimates involved there. So, you see how each segment has been dealt with here.

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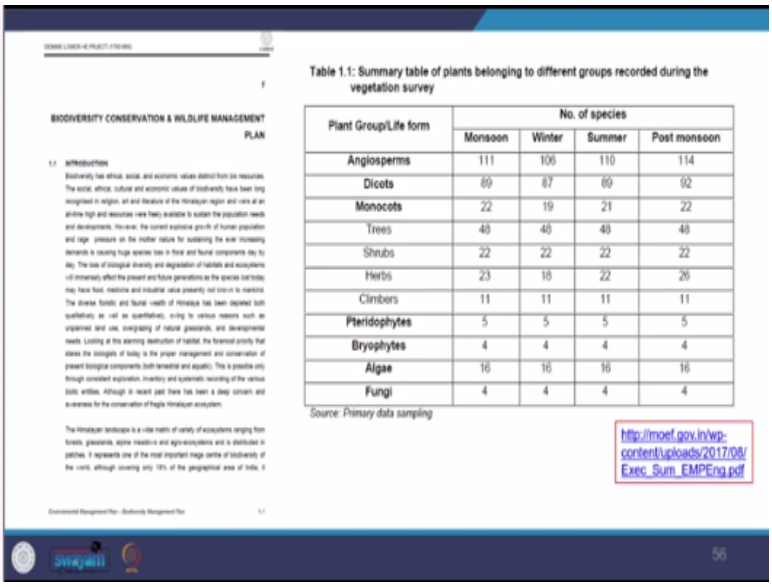

And now just there are so many components, but I will just quickly run through the Biodiversity Conservation and Wildlife Management Plan. So, you see how they have summarized different types of plans, what different groups they are, the number of species that were recorded during the service, and all those scoping baseline studies and methods that were involved. So, here you can see what they studied and how they have presented the summary table.

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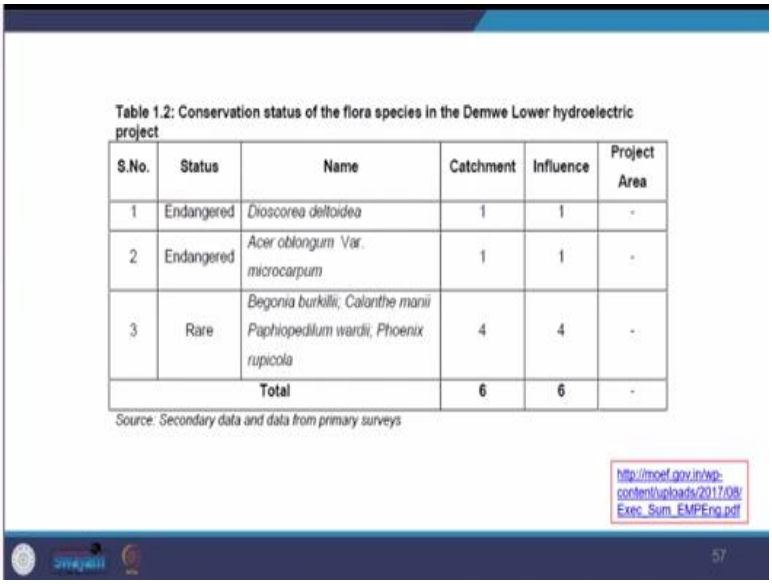

Table 1.2: Conservation status of the flora species in the Demwe Lower hydroelectric project

S.No.	Status	Name	Catchment	Influence	Project Area
1	Endangered	*Dioscorea deltoidea*	1	1	-
2	Endangered	*Acer oblongum Var. microcarpum*	1	1	-
3	Rare	*Begonia burkillii; Calanthe manii Paphiopedilum wardii; Phoenix rupicola*	4	4	-
Total			6	6	-

Source: Secondary data and data from primary surveys

http://moef.gov.in/wp-content/uploads/2017/08/Exec_Sum_EMPEng.pdf

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And then they are also telling about the conservation status which are the endangered species, which are the rare species so that all is taken care of you have you have learned about these before. So, you see how they are indicating it here.

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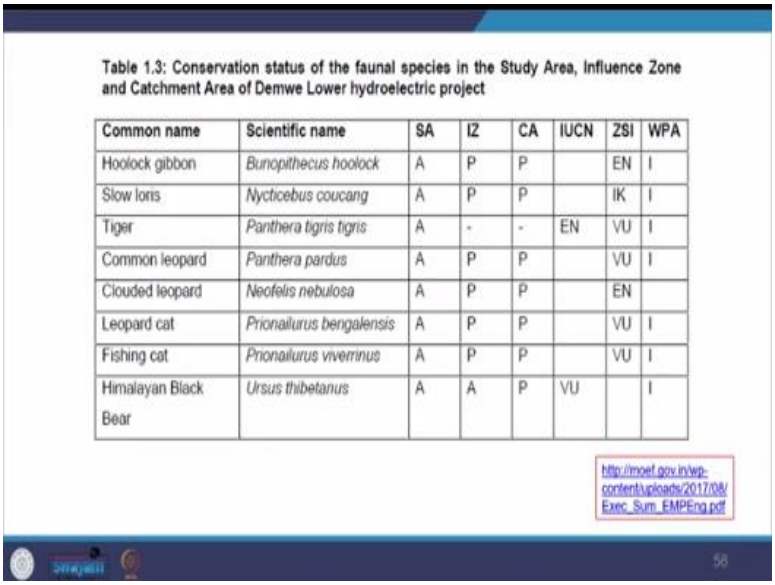

Table 1.3: Conservation status of the faunal species in the Study Area, Influence Zone and Catchment Area of Demwe Lower hydroelectric project

Common name	Scientific name	SA	IZ	CA	IUCN	ZSI	WPA
Hoolock gibbon	*Bunopithecus hoolock*	A	P	P		EN	I
Slow loris	*Nycticebus coucang*	A	P	P		IK	I
Tiger	*Panthera tigris tigris*	A	-	-	EN	VU	I
Common leopard	*Panthera pardus*	A	P	P		VU	I
Clouded leopard	*Neofelis nebulosa*	A	P	P		EN	
Leopard cat	*Prionailurus bengalensis*	A	P	P		VU	I
Fishing cat	*Prionailurus viverrinus*	A	P	P		VU	I
Himalayan Black Bear	*Ursus thibetanus*	A	A	P	VU		I

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Then what is the conservation status of faunal species in the study area, influence area, and the catchment area you can see here? So, they are showing all the common names, scientific names, and all the areas here and which as per which list IUCN and all that is applicable here.

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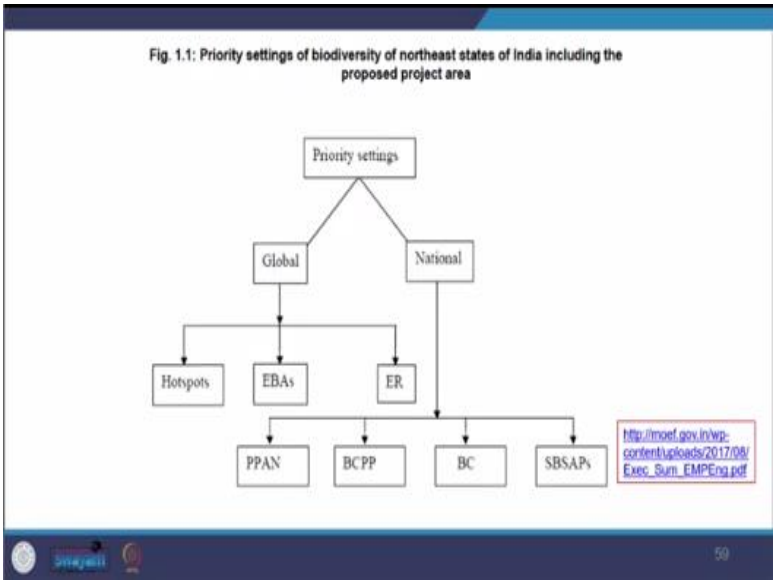

And then they have also done priority setting of biodiversity, like what is the priority setting as a global, national, hotspots EBA, ER, and then all those categories, which you can see here at the national level.

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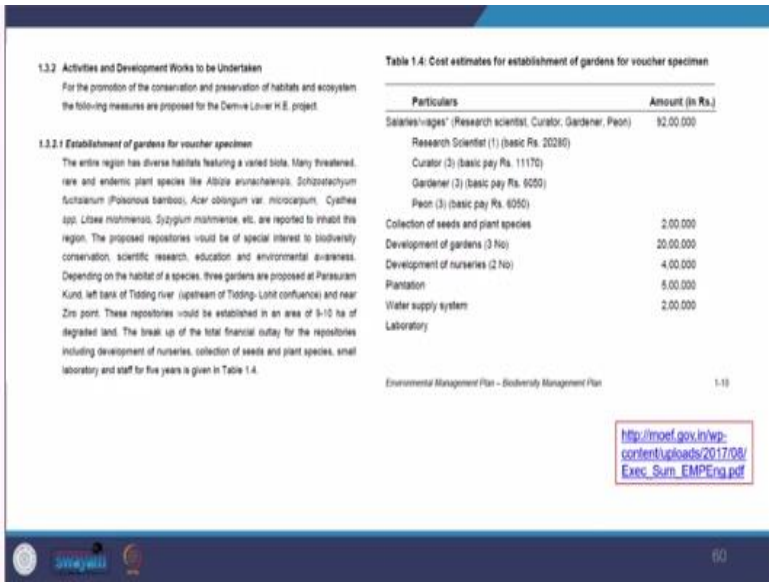

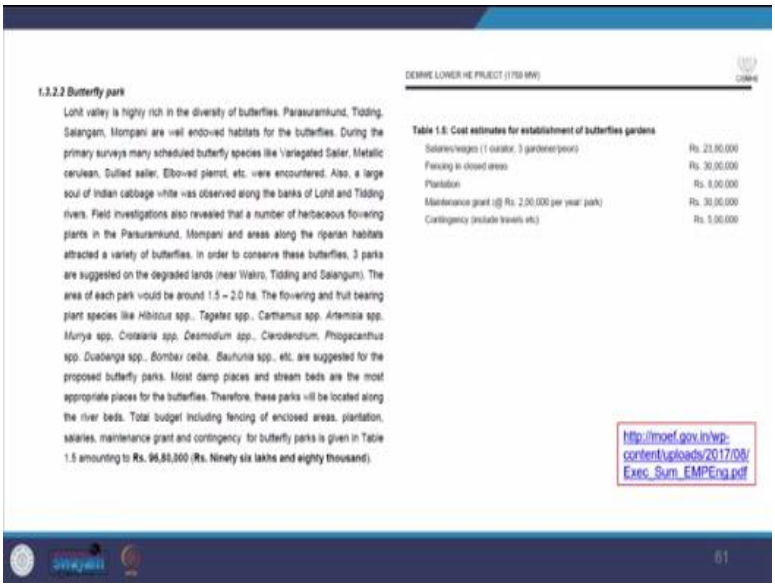

So, you also see what kind of activities and development work will be undertaken within this and then like they are taking care of within that activity establishment of gardens for voucher specimen, then they have calculated the cost estimate for that, then they are working out the Butterfly Park and then they have worked out the cost for that, how they are going to do it.

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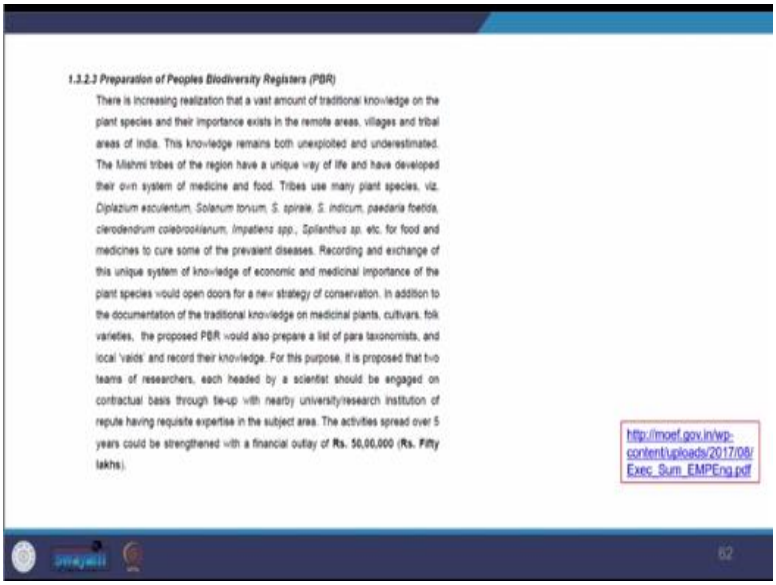

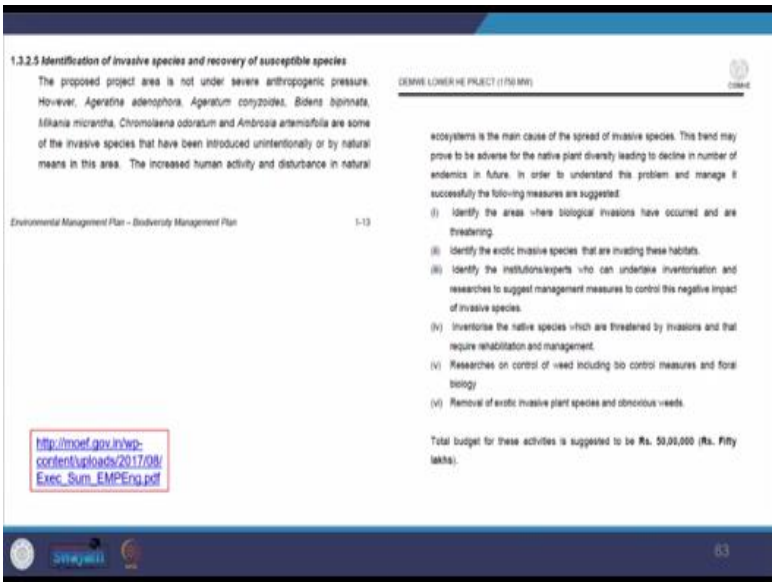

Then they prepare preparation People's Biodiversity Register so that they can take taking as a mitigation measure and then identification of invasive species and recover susceptible species. So, you have also studied invasive species and susceptible species. So, they are creating that identification.

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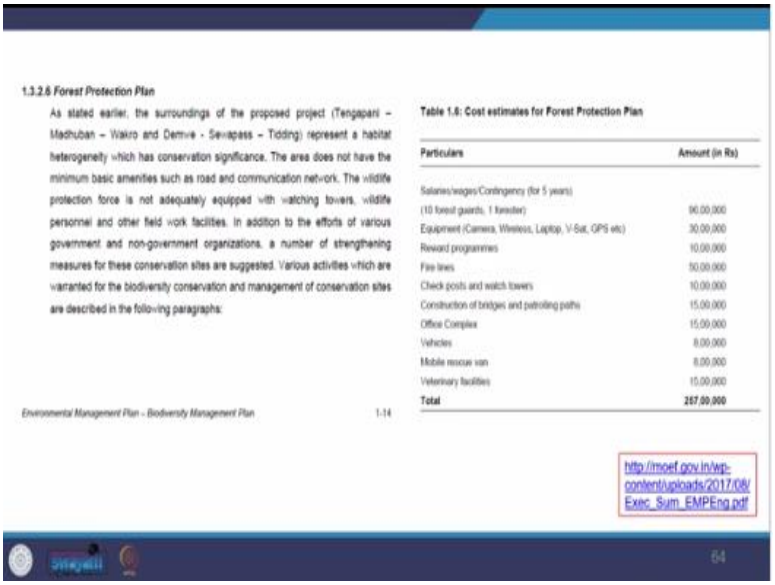

1.3.2.6 Forest Protection Plan

As stated earlier, the surroundings of the proposed project (Tengapani – Madhuban – Wakro and Demwe - Sewapass – Tidding) represent a habitat heterogeneity which has conservation significance. The area does not have the minimum basic amenities such as road and communication network. The wildlife protection force is not adequately equipped with watching towers, wildlife personnel and other field work facilities. In addition to the efforts of various government and non-government organizations, a number of strengthening measures for these conservation sites are suggested. Various activities which are warranted for the biodiversity conservation and management of conservation sites are described in the following paragraphs:

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Table 1.6: Cost estimates for Forest Protection Plan

Particulars	Amount (in Rs)
Salaries/wages/Contingency (for 5 years)	
(10 forest guards, 1 forester)	90,00,000
Equipment (Camera, Wireless, Laptop, V-Sat, GPS etc)	30,00,000
Reward programmes	10,00,000
Fire lines	50,00,000
Check posts and watch towers	10,00,000
Construction of bridges and patrolling paths	15,00,000
Office Complex	15,00,000
Vehicles	8,00,000
Mobile rescue van	8,00,000
Veterinary facilities	10,00,000
Total	257,00,000

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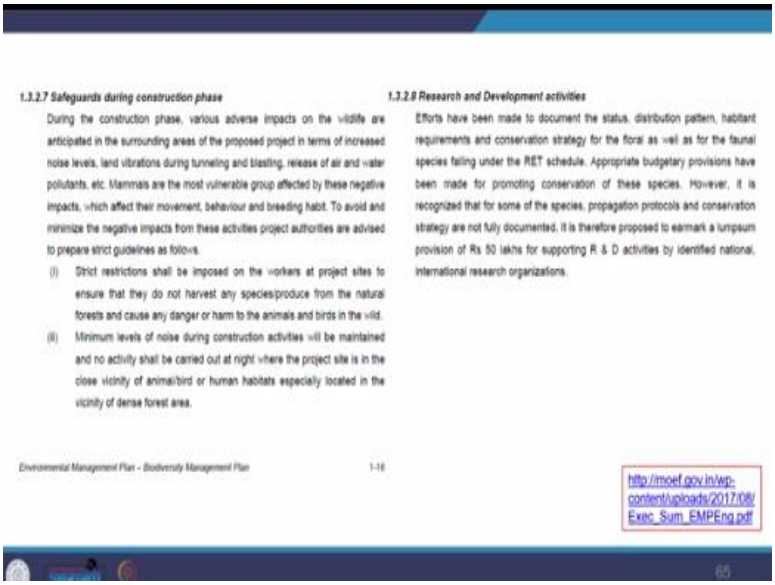

1.3.2.7 Safeguards during construction phase

During the construction phase, various adverse impacts on the wildlife are anticipated in the surrounding areas of the proposed project in terms of increased noise levels, land vibrations during tunneling and blasting, release of air and water pollutants, etc. Mammals are the most vulnerable group affected by these negative impacts, which affect their movement, behaviour and breeding habit. To avoid and minimize the negative impacts from these activities project authorities are advised to prepare strict guidelines as follows.

(i) Strict restrictions shall be imposed on the workers at project sites to ensure that they do not harvest any species/produce from the natural forests and cause any danger or harm to the animals and birds in the wild.

(ii) Minimum levels of noise during construction activities will be maintained and no activity shall be carried out at night where the project site is in the close vicinity of animal/bird or human habitats especially located in the vicinity of dense forest area.

1.3.2.8 Research and Development activities

Efforts have been made to document the status, distribution pattern, habitant requirements and conservation strategy for the floral as well as for the faunal species falling under the RET schedule. Appropriate budgetary provisions have been made for promoting conservation of these species. However, it is recognized that for some of the species, propagation protocols and conservation strategy are not fully documented. It is therefore proposed to earmark a lumpsum provision of Rs 50 lakhs for supporting R & D activities by identified national, international research organizations.

Environmental Management Plan – Biodiversity Management Plan 1-16

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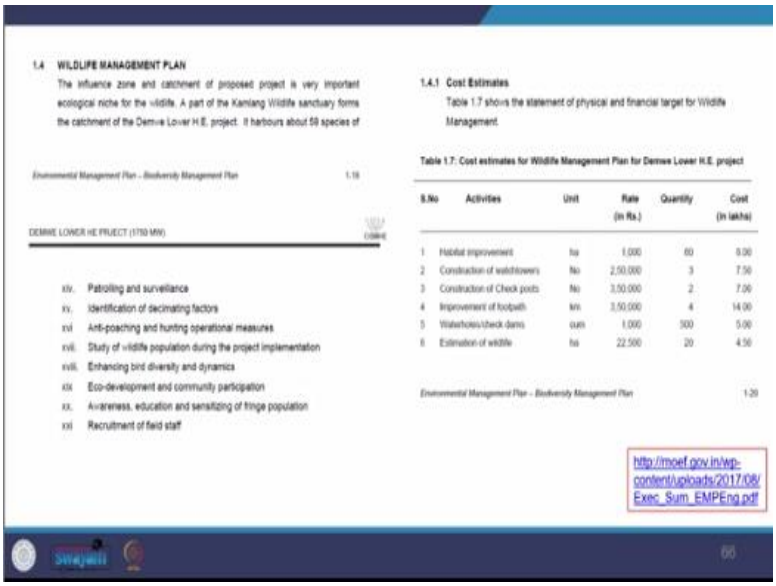

1.4 WILDLIFE MANAGEMENT PLAN

The influence zone and catchment of proposed project is very important ecological niche for the wildlife. A part of the Kamlang Wildlife sanctuary forms the catchment of the Demwe Lower H.E. project. It harbours about 59 species of

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DEMWE LOWER HE PROJECT (1750 MW)

xiv. Patrolling and surveillance
xv. Identification of decimating factors
xvi Anti-poaching and hunting operational measures
xvii. Study of wildlife population during the project implementation
xviii. Enhancing bird diversity and dynamics
xix Eco-development and community participation
xx. Awareness, education and sensitizing of fringe population
xxi Recruitment of field staff

1.4.1 Cost Estimates

Table 1.7 shows the statement of physical and financial target for Wildlife Management.

Table 1.7: Cost estimates for Wildlife Management Plan for Demwe Lower H.E. project

S.No	Activities	Unit	Rate (in Rs.)	Quantity	Cost (in lakhs)
1	Habitat improvement	ha	1,000	60	0.60
2	Construction of watchtowers	No	2,50,000	3	7.50
3	Construction of Check posts	No	3,50,000	2	7.00
4	Improvement of footpath	km	3,50,000	4	14.00
5	Waterholes/check dams	cum	1,000	500	5.00
6	Estimation of wildlife	ha	22,500	20	4.50

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And then, the Forest Protection Plan and what kind of cost will be involved. So, for each and everything, they are identifying it safeguard during the construction phase. So, now you can see the phase also they are doing and what kind of research and development activities they will undertake. Then they look at the Wildlife Management Plan again, you can see that all the activities have not been put them here patrolling

and surveillance, identification of decimating factors anti-poaching hunting study of wildlife population, and so on. And then the cost involved in that.

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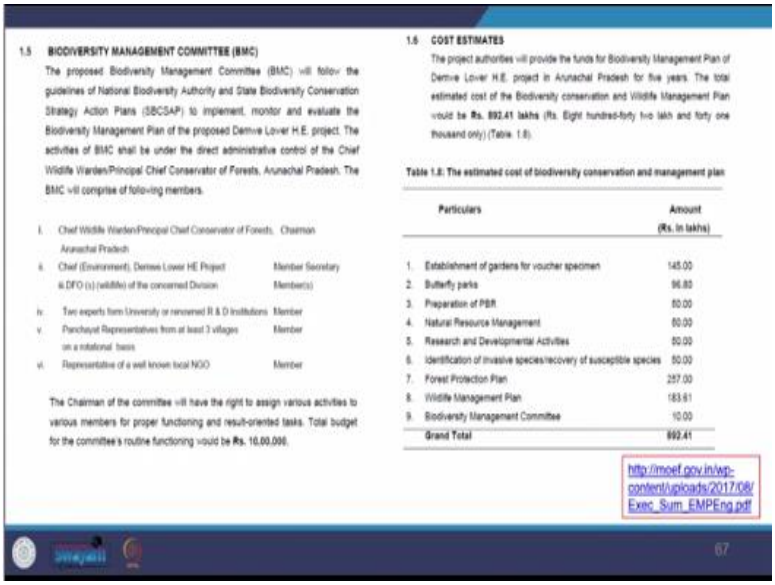

Likewise, you can see the Biodiversity Management Committee, which will follow the guidelines of the National Biodiversity Authority and would be they would implement monitor and keep on evaluating it. So, we talked about the responsibility matrix, this is how they are identifying who will be responsible for what and what is the cost involved.

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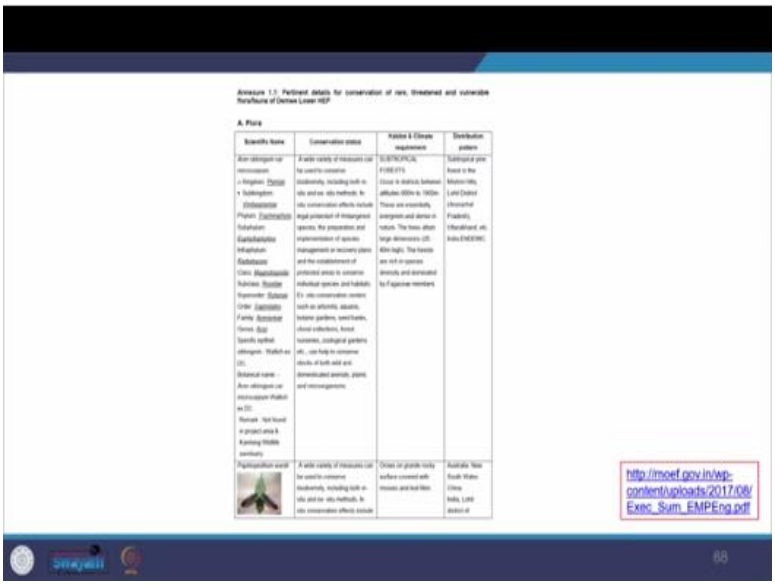

So, within this, they have also given an extensive list of pertinent details for the conservation of rare, threatened, and vulnerable flora and Flora Fauna in this particular area.

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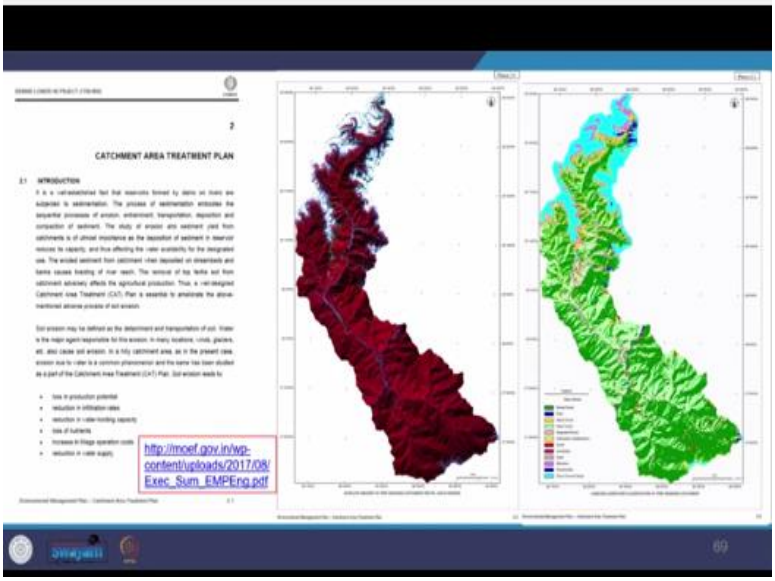

So, likewise, you can see the Catchment Area Treatment Plan, just skimming through this a lot of areas which they have gone through, but we can just quickly skim through this, not all of it, so we can see the Catchment Area Treatment Plan here, various land use and land cover.

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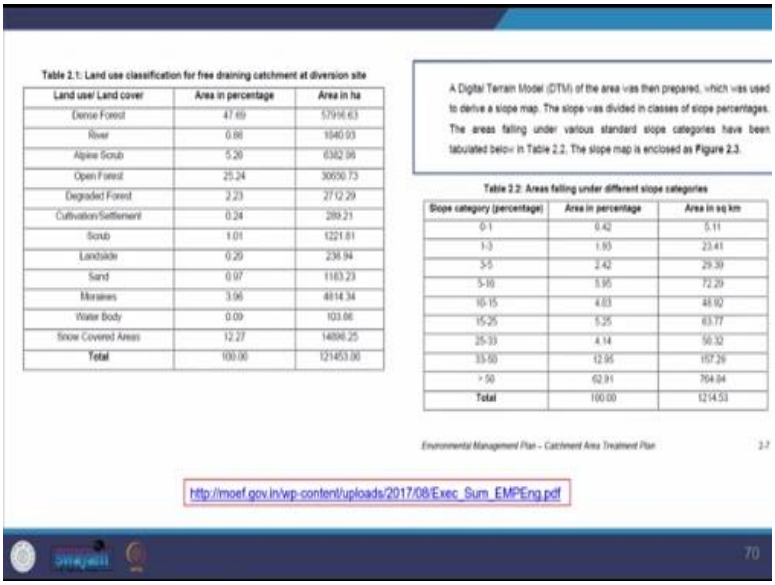

Table 2.7: Erosion intensity rates of catchment area

Erosion intensity categorization as per SYI values	Percentage of catchment area
Very High	4.72
High	13.65
Medium	17.59
Low	28.79
Very Low	35.25
Total	100.00

Table 2.8: Sub-watershed wise proposed treatment measures

Sub-watersheds	Afforestation (1600 tree/ha) in ha	Afforestation (800 tree/ha) in ha	Contour-Bunding in ha	Pasture Development in ha
W2	420	65	22	158
W7	323	49	26	54
W8	734	344	36	96
W22	1001	643	0	381
W24	905	1284	3	328
	3383	2384	86	1017

Environmental Management Plan – Catchment Area Treatment Plan 2-21

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The classification you can see here like dense forest, river, Alpine scrub, and so on, you can see. Then land use classification for fields, draining catchments, then areas falling under different slope categories, what digital terrain model they have developed. Then erosion intensity rates of the catchment area they have taken to see how they are classifying it to understand the significance of very high, high, medium, low, and very low total, you can see how sub-watershed wise also, they are proposing the treatment measurements.

So, you can see the watershed numbers here what kind of treatment they are doing afforestation like they are going to do 1600 trees per hectare or they going to do 800 trees per hectare or they are going to do the contour bunding and what area and then pasture development and how much area they would be doing. So, see the kind of treatment measures they are taking. So, you can see the range of mitigation measures also which are here.

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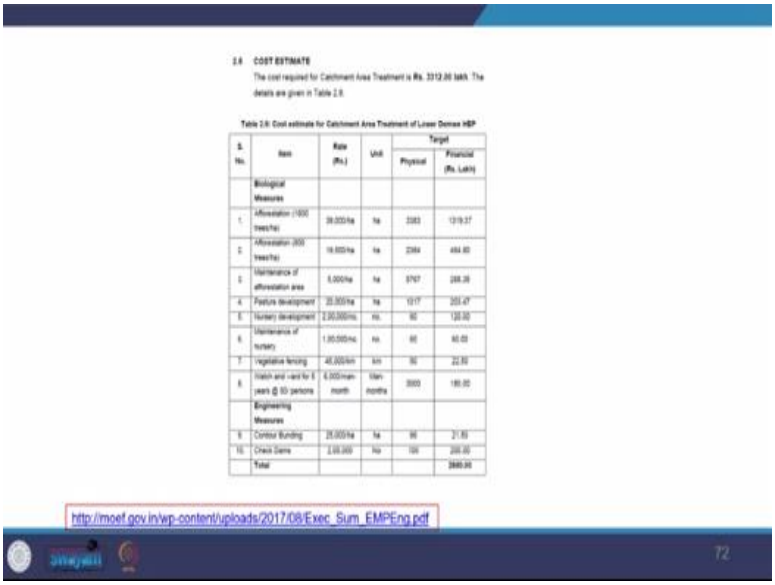

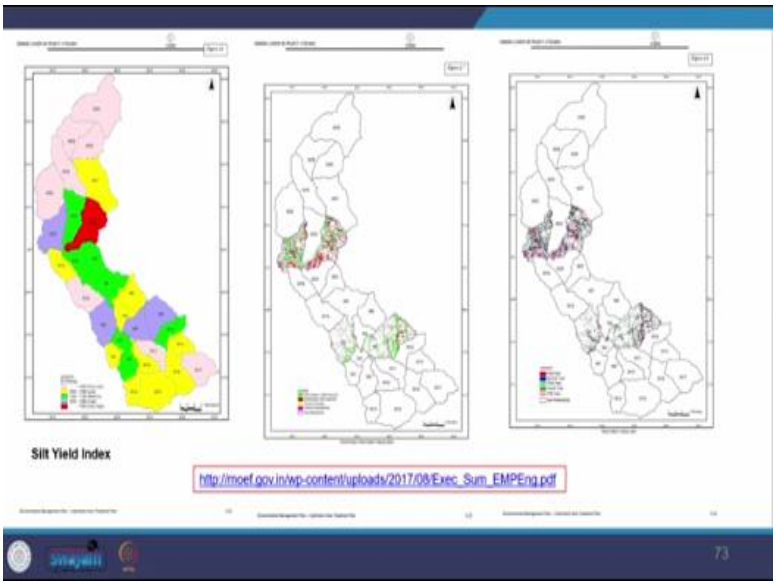

You can see the cost estimation of a catchment area treatment here you can see how they have calculated the problem with the silt yield index. Then you can see all the proposed treatment measures, you can see a forestation the green color shows all the afforestation. Red shows afforestation for how much area like 1600, 800 and then the contour bunding where they will do where they were going to develop pasture development, and then how they are going to create sub-watersheds. So, you can see all those here.

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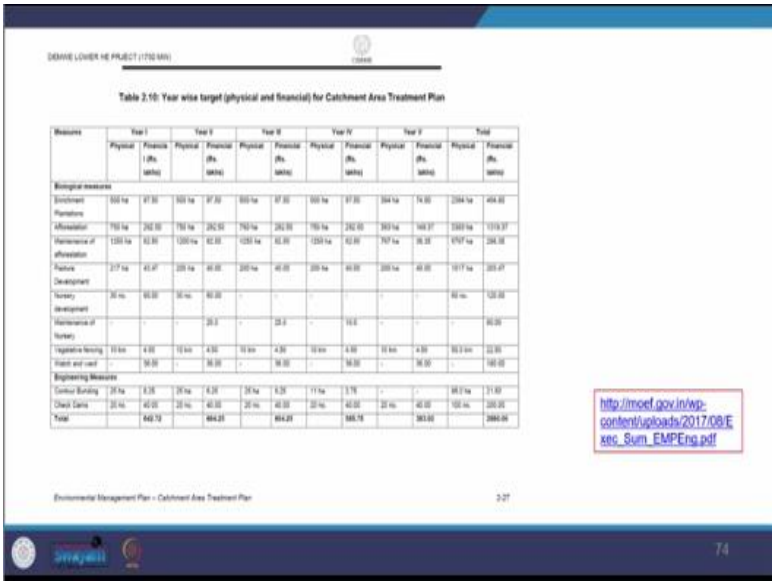

And then they created a treatment index map here based on their findings. So, you see how intensive and detailed they prepare. And then now you can see your year rise target; physical and financial for the catchment area here. So, you can see your 1 year, 2 years, 3, 4, 5 and then how much total financial and then for the biological measure, for engineering measure and so on. So, that they have covered. So, that was what we saw in the Environmental Management Plan.

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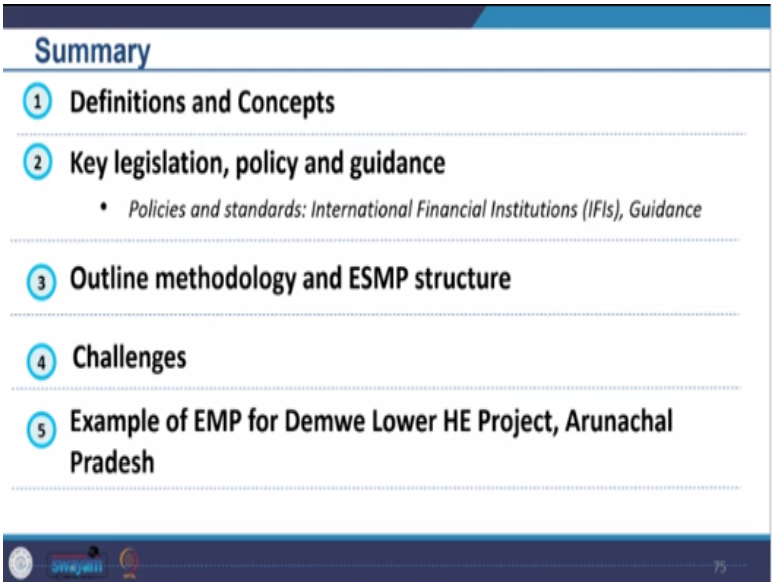

So, winding up for today's class. As we saw in both definitions and concepts about Environmental Management Plans, we also saw environmental and social management plans ESMPs. So, then we saw the key legislation policy and guidelines across the globe as well as what is in our country. Then we saw the involved metallurgy and what is the structure of it, what kind of challenges are still there, and then we looked at one of the examples just to understand what the EMP looks like.

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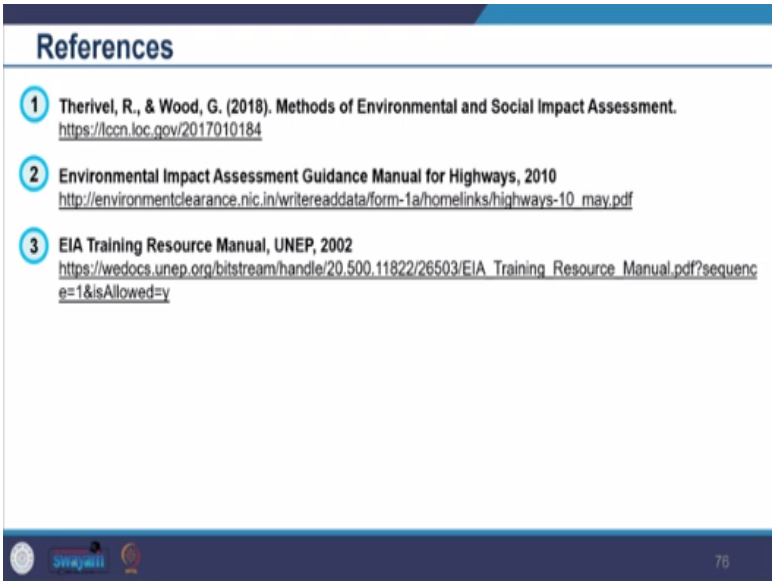

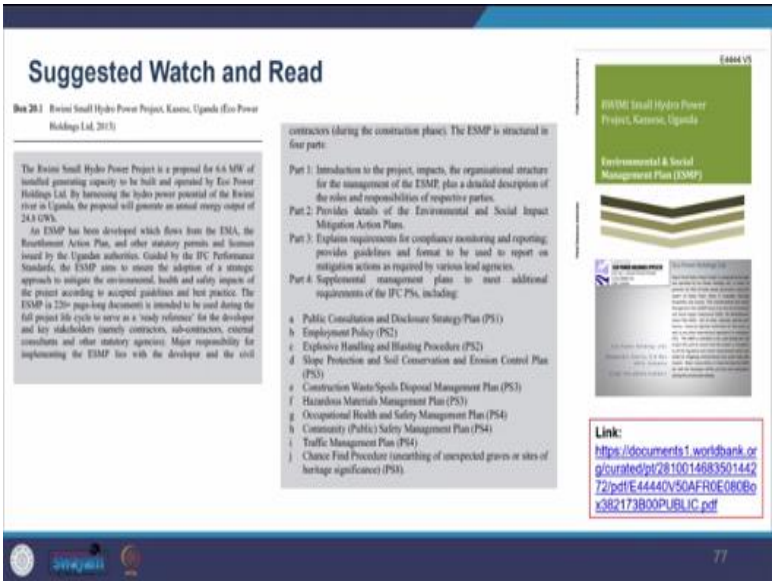

So, that was all for today. So, this was our key reference, we have been referring to the book of Therivel and Wood and then we have also taken certain cases here for reference purposes and then you can see the suggested watch and read. They can be, there are more examples which you can refer to and have a better understanding of the issues here.

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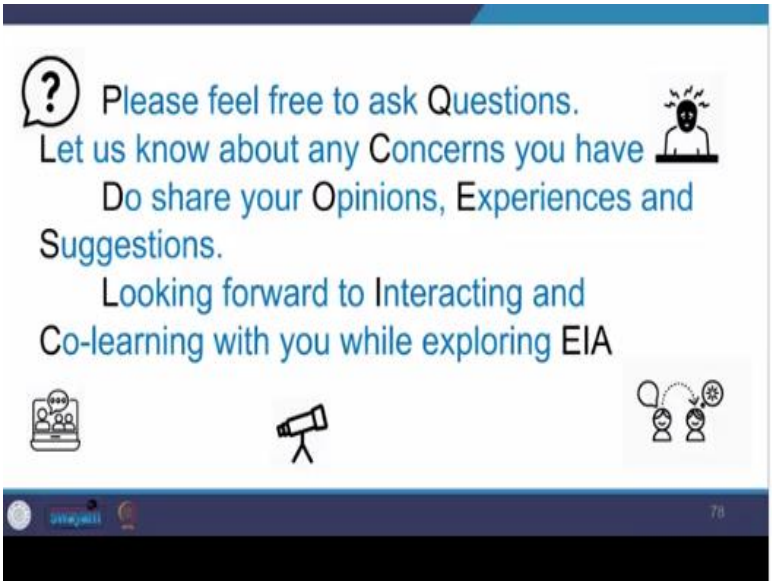

So, winding up, please feel free to ask questions. Let us know about any concerns you have. Do share your opinions, experiences, and suggestions. Looking forward to interacting and co-learning with you while exploring EIA. Thank you.