Environmental Impact Assessment
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Lecture 59
EIA Case Study - Development of Water Aerodrome, Andaman and Nicobar
Part I

Welcome to the course Environmental Impact Assessment. And today we will look at another case study and we will look at in two parts. So, today we will cover one part of it. We will look at the case study of what aerodrome in Andaman and Nicobar. So, we will look at this case. This is another typology which we are looking at. And this is new happening in the country. So, we will see how the EIA about this particular infrastructure was prepared. So, we will look at that aspect here.

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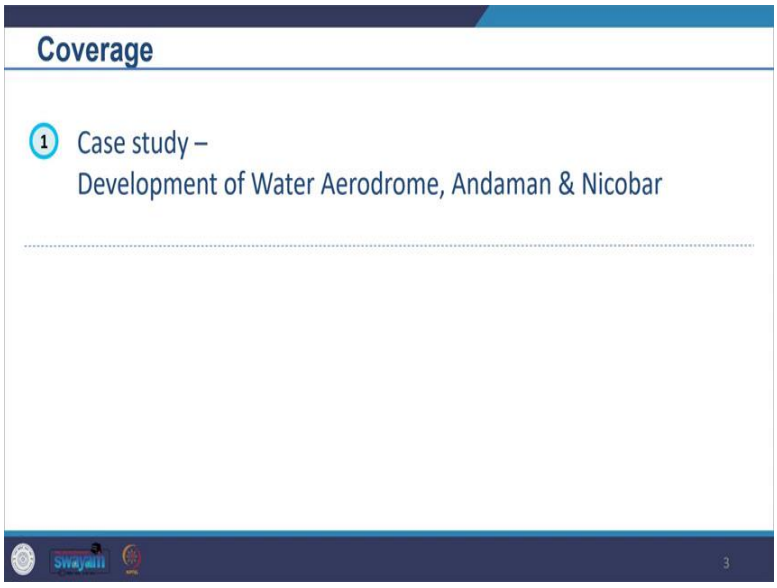

So, our coverage would be the, we are going to look at this case study EIA of Development of Water Aerodrome in Andaman and Nicobar.

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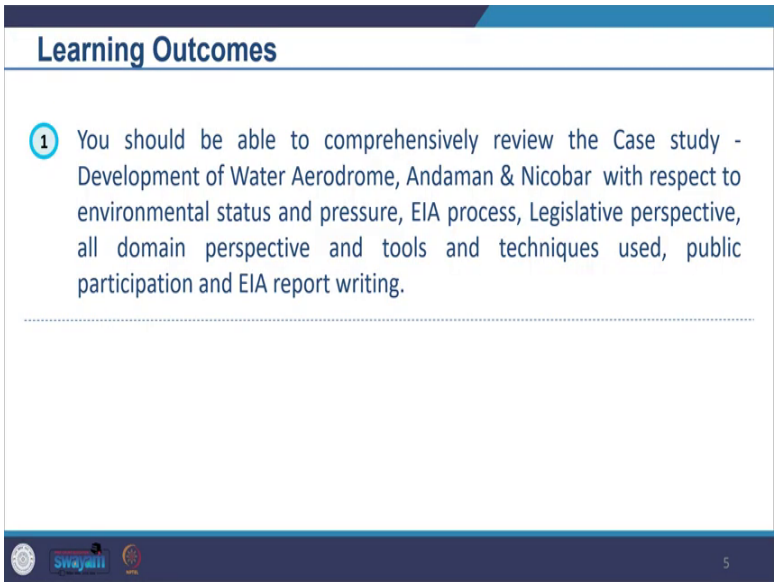

So, the expected learning outcome, what is expected after you complete this particular session, these parts that you should be able to comprehensively review the case study and look at all the components what we have studied in this subject, look at from the point of view of environmental status, what kind of development pressures we have, the EIA process, and then look at it from the legislative perspective and then look at it from all the domains which should have been covered in this particular case, and then the details of it, the tools and techniques applied, and then how was the public participation and EIA report writing.

So, we will not critically review that I would make you walk through the report, but then in our discussion forum, you can take it forward with your understanding of all the aspects and see how this EIA was undertaken and your take and your perspective on this particular case.

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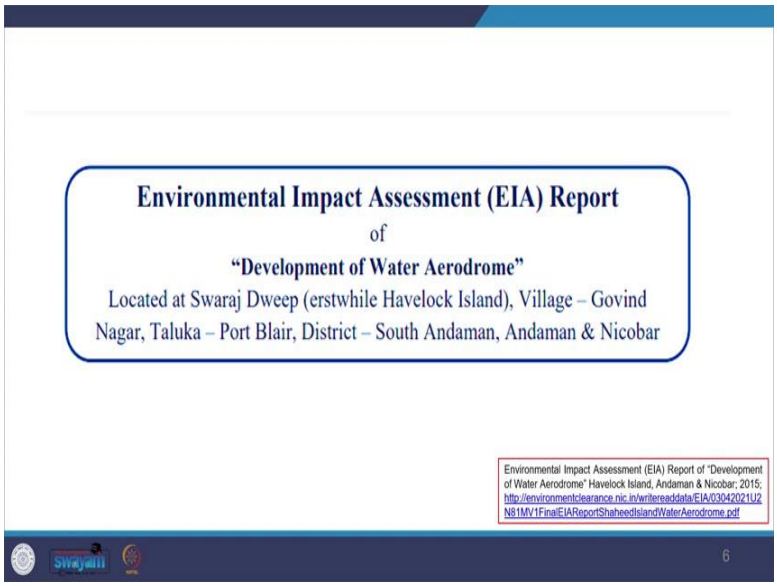

So, looking at this Environmental Impact Assessment Report, this particular project is located at Swaraj Dweep, which was formerly called Havelock Island. It is located in the Govind Nagar Village and the Toluka of Port Blair and is located in the district of South Andaman and Andaman and Nicobar Island. So, we are looking at a very typical case Island case here and then looking at very upcoming projects of water aerodrome here.

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So, this project was proposed by looking at the project proponents Andaman and Nicobar administration which is the Directorate of Civil Aviation, and the environmental consultant for this is ENVIRO RESOURCES, you can see that their NABET certified agency consultant to undertake the EIA, and then their principal consultant, our Feedback Infrastructure, and all the tests and lab work laboratory work was done by ENVIRO-TECH Services Environmental Laboratory.

So, you can see all that information is provided here. And then you also see that there is a declaration here, which has been provided by the ENVIRO RESOURCES who are the environmental consultant for this. So, they take responsibility for all the content of the EIA report for the proposed development.

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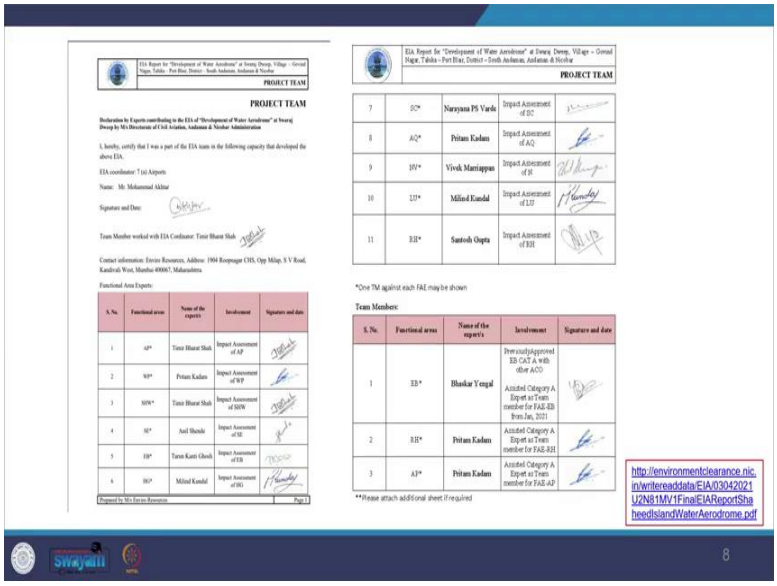

So, here you can see what we learned about how the team is. So, you look at the project team here, the range of project teams as per the various domains you can see here functional areas, and who were the experts involved and what was their involvement into and, and their endorsements. So, they are responsible for the segment which they have done.

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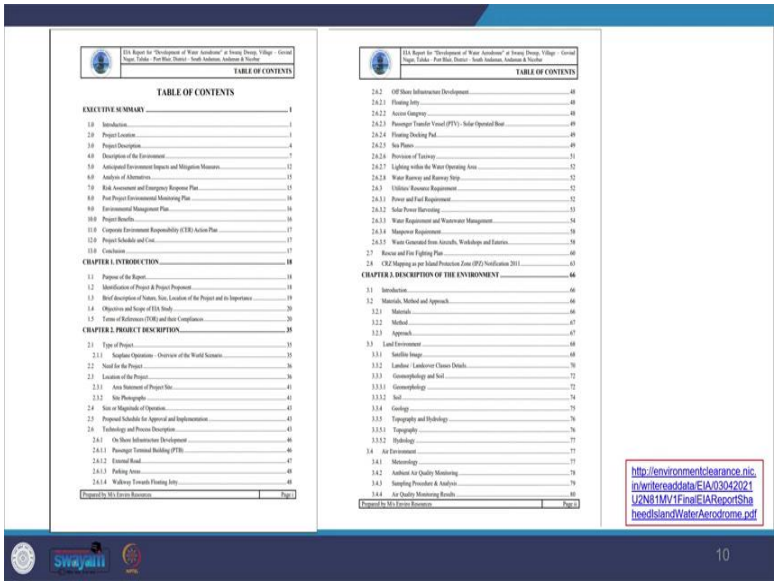

And then how the report is structured. If looking at the report structure, here you can see you have executed a summary which is very key element of report writing then you can see the introduction then you can see Chapter 2 deals with the project descriptions, where you will see how with the different kinds of projects you

will see the type of the project or how the Seaplane Operations will take place, need of the project, why it is needed, where it is located, and then looking at the size and magnitude of operations and then the technology and process description.

Then all this information and detailed information about the project is given, then you can see Chapter 3 which describes the environment in which the project will be located. So, you see all the materials methods, and approaches that will be used in the land environment, the air environment, and then you will see the noise environment, water environment, soil environment, biotic environments, and socio-economic environments. So, you will see all that has been covered in the report.

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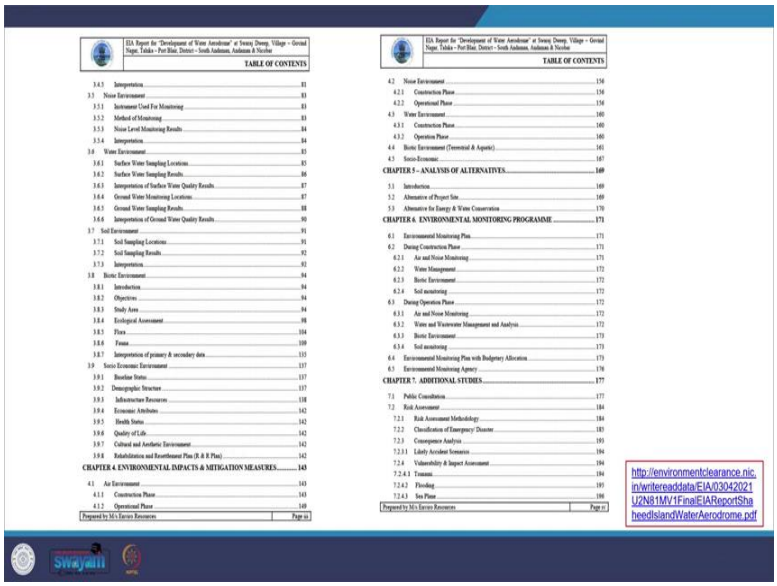

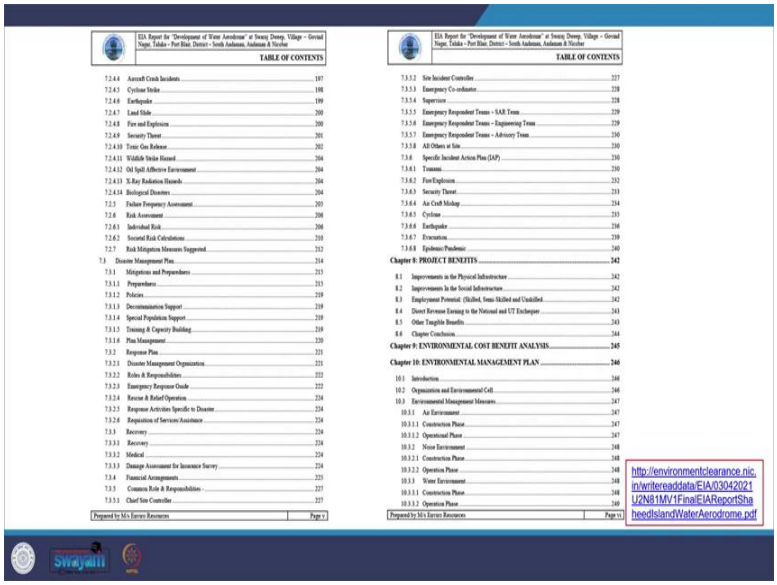

Then you also see the environmental impact and mitigation measures that they have taken including for all the key impact areas air, noise, water, biotech, and socio-economic. So, what are the measures they have taken to

mitigate the impact, then you will see here in Chapter 5 Analysis of Alternatives, that, they have also analyzed the alternatives, which we will look at in Part 2. And then an environmental monitoring program.

So, how do they plan to monitor the entire thing, how they are going to follow up the entire mitigation, which they have talked about, and how they are going to comply with all the environmental aspects which they have committed to, and then, since, it is a very unique project, what you see here, so, you can also see the additional studies which they have undertaken. So, that is covered under Chapter 7.

So, you see the public consultation, and risk assessments that all is given and then you will see within risk assessment also you can see risk assessment with the logic classification of emergency and disaster consequence analysis, accidents, scenario, vulnerability and impact assessment, tsunami, flooding, seaplane all that you can see the aircraft crash incident, cyclone, so, all that aspects have been covered here, there is a range of aspects which can come up so all the specific additional study which was done under this project has been covered here.

So, you also see that they have a disaster management plan here in addition to risk assessment, then you also see, within this, you see a range of mitigation and preparedness, preparedness policies, all that aspects is covered here within the disaster management plan. So, in Chapter 8 you see the project benefits, so, they have talked about the impact.

So, here you see what are the project benefits and what benefits will be there because of the project in the neighborhoods, where the project is located. And then in Chapter 9, they look at the environmental cost-benefit analysis, and then in Chapter 10 they look at the environmental management plan, and they summarize and conclude which helps them to decide on the decision-makers.

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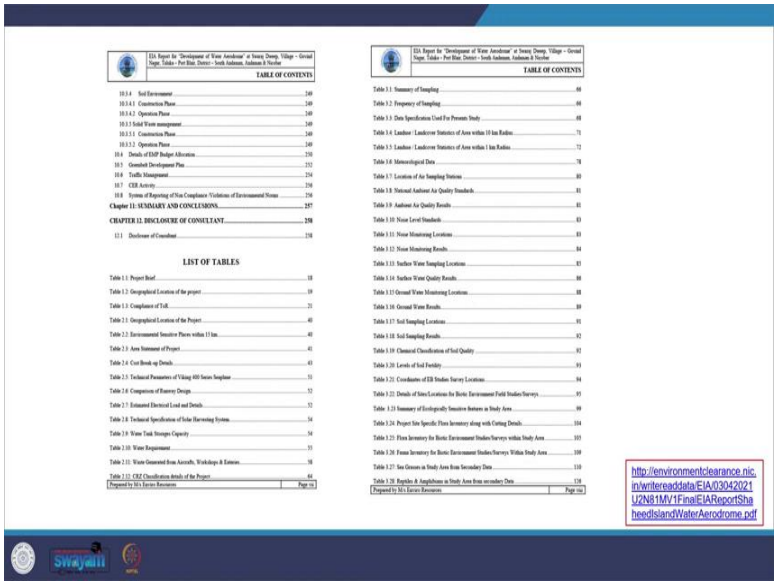

And all the disclosures of the consultants, what all who have been involved. So, you see the list of tables here the kind of information which has been provided from project brief to geography locations, compliance of ToR, so all that has been provided with all detailed data which has been collected.

So, you see the wide range of information that is there from all the details that one road needs to provide as per different domains which are decided from as per the ToR or scoping of the project. So, you see all the tables and then a list of figures that have to be provided you can see the all information about the project and the environment and then the calculations all have been provided. So, you see how intense all the details have to be given here.

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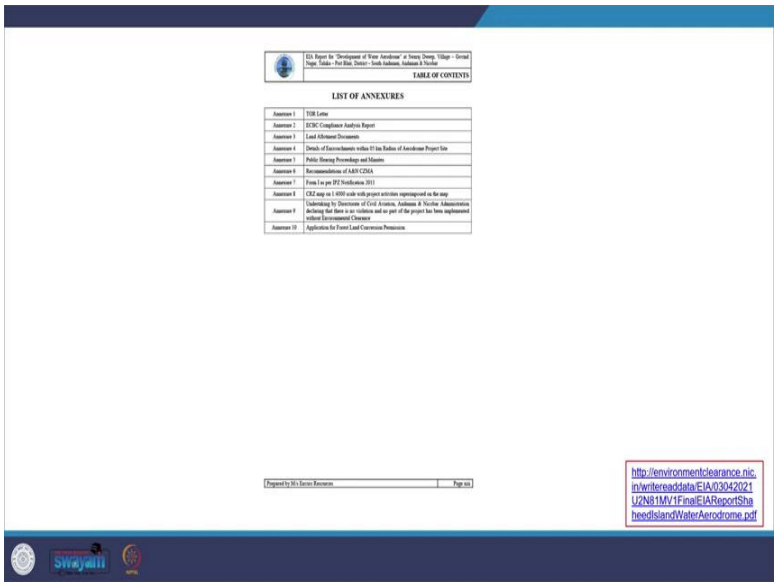

And then all the other supporting documents that you are letter and then ECBC compliance land allotment document and all these what proceedings they had with public participation have to be given here.

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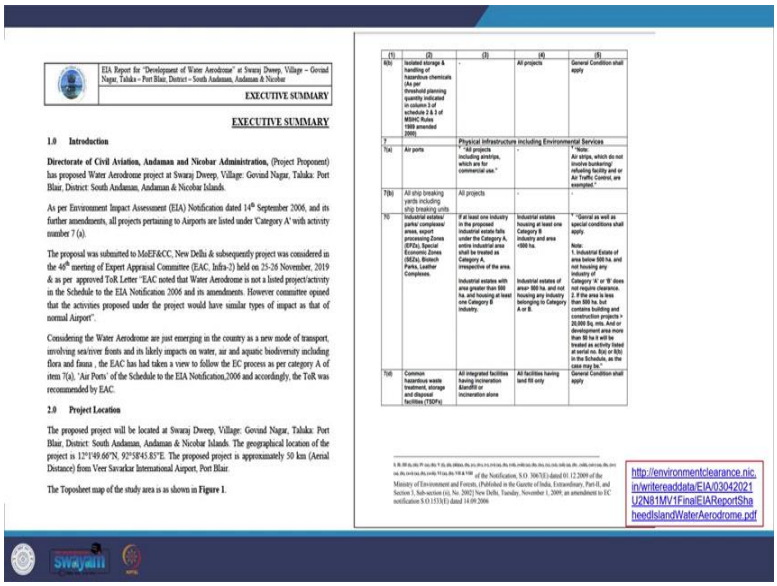

So, first quickly looking at the executive summary, I would mix some of the things just to cut it short. So, you see here that the water aerodrome, if you look at the list as per the notification of 2006 does not come under EIA purview. However, there was concern about the committee expert appraisal committee EAC related to infrastructure.

So, they thought that there might be a similar impact as per the normal airport and airports do come within the purview of EIA, you can see I have snipped it for you here activity no. 7 (a) Airports and they come under Category A all projects including airstrips which are for commercial use. And so, these come under category A. So, given that context and it was a water port, which has not been there before in the Indian context, so, it is not there in the list, but given the possibility of the kind of impact it might have, it has been included and taken under EIA.

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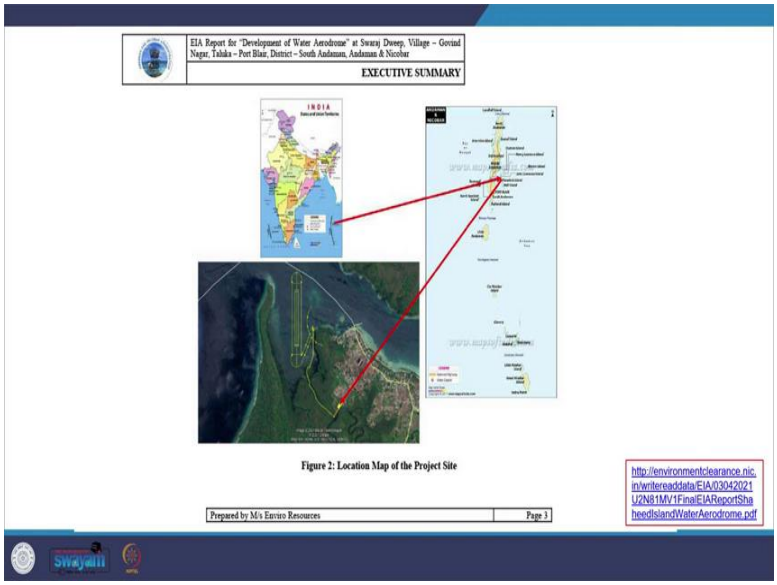

So, looking at the project location just to understand, so that all our learners understand where it is located. So, you can see here the island, you see these islands here. So, here you see that these are Andaman and Nicobar Island and that is where the project is located. And you can see the runway here and how the water runway would be there.

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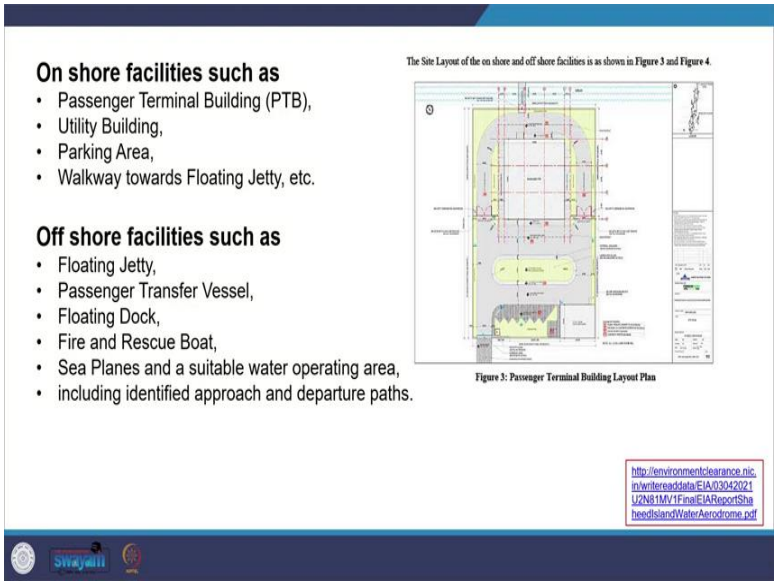

So, this project would have facilities like it will have some onshore facilities such as a passenger terminal building, utility building, parking area, walkway, floating jetty, and so on and then they would have offshore facilities such as a floating jetty, passenger transfer vessel, floating dock, fire and rescue boat, seaplanes, and suitable water operating area and then approach and departure of paths. So, all that would be here you can also see the passenger terminal building layout here how it would be. So, all these constructions would come up for the project all these facilities would come up.

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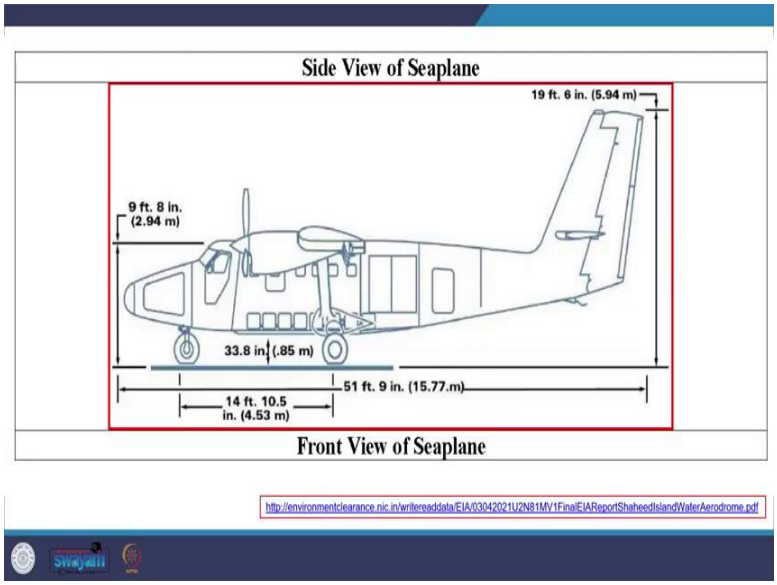

And looking at the magnitude of this, it would the kind of seaplanes which would come here would carry 19 passengers and it would have like 380 packs, the infrastructure would take care of 380 pax. So, each round-trip of seaplane will carry approximately 30 passengers.

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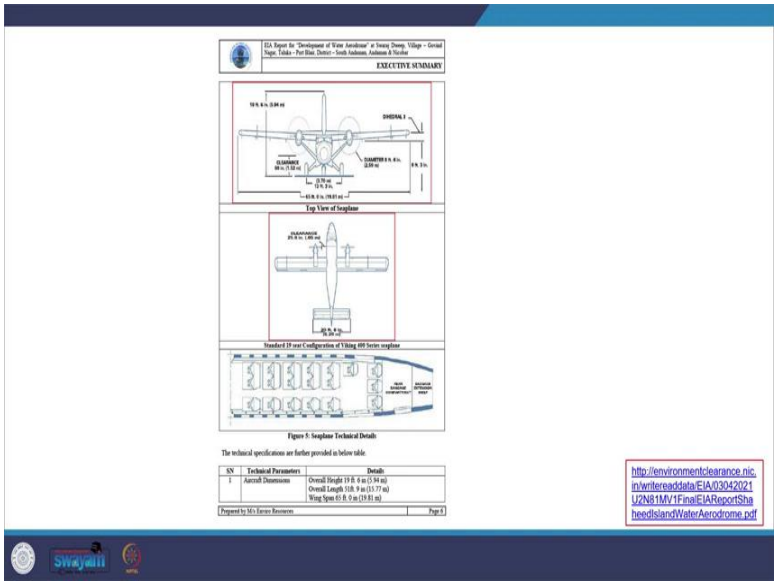

So, you see each seaplane has 19 capacity. So, round trip it will carry 38 passengers and we will have considered having 5 such trips for each of these to see planes in a day. So, you see how those calculations are done and then this particular project would carry passengers in the range of 1 lakh passengers per annum, which is like 380 paxs daily for 2790 non-monsoon days for one sea plane. So, that is what the calculations have been made to understand the magnitude of the project.

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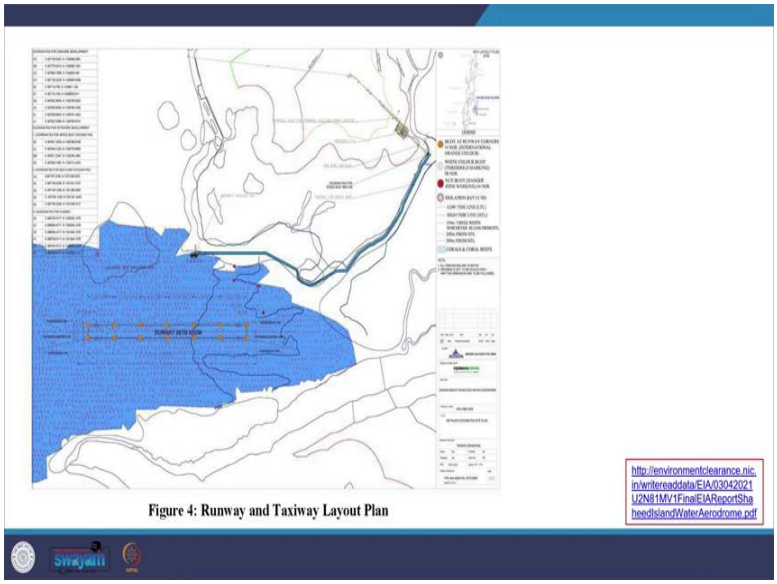
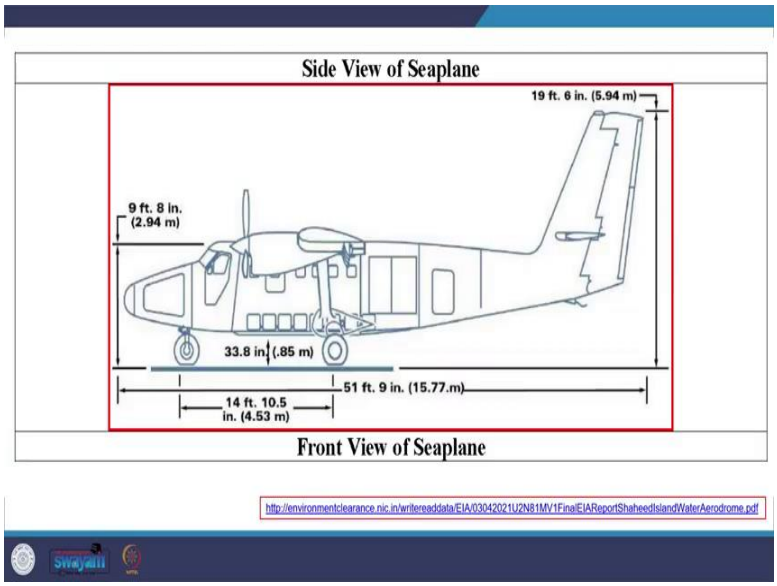


Figure 4: Runway and Taxiway Layout Plan

http://environmentclearance.nic.in/writereaddata/EIA/03042021U2N81MV1FinalEIAReportShaheedIslandWaterAerodrome.pdf



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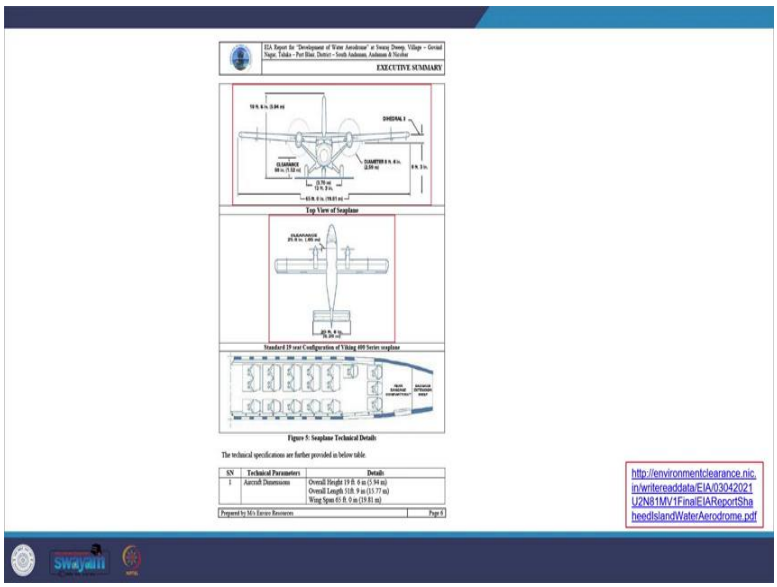

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So, you can see here the project site the image of the project site, you can see here runway and taxiway layout plan, and then all the details are given here. So, you see how the understanding of the project detail has been

developed here, the size of the seaplane that will be coming to this particular aerodrome and the details of technical details of the seaplane.

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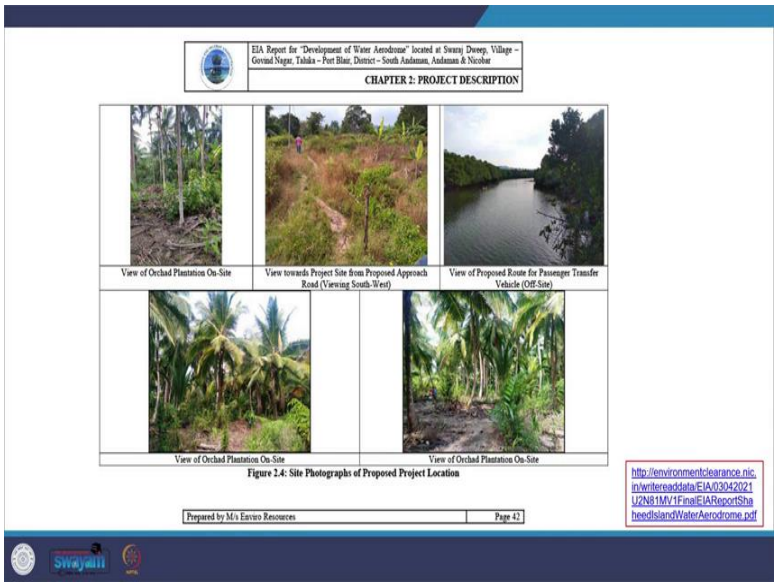

Then you can look at the site photographs, and where the project would come from. So, you see the orchard plantation on site, which is there then you can also see approach road proposed approach road currently versus status and then view the proposed route for passenger transfer vehicles, so the passenger route for that.

So, you also see that this particular area has environmentally sensitive places. So, you recollect what we studied about environmentally sensitive places, how we identify and what are the key concerns when we deal with such kind of environmentally sensitive areas.

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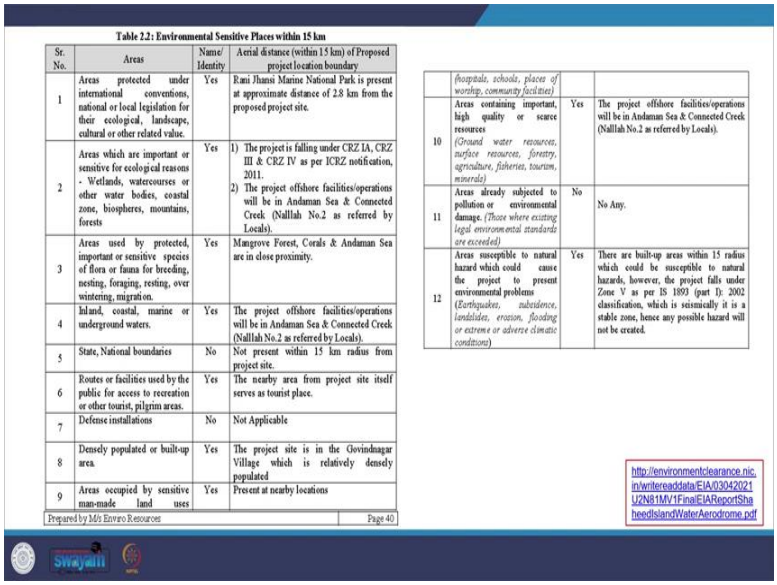

So, here you see they have identified environmentally sensitive places within 15 kilometers. So, they have taken a radius of 15 kilometers for environmentally sensitive areas. So, you see areas like areas protected under

international convention, so they are referring to all the protected areas under international convention. So, you see that do they have it, have in this particular radius, what they are studying and the details of those projects.

So, you can see Rani Jhansi Marine National Park is present. Then likewise, you see areas that are important or sensitive for ecological reasons like wetlands, water courses, or other water bodies. So, all those are present in these 15 kilometers then you see the area used by protected important or sensitive species of Laura.

So, you also see those mangrove forests, coral, and the Andaman Sea nearby. So, you see all these inland, coastal marine, state national boundaries, routes, or facilities. So, all these sensitive places have been identified. So, many preparing area reports see how intensive it could be and all those details have to be given point by point.

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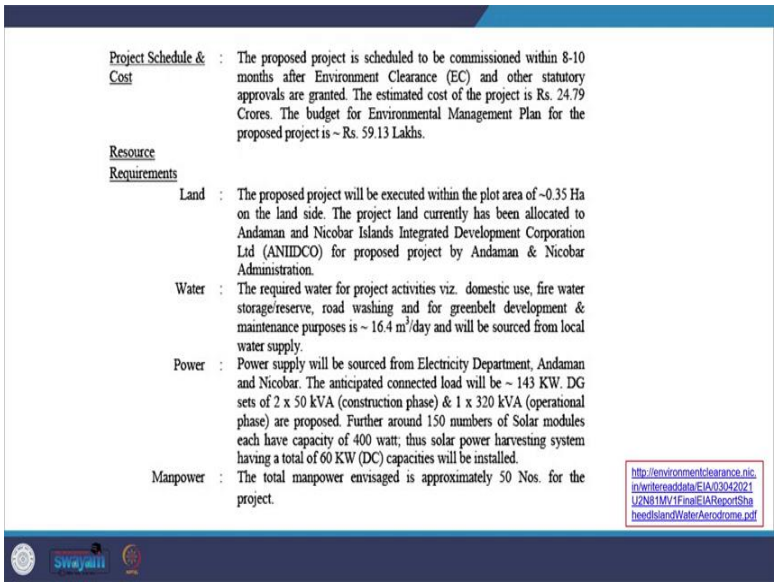

So, looking at the project schedule and cost here. So, the project -- Estimated cost of the project is nearly twenty 5 crores you see here, and the budget of the environmental management plan. So, what they will do to mitigate the environmental impact would be nearly 60 lakhs, 59 Plus lakhs. So, that is what their calculations are. And the kind of resources they would be used as land resources, water resources, power, and manpower.

So, if you look at the land resource what they would be using is like 0.35 hectares on the land side they would be using and then you also see water, water will be required for project activities like domestic use, fire water storage, road washing, and for Greenbelt development maintenance of that and we will be channelized through the local water supply.

Then you see power supply will be sourced from electrical departments and then what will be the requirements and so on. And total manpower which is required is calculated to be 50 numbers for the project, so they would be required for this particular facility 50 numbers, so you will see that here.

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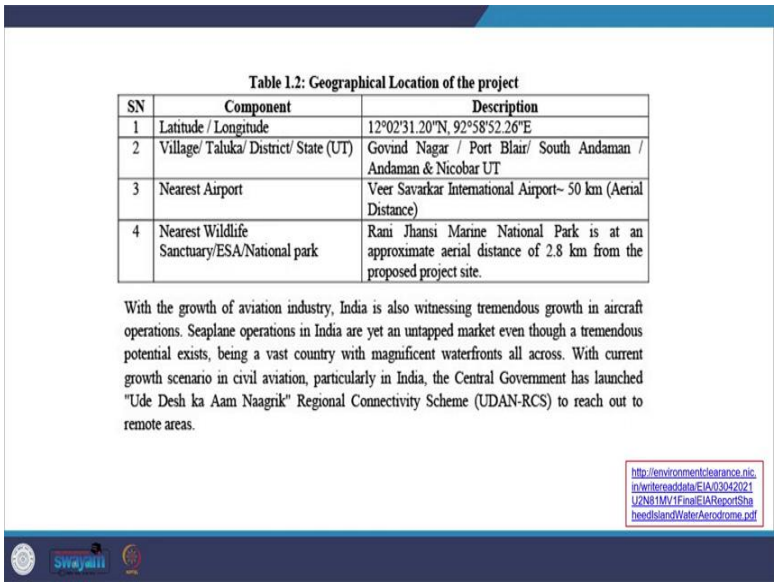

Details of the geographic locations are given you can see where it is located. And particularly, this one is done within India's UDAN program which is like Ude Desh ka Aam Naagrik, which is like which means which is said in Hindi here, it means every common citizen of the country would fly, so Ude Desh ka Aam Naagrik. And within Regional Connectivity Scheme RCS, RCS, which has been abbreviated UDAN which means flying, flight. And it is the program for regional connectivity. So, within that, this particular project has been done.

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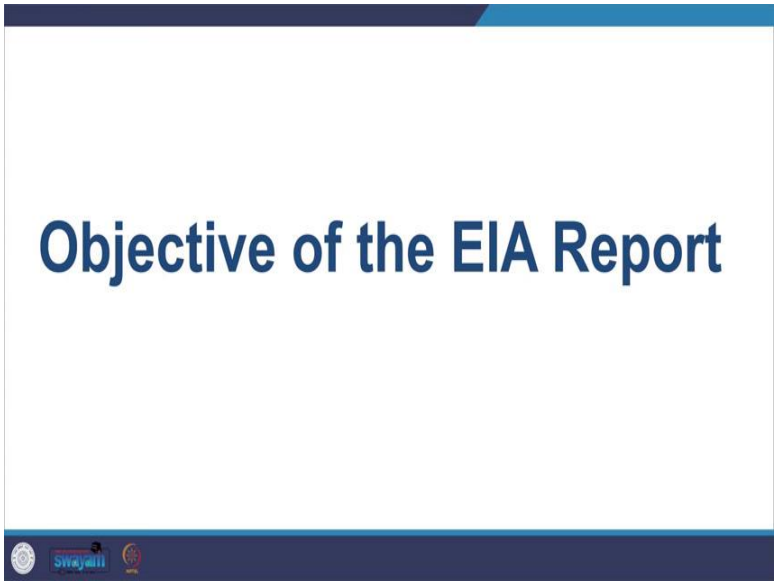

So, looking at now, that was a brief description of the project looking at the purpose of the EIA report. So, we see that the purpose of this, the key purpose behind this EIA report is to integrate the environmental concerns in the development activities, what we are addressing as sustainable development. So, that it can enable integration of environmental concerns and mitigation measures and the project development and also to have any kind of future liabilities, any kind of things which happen because of the project.

So, anticipating all that and paring it down about all the actions which they are going to take. So, the study area for this EIA versus the 10-kilometer radial area from the proposed project site and wherever it was environmentally sensitive areas where it was concerning studying, then a 15-kilometer radius was taken. For this study secondary data was collected around the 10 kilometers or 15 kilometers of the site as per the study purpose for any kind of study detailed environmental monitoring, they are taken 10 kilometers for the environmentally sensitive area they had taken 15 kilometers.

So, to get an idea about the existing state of the environment, various environmental data were collected, including metrology, air quality, water quality, soil quality, and all those areas. It was carried out As you will see this is fairly latest report from December 2019 to February 2020.

So, the scope of the study included a description of the project and associated work, so describing the project, so, becomes the key purpose key component of the EIA report, then establishing the base environment and social scenario and then identification and description of the elements of community and environment which would be likely to be impacted by the project. So, those all community and environmental aspects, what kind of impact it would have?

So, identifying them and then describing them. Then it also had the study the existing traffic scenario, and the impact on transportation, so that it would also do that and conservation of resources, how resource efficiency is attained here, and then design. Specifying monitoring and audit requirements is necessary so how they are going to monitor and audit all that is going on at the operational stage of this project?

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So, here we see how they are complying with the ToR Terms of Reference, or like I said, it is the scoping stage, where the ToR is used as per the domain vise-like what they need to undertake what they need to study while

assessing the environmental impact of any kind of a project. So, as you will see here they have given point by point how they are complying with the ToR.

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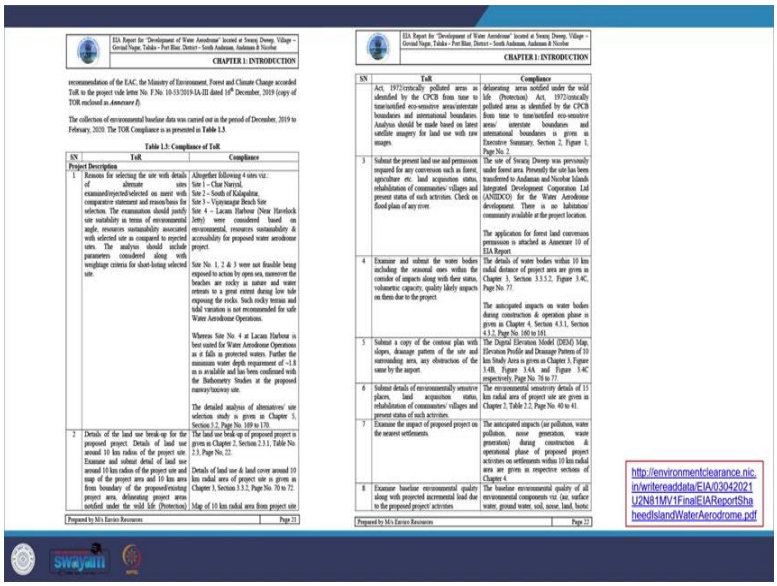

So, you see like, they have reasons for selecting the site with details of alternative sites and so on, which is like given in the ToR. So, they have like how did they comply by it, so, they had four sites 1, 2, 3, 4, Char Nariyal and then South Kalapatthar, then you have Vijayanagar Beach Site, Lacam Harbor, so all these were studied as an alternative. So, they have given it point by point and the details are given later.

Then you will see the details of the land use breakout for the proposed project in point number 2, you can see the details of land use around a 10 10-kilometer radius of the project site. So, how they have worked it out, and in which sections they are giving those details been given. So, likewise, you see that point 3 submits the present values and permission required for any conversion such as forest agriculture and so on.

So, how they have complied with it? Likewise, you can examine and submit the water bodies, including the seasonal ones within the corridor of impact. So, how they have taken care of that where all they are describing is how they have documented it. So, compliance has been given. Like in point 5 you can see submit a copy of the contour plan with the slope drainage pattern of the site. So, they have also created a digital elevation model map, elevation profile, and digital pattern of a 10-kilometer area study area, which was within the scope.

So, and then they have given all the figures that address these terms of reference. Likewise, you can see some details of environmentally sensitive places' land acquisition status, and how they have addressed it examine the impact of a proposed project or nearest settlements. So, the anticipated impact, and what will happen during the construction and operation of the project have been mentioned and they have also mentioned in which chapter to cover that. So, likewise, you can see examined baseline environmental quality along with the project incremental load due to proposed project activities.

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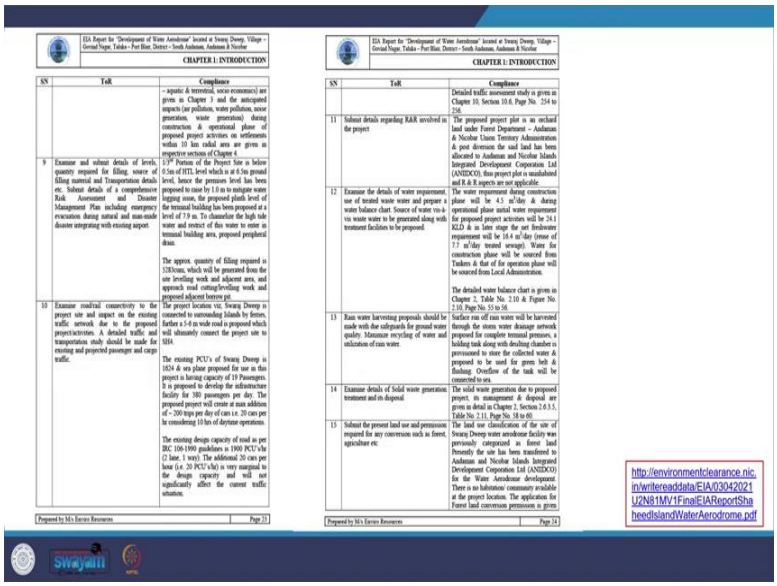

So, the baseline environmental quality had to be given. So, the entire baseline environmental quality has been provided in the report. Then you see how they have examined levels, quantity required for filling, source of filling, material, and all these details you can see. We will see point number 11 where submit details regarding rehabilitation and resettlement involved in the project. So, you can see here what compliance they have done or what they mention here.

The proposed project plot is an orchard land under the forest department of Andaman and Nicobar Union Territory administration and post division and the said land has been allocated to Andaman and Nicobar Island Integrated Development Corporation thus project plot is uninhabited and R&R aspects are not applicable. So, you think about what kind of resettlement, and rehabilitation rehabilitation are required economically and physically, and what part they have covered and not covered. So, you can reflect on that when you go through all these things.

So, here again, point number 12 you can see, the various water requirements that they are required to address and how they have created the detailed water balance chart for this particular project. And point number 13, you can see rainwater harvesting. So, how they have taken care of that and then solid waste generation and disposal of it and then with segments addresses to that, and present land use permissions required for this purpose.

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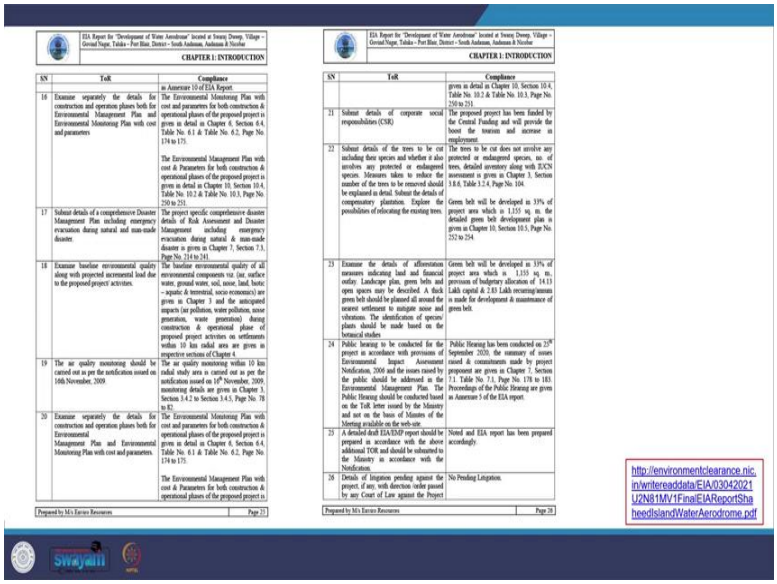

So, you see all the details for construction or operations have to be given as the comprehensive Disaster Management Plan which you also saw in the table of contents of the report then examined baseline environmental quality, and then it was required to do it with incremental load due to the project activities.

So, not just the baseline environmental quality, but also the projected incremental load on that and how did they address that with chapters have addressed they have mentioned it, then air quality monitoring and then, that has to be done then also construction operation phase both for environmental management plan and environmental monitoring plan with cost and parameters. So, the Environmental Management Plan and monitoring plan have to be given.

So, they have covered under which chapter they have covered, and then what kind of corporate social responsibility CSR, they are going to take care of that is been mentioned. So, likewise, you see they are required to submit details of trees to be cut, including their species and whether it is also -- Whether it also involves any protected or endangered species. So, recollect what we studied, and how those aspects have to be covered.

So, it is required by the ToR that the detailed list is prepared. We had, in the previous just the previous lectures, seen how the entire metro line there was like a 200-page list, which meant for the details of the trees and where the trees were cut. So, here again, you see point number 23, where you have details of afforestation indicating land and financial outlay related with that, so how they are addressing it, how they are creating the Greenbelt, then 24 you see public hearing to be conducted for the project by the provision of EIA notification 2006.

So, we have also seen this notification and that also comes here in the ToR so how did they comply with that, and then how do they have to give a detailed draft EIA EMP report that should be prepared by the ToR and details of litigation pending any kind of litigations which are involved. So, that had to be mentioned here.

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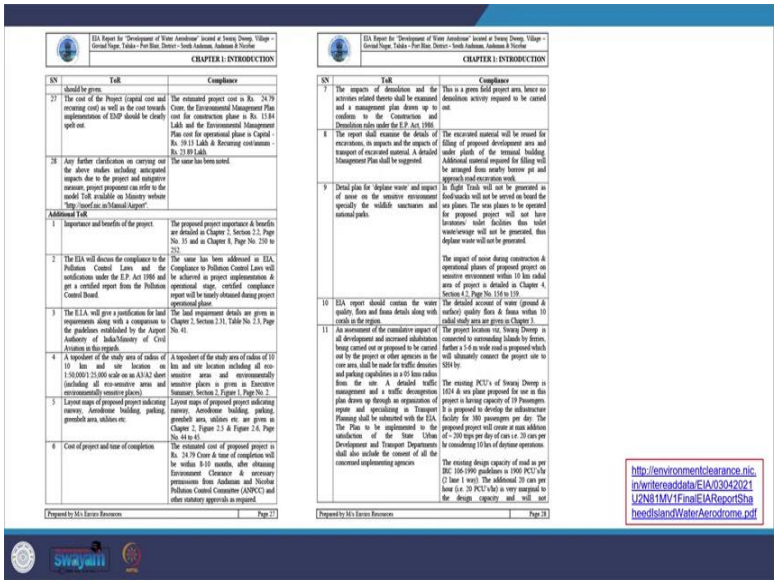

So, other details like the cost of the project, any clarifications which are required. And there are also you will see here that there are additional ToRs apart from the key ToR. You have the importance and benefits of the project which was to be given then EIA will discuss the compliance of pollution control laws. So, what laws does it have to comply with and what justification for the land requirements, how much land they are using, and all the drawings and details, the maps they are using here that have to be provided here including all the eco-sensitive areas as well and environmentally sensitive places also.

Then all the maps which they had to do cost of all project at the time of completion. So, all that detail had to be given here. So, you see a range of additional ToR which has been adopted here, so you can see here all that.

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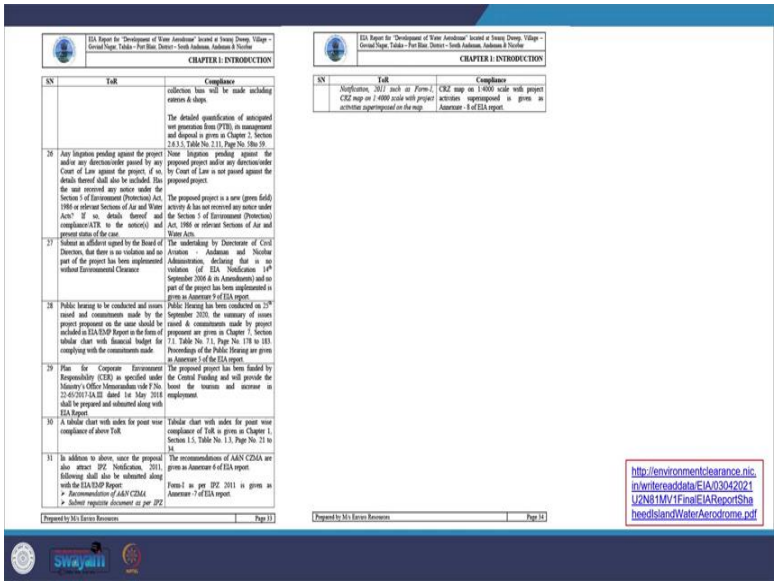

So, here again, you would see that since it is an island the last point which you can see here, in addition to the above since the proposal also was in see Island Protection Zone. So, it had to abide by TPZ notification Island Protection Zone notification as per the report it says 2011. Accordingly, they had to submit EIA and EMP

reports. So, they have undertaken all these considerations and have also provided regular details about that. So, you see how the ToR compliance has to be done.

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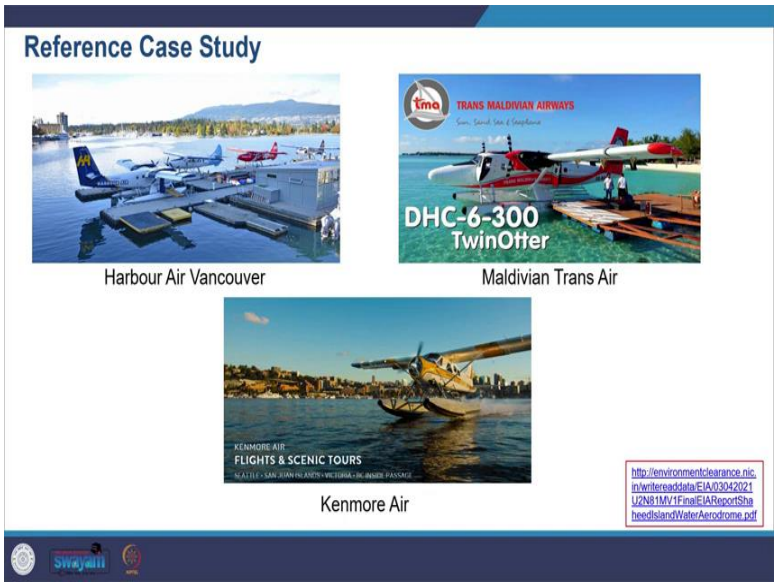

So, you also see their reference case studies. So, like since it was being done emerging area, it is a very new area in the Indian context. So, they also had reference case studies. So, you can see Harbor Air Vancouver then you have Maldivian Trans Air, and Kenmore Air flight and it is in Victoria, you can see here San Juan Islands.

So, you see all these further key references are based on which they had also judged their possible what kind of impact it would have on what kind of domain. So, we had discussed that you also adopt a case study approach. So, here they have also taken case studies for reference.

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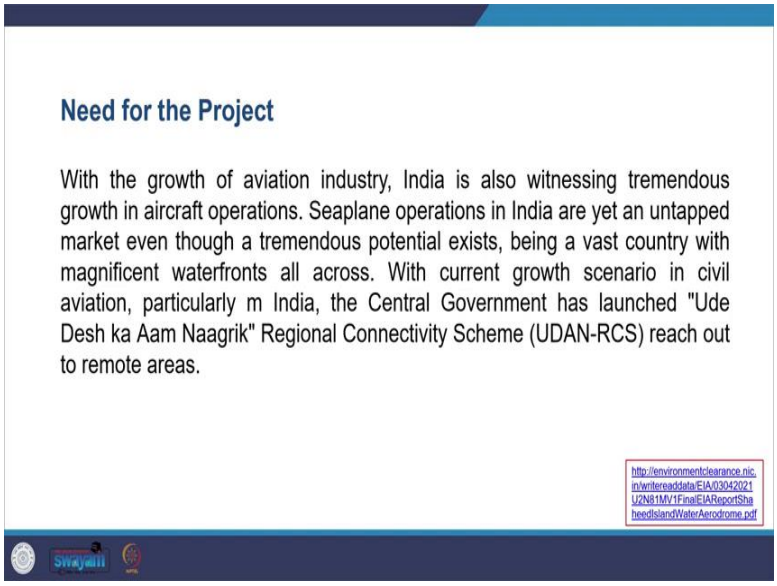

And then you will see here how they have highlighted the need for the project. So, you see how there is growth in aircraft operation and within this government initiative for creating flights for every common man of the

country, there is regional connectivity within the regional connectivity scheme, this project has created. So, it is for the government set up for which this project has been created. So, on that basis, they have established the need for the project. So, further, you see all the details they have given for the project description.

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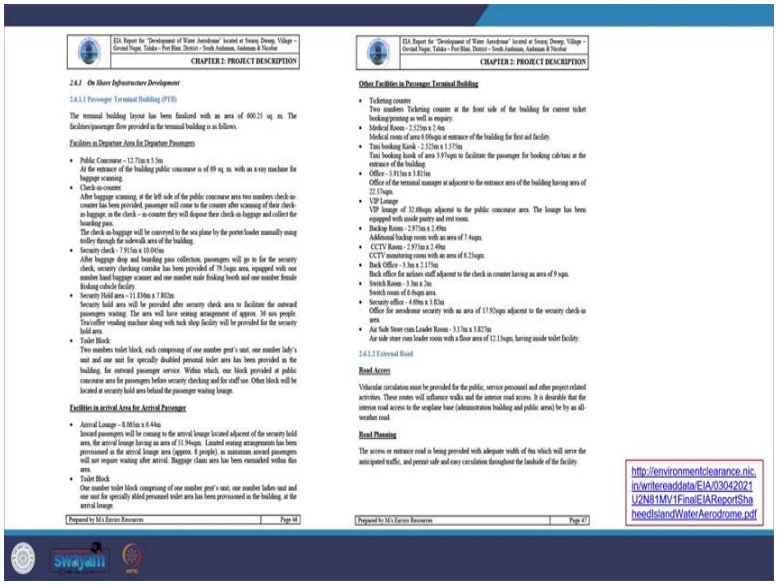

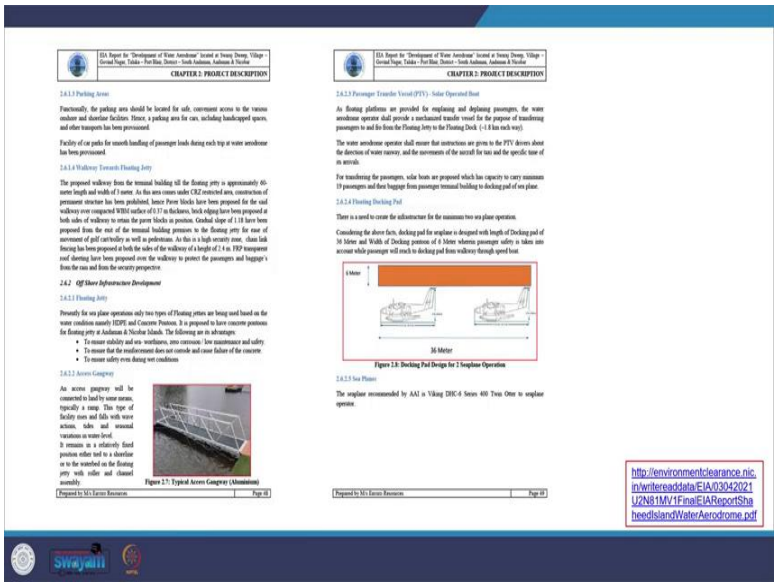

So, all the components that will come from the passenger terminal building to facilities at the arrival area for arrival passengers, you see all details have been mentioned. So, this is about the DPR detailed project report, which is prepared, and designed for the project. So, based on that, what kind of impact assessment they will do here?

So, that all has been transferred here as well are referred here as well. So, you see all the other facilities aligned with the passenger terminal building, then the external roads, the parking area, the walkway, the floating jetty, and the offshore infrastructure. So, the points which we talked about, you see all the details are being discussed here.

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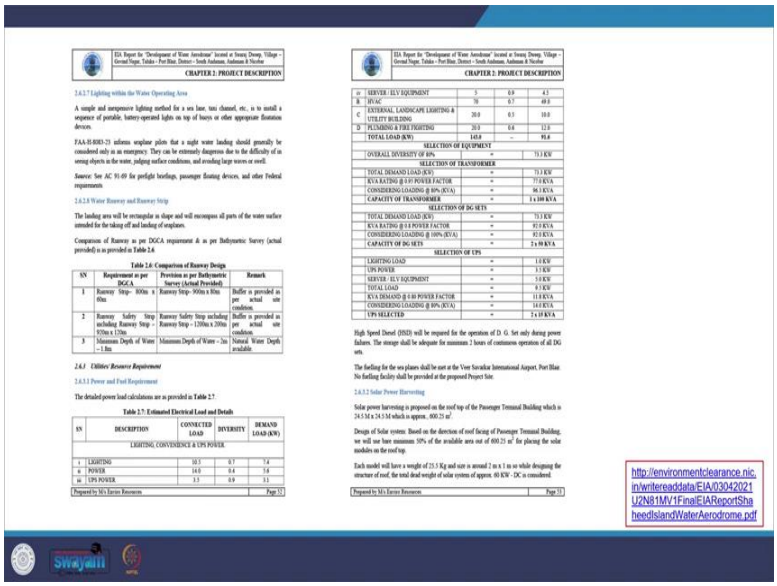

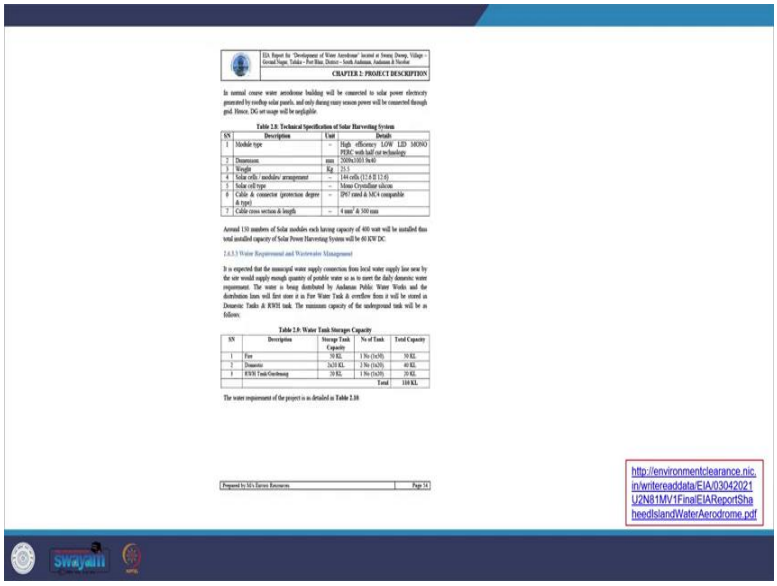

And then lighting within the water operating area, water runway, and runway strip, you will see power and fuel requirements and then solar power harvesting how they would be doing, water requirements, and Wastewater Management how they would be handling it.

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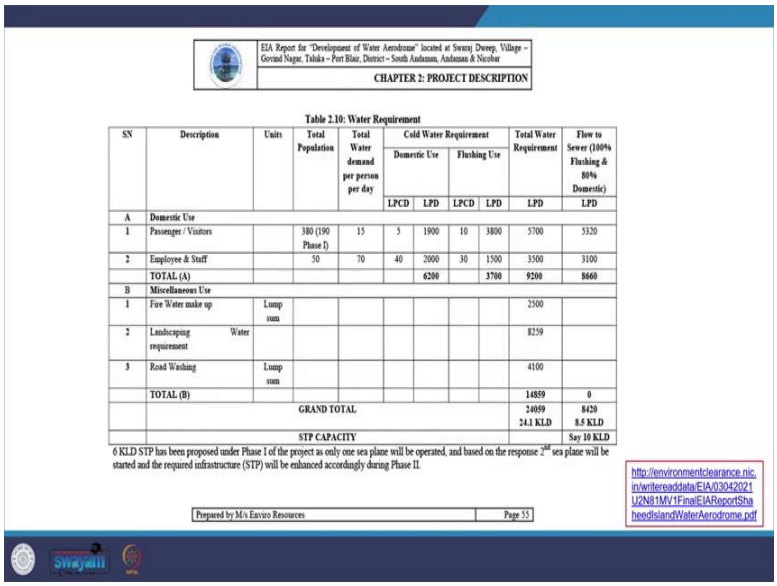

So, here you see how they have created the water requirements, tabulation for what purpose how much water they would require, and what would be the total requirement and the estimation related to that.

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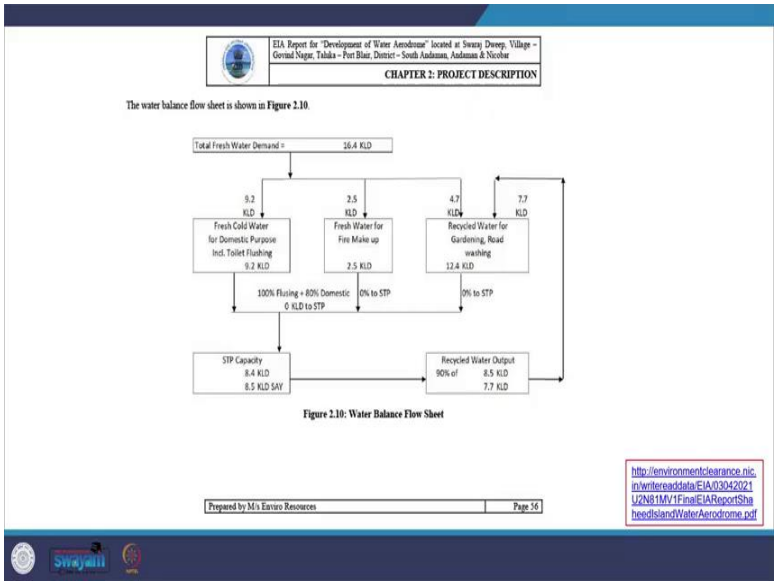

Then, like in compliance with the ToR and also for estimation purposes, they have created the water balance flow here.

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And then you also see the manpower requirement what they have calculated estimated that direct and indirect employments of about 30 to 40 numbers of people which of various skills will happen and then also they highlight that local business will get the opportunity to supply construction material and demand generated from temporary workers, colony for basic needs, and then they can be increased in the local business.

So, if you remember what we had talked about in the social impact assessment when we were talking about the London Bridge craze, also, what kind of opposition was raised, what kind of concerns were raised. So, look at that, and then try to see whether this assessment also addresses that kind of aspect or not.

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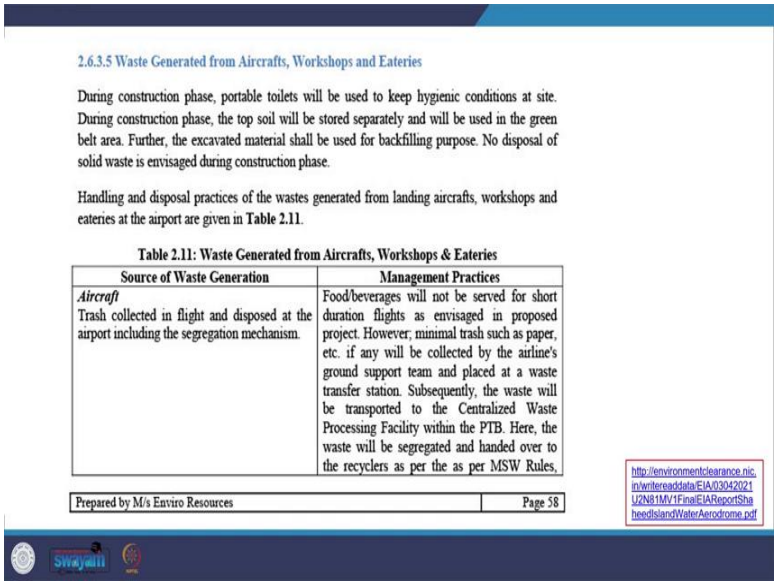

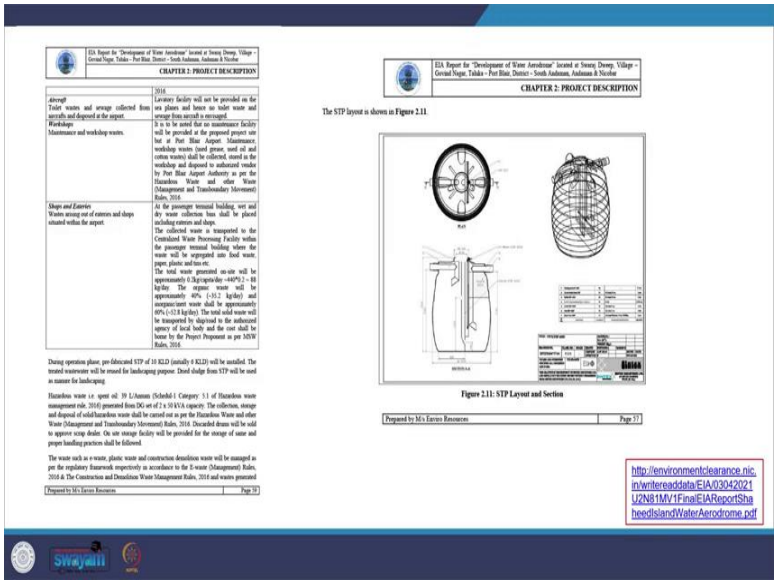

So, they have also given what kind of waste will be generated and how they are going to handle it in the management practice. So, for example, we just looking at one, so, this copy will be given to you, you can see it in detail, but just to skim through that you look at the aircraft and then the from the aircraft the trash which will be collected, so how they are going to manage those waste here and then how they will also establish the STP and what will be its design like and then how they are going to deal with that.

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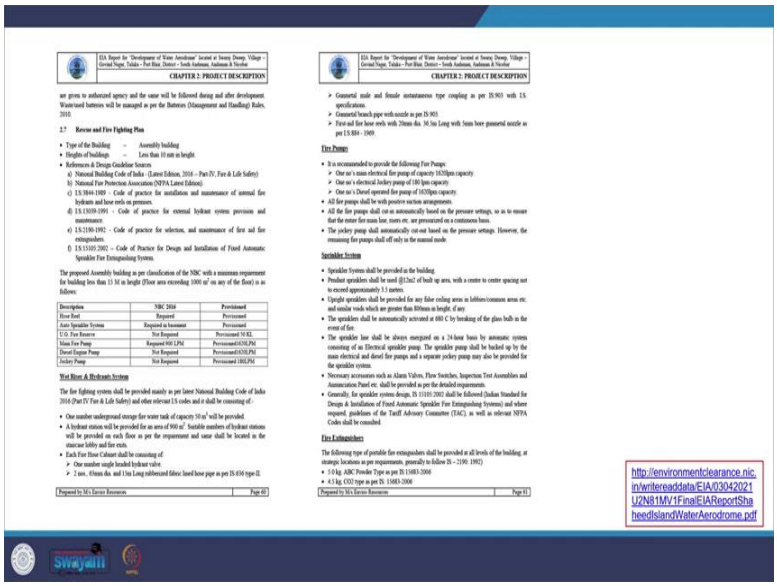

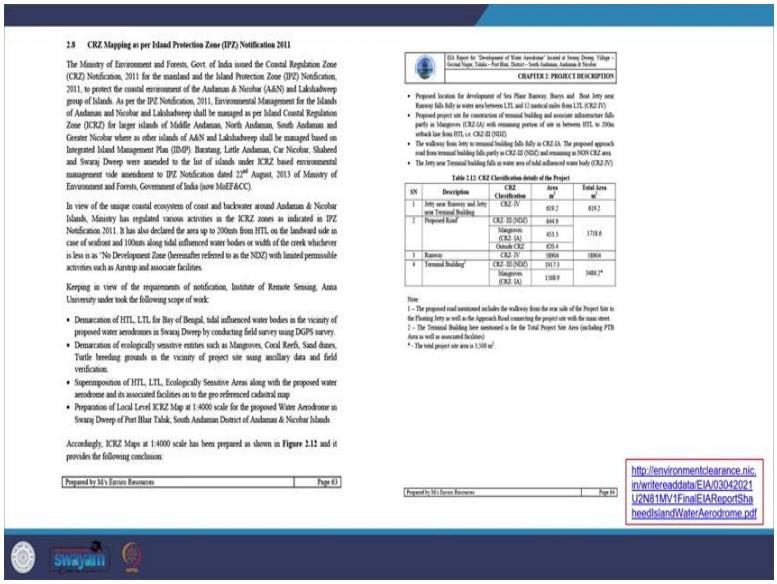

And then further what kind of rescue and firefighting plan will be there fire pumps, sprinkler system, fire extinguisher. Further another thing since we are dealing with islands, you also need to notice that it would also come under CRZ coastal regulations zone notification, so, it will fall under that, how do they comply with that?

So, CRZ mapping is done as per the island protection zone notification of 2011 which they have referred to here. And then they have demarcated all the areas of high tide level low tide level and so on. So, you will see that all acknowledgment and mapping have been done and what will fall under what has been taken care of.

So, in this table, you can see the CRZ classification detail of the project. So, the Jetty near the runway would come in CRZ 4, then the proposed road would come under CRZ 3, then the runway would come under CRZ 4, and the terminal building would come under CRZ 3. So, you see how all the elements are coming.

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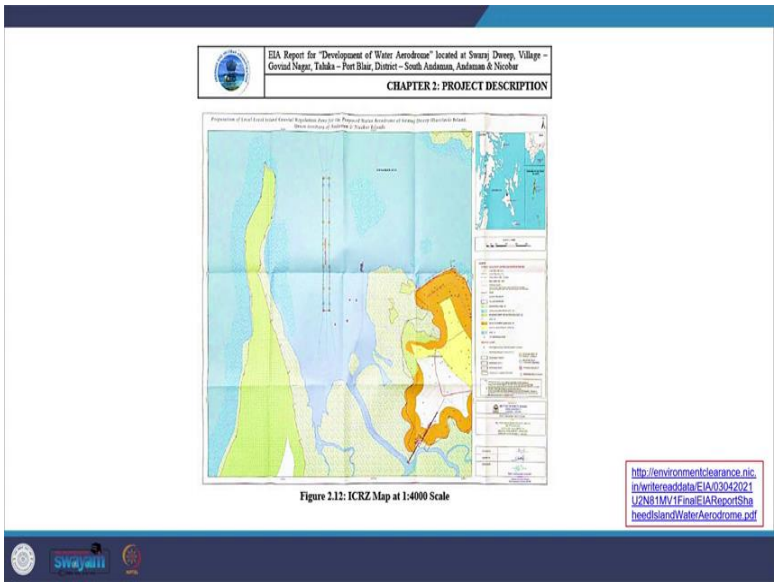

So, all those details have been given here you can see also the CRZ map which has been created here for the project. So, that was about the project description.

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So, now we will move towards the description of the environment where the project will be located, and how they are giving it. And while you go through this think of what they have given what they have not given and what more kinds of impacts can come in. So, a description of the project environment.

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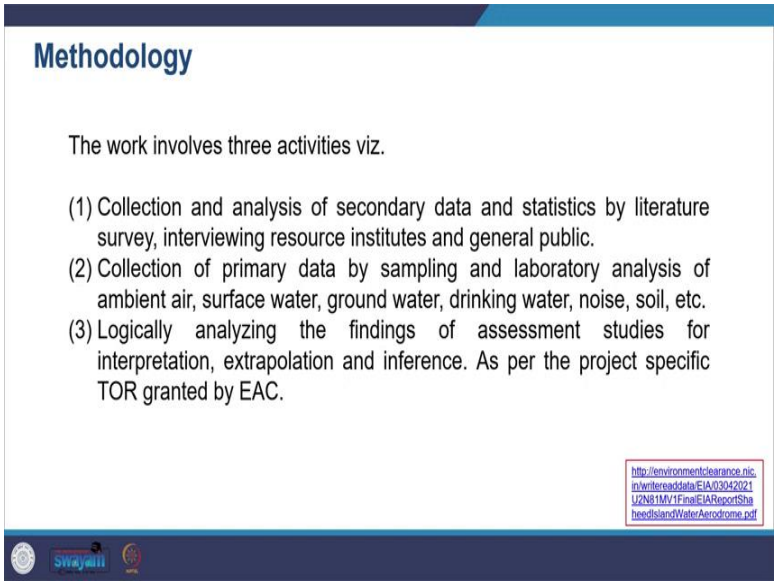

So, you see, they have -- The methodology which they have adopted as like that is a much-simplified methodology which you can see here. So, collection and analysis of secondary data and statistics. So, they collected through literature review, interviewing, resources, institute, and the general public, then they collected primary data by sampling and laboratory analysis, which they have mentioned at the very beginning of the cover page itself.

And then how they use laboratory analysis for air, water, groundwater, drinking water, noise, soil, and so on. So, the third step is logically analyzing the findings of assessment studies for interpretation, extrapolation, and inferences. So, they have logically and systematically analyzed all that data as per the report.

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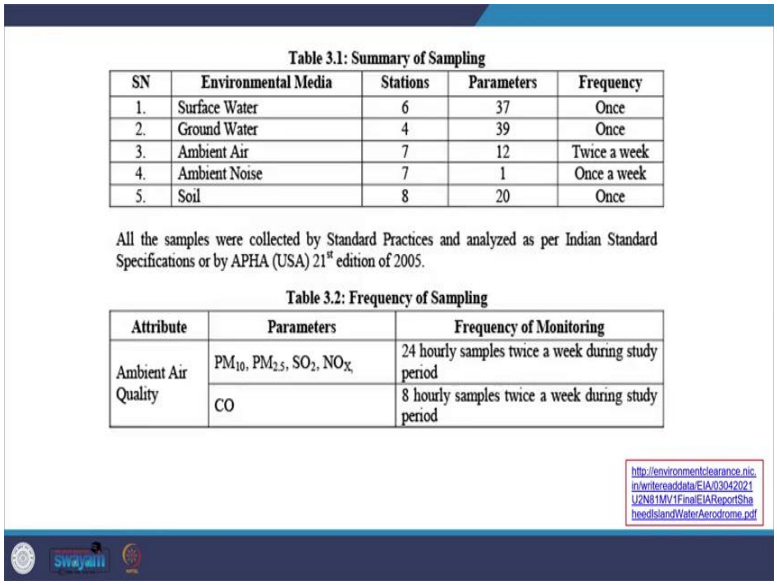

So, you see how they have given all the details of the summary of sampling for surface water, how many stations they use, what kind of, how many parameters were covered, and what the frequency of collecting this data is also mentioned. So, you will see the frequency of sampling as well mentioned here for all the aspects of ambient air quality, metrology, water quality ecology, and so on, you can see here.

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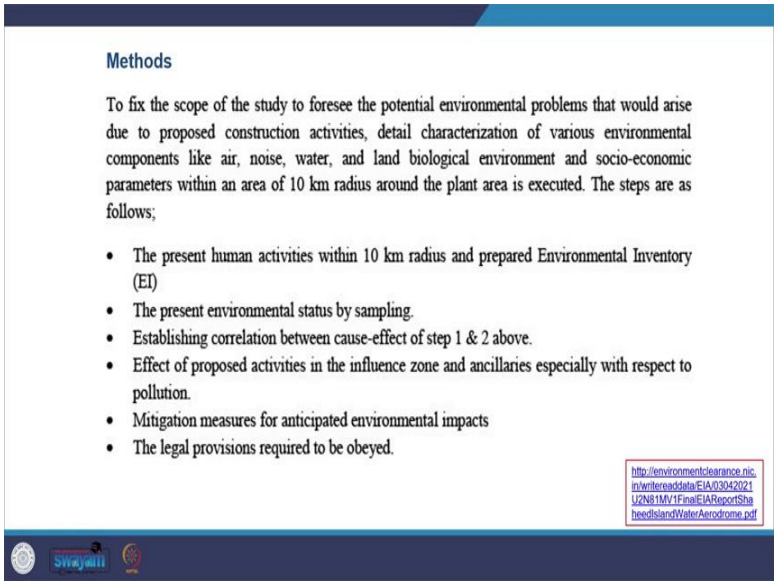

And then looking at their method, what they adopted is like one was they took 10 kilometers for the environmental sensitivity, they took 15 kilometers, and then they presented the environmental status by sampling. So, by creating the baseline information, they presented the environmental status, then, they did the

cause-effect by integrating one and two that is, first they established the human activities around 10 kilometers, then they also had environmental status.

So, they created cause and effect relationship here to understand what kind of human activities are having an impact on the resources or the environment. So, and then, based on that they created influence zones and all kinds of ancillary areas concerning pollution, and then they created mitigation measures for the anticipated impact, environmental impact, and what kind of legal provisions are required to be obeyed, so all that was identified.

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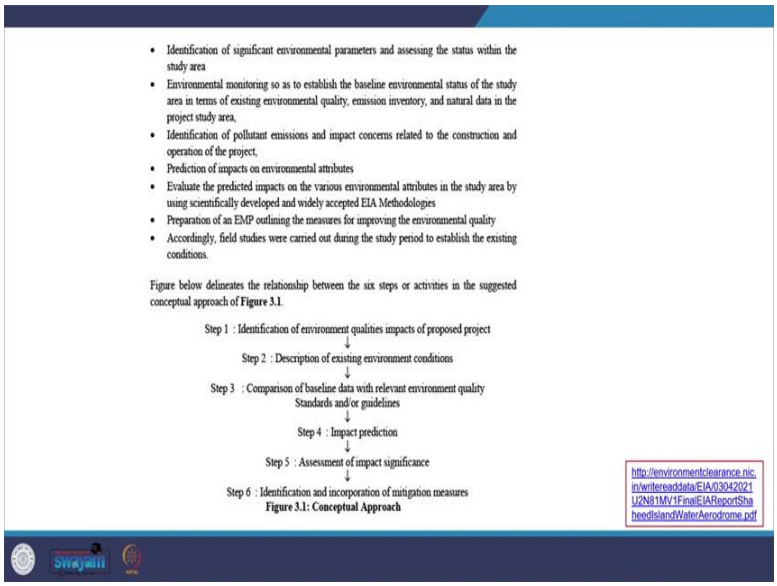

They also looked at the significant environmental parameters, also environmental monitoring, and then also looked at the environment, identification of pollution emissions, and impacts on environmental attributes, what kind of impact it had, and then evaluated the predicted impact. So, you have also seen how we evaluate the predicted impact, and then further, they prepare the EMP and then also carry out field studies for establishing the existing conditions. So, you can also see in the diagram here.

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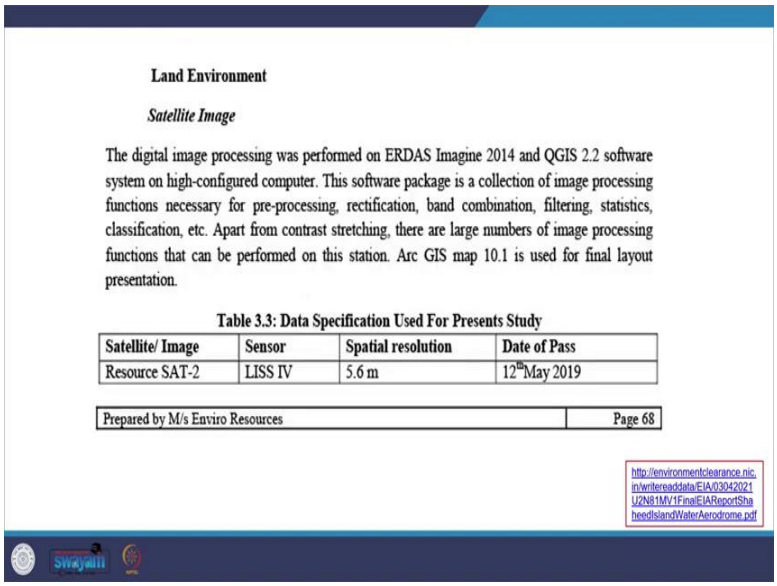

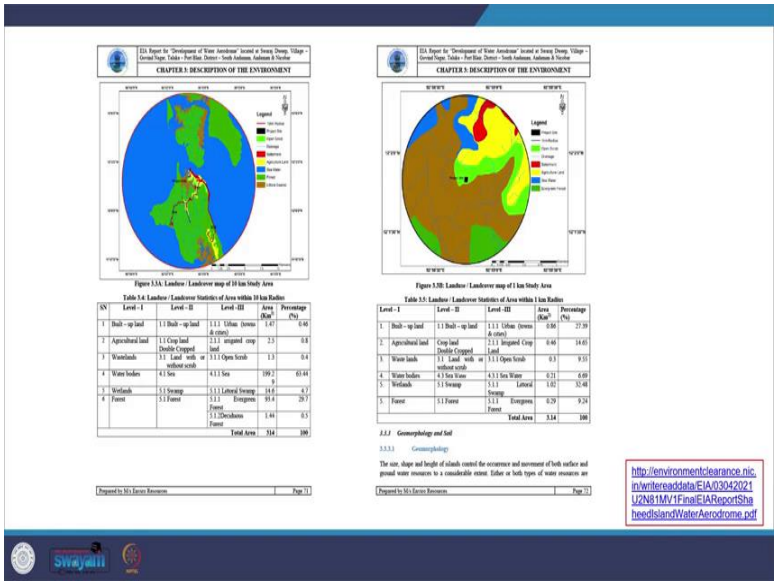

So, here, you see how they have provided point by point all the details and what kind of data source they have used. So, land environment, for that, they have a use satellite image, and you will see how that is been brought up, and then what kind of land cover land use statistics are there, so within what radius and that all has been given here.

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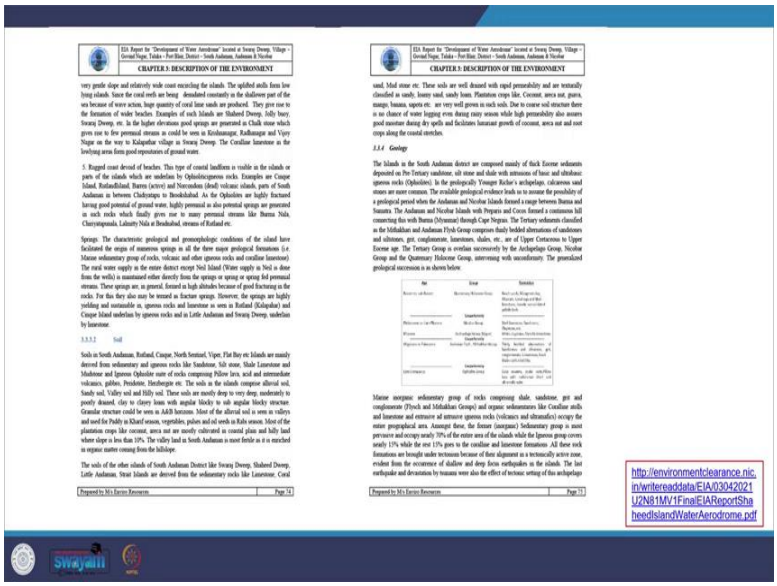

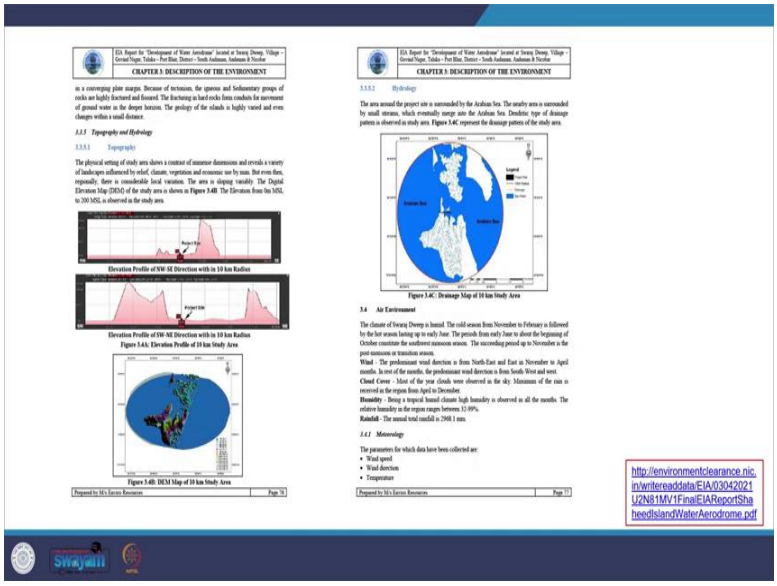

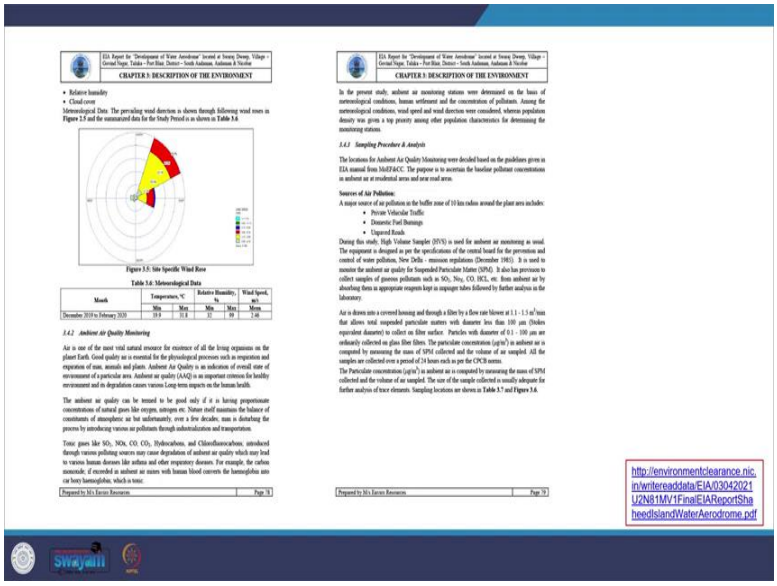

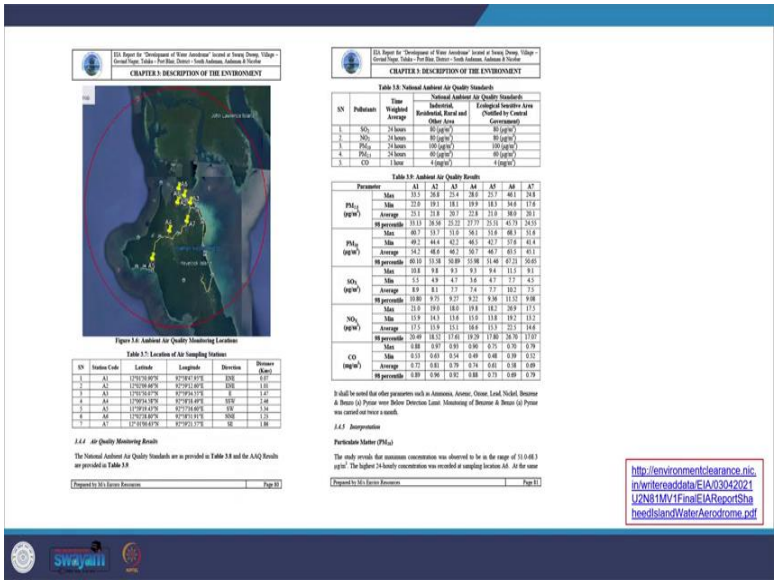

So, likewise, you see how they have given for the soil, how they have given for the geology, topography, how they have done for hydrology, and then, so, what they have done for air environments, how they are monitoring air, ambient air quality, and what kind of sampling procedure and analysis they are taking.

So, they have identified different sorts of air pollution and then ambient air quality monitoring locations, they have identified in the report, and then all the -- how they are following standards national ambient air quality standards, and what was the result of this survey has been compared with the standards.

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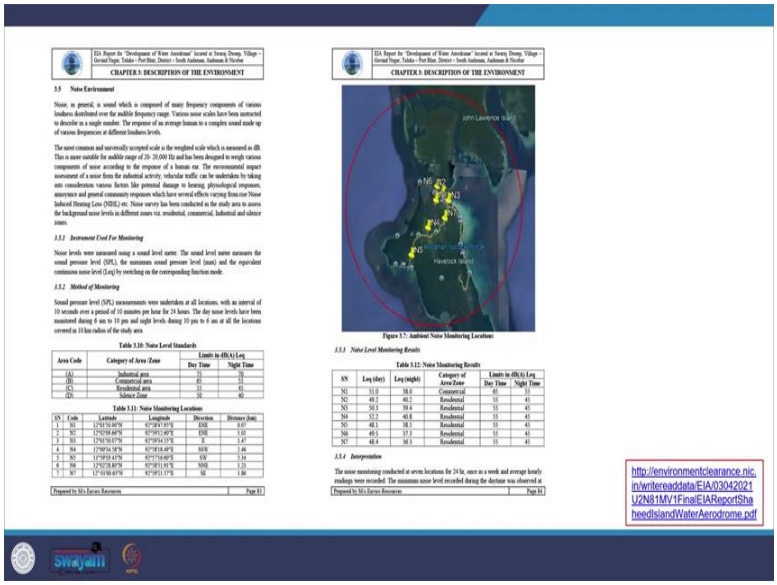

So, you also see that they have covered noise environment, and then how they are doing it, what kind of instruments are used methods of monitoring those noise that they have detailed out here.

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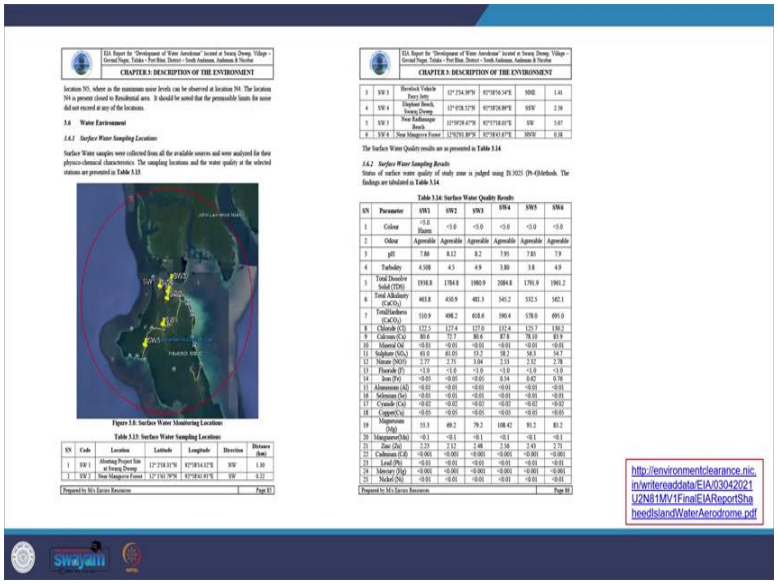

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location N5, where as the maximum noise levels can be observed at location N4. The location N4 is present closed to Residential area. It should be noted that the permissible limits for noise did not exceed at any of the locations.

3.6 Water Environment

3.6.1 Surface Water Sampling Locations

Surface Water samples were collected from all the available sources and were analyzed for their physico-chemical characteristics. The sampling locations and the water quality at the selected stations are presented in **Table 3.13**.

Figure 3.8: Surface Water Monitoring Locations

Table 3.13: Surface Water Sampling Locations

SN	Code	Location	Latitude	Longitude	Direction	Distance (km)
1	SW 1	Aberdeen Project Site at Swaraj Dweep	12° 2'18.31"N	92°58'44.32"E	NW	1.30
2	SW 2	Near Mangrove Forest	12° 1'43.78"N	92°58'41.91"E	SW	0.32

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3	SW 3	Havelock Vehicle Ferry Jetty	12° 2'54.39"N	92°58'56.34"E	NNE	1.41
4	SW 4	Elephant Beach, Swaraj Dweep	12° 0'58.32"N	92°59'26.80"E	SSW	2.38
5	SW 5	Near Radhanagar Beach	11°59'59.47"N	92°57'18.01"E	SW	5.07
6	SW 6	Near Mangrove Forest	11°59'01.80"N	92°58'43.07"E	NNW	0.38

The Surface Water Quality results are as presented in **Table 3.14**.

3.6.2 Surface Water Sampling Results

Status of surface water quality of study zone is judged using IS:3025 (Pt-4)Methods. The findings are tabulated in **Table 3.14**.

Table 3.14: Surface Water Quality Results

SN	Parameter	SW1	SW2	SW3	SW4	SW5	SW6
1	Colour	<5.0 Hazen	<5.0	<5.0	<5.0	<5.0	<5.0
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	7.80	8.12	8.2	7.95	7.85	7.9
4	Turbidity	4.508	4.5	4.9	3.80	3.8	4.9
5	Total Dissolve Solid (TDS)	1938.8	1784.8	1980.9	2084.8	1791.9	1941.2
6	Total Alkalinity ($CaCO_3$)	463.8	430.9	481.3	545.2	532.5	582.1
7	TotalHardness ($CaCO_3$)	510.9	498.2	618.6	590.4	578.0	695.0
8	Chloride (Cl)	122.5	127.4	127.0	132.4	125.7	130.2
9	Calcium (Ca)	80.6	72.7	80.6	87.8	78.10	87.9
10	Mineral Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
11	Sulphate (SO_4)	41.0	41.05	33.3	38.3	36.3	54.7
12	Nitrate (NO_3)	2.77	2.75	3.04	2.13	2.32	2.78
13	Fluoride (F)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
14	Iron (Fe)	<0.05	<0.05	<0.05	0.14	0.42	0.78
15	Aluminium (Al)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Selenium (Se)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
17	Cyanide (Cn)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Copper(Cu)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Magnesium (Mg)	53.3	49.2	59.2	108.42	90.2	80.2
20	Manganese(Mn)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
21	Zinc (Zn)	2.23	2.12	2.48	2.56	2.43	2.73
22	Cadmium (Cd)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Lead (Pb)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24	Mercury (Hg)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
25	Nickel (Ni)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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http://environmentclearance.nic.in/writereaddata/EIA/03042021U2N81MV1FinalEIAReportShaheedIslandWaterAerodrome.pdf

Likewise, you see water environments, what locations from where they are collecting the samples, what standards they are following, and what are the results of their sampling survey.

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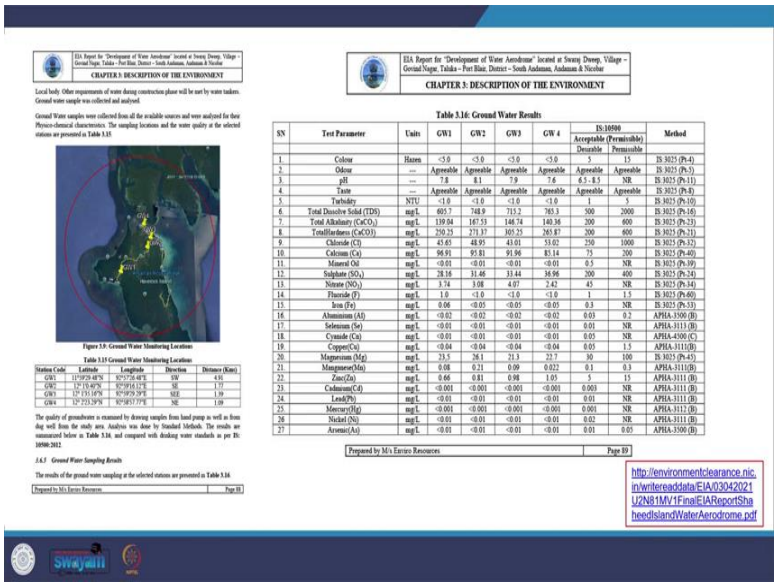

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Local body. Other requirements of water during construction phase will be met by water tankers. Ground water sample was collected and analysed.

Ground Water samples were collected from all the available sources and were analyzed for their Physico-chemical characteristics. The sampling locations and the water quality at the selected stations are presented in **Table 3.15**.

Figure 3.9: Ground Water Monitoring Locations

Table 3.15 Ground Water Monitoring Locations

Station Code	Latitude	Longitude	Direction	Distance (Km)
GW1	12°19'29.48"N	92°57'28.48"E	SW	4.91
GW2	12° 1'0.40"N	93°0'16.12"E	SE	1.72
GW3	12° 1'51.18"N	92°59'29.29"E	SSE	1.39
GW4	12° 2'23.29"N	93°0'53.77"E	NE	1.09

The quality of groundwater is examined by drawing samples from hand pump as well as from dug well from the study area. Analysis was done by Standard Methods. The results are summarized below in **Table 3.16**, and compared with drinking water standards as per IS: 10500:2012.

3.6.3 Ground Water Sampling Results

The results of the ground water sampling at the selected stations are presented in **Table 3.16**.

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Table 3.16: Ground Water Results

SN	Test Parameter	Units	GW1	GW2	GW3	GW 4	IS:10500 Acceptable (Desirable)	IS:10500 Permissible	Method
1.	Colour	Hazen	<5.0	<5.0	<5.0	<5.0	5	15	IS 3025 (Pt-4)
2.	Odour	---	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS 3025 (Pt-5)
3.	pH	---	7.8	8.1	7.9	7.6	6.5 - 8.5	NR	IS 3025 (Pt-11)
4.	Taste	---	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS 3025 (Pt-8)
5.	Turbidity	NTU	<1.0	<1.0	<1.0	<1.0	1	5	IS 3025 (Pt-10)
6.	Total Dissolve Solid (TDS)	mg/L	605.7	748.9	713.2	785.3	500	2000	IS 3025 (Pt-16)
7.	Total Alkalinity ($CaCO_3$)	mg/L	139.04	167.53	146.74	140.36	200	600	IS 3025 (Pt-23)
8.	TotalHardness ($CaCO3$)	mg/L	250.25	271.37	305.25	265.87	200	600	IS 3025 (Pt-21)
9.	Chloride (Cl)	mg/L	45.65	48.95	43.01	53.02	250	1000	IS 3025 (Pt-32)
10.	Calcium (Ca)	mg/L	96.91	95.83	91.96	85.14	75	200	IS 3025 (Pt-40)
11.	Mineral Oil	mg/L	<0.01	<0.01	<0.01	<0.01	0.5	NR	IS 3025 (Pt-39)
12.	Sulphate (SO_4)	mg/L	28.16	31.46	33.44	36.96	200	400	IS 3025 (Pt-24)
13.	Nitrate (NO_3)	mg/L	3.74	3.08	4.07	2.42	45	NR	IS 3025 (Pt-34)
14.	Fluoride (F)	mg/L	1.0	<1.0	<1.0	<1.0	1	1.5	IS 3025 (Pt-60)
15.	Iron (Fe)	mg/L	0.06	<0.05	<0.05	<0.05	0.3	NR	IS 3025 (Pt-53)
16.	Aluminium (Al)	mg/L	<0.02	<0.02	<0.02	<0.02	0.03	0.2	APHA-3500 (B)
17.	Selenium (Se)	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	NR	APHA-3113 (B)
18.	Cyanide (Cn)	mg/L	<0.01	<0.01	<0.01	<0.01	0.05	NR	APHA-4500 (C)
19.	Copper(Cu)	mg/L	<0.04	<0.04	<0.04	<0.04	0.05	1.5	APHA-3111(B)
20.	Magnesium (Mg)	mg/L	23.5	26.1	21.3	23.7	30	100	IS 3025 (Pt-45)
21.	Manganese(Mn)	mg/L	0.08	0.21	0.09	0.022	0.1	0.3	APHA-3111(B)
22.	Zinc(Zn)	mg/L	0.66	0.81	0.98	1.05	5	15	APHA-3111 (B)
23.	Cadmium(Cd)	mg/L	<0.001	<0.001	<0.001	<0.001	0.003	NR	APHA-3111 (B)
24.	Lead(Pb)	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	NR	APHA-3111 (B)
25.	Mercury(Hg)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	NR	APHA-3112 (B)
26.	Nickel (Ni)	mg/L	<0.01	<0.01	<0.01	<0.01	0.02	NR	APHA-3111 (B)
27.	Arsenic(As)	mg/L	<0.01	<0.01	<0.01	<0.01	0.01	0.05	APHA-3500 (B)

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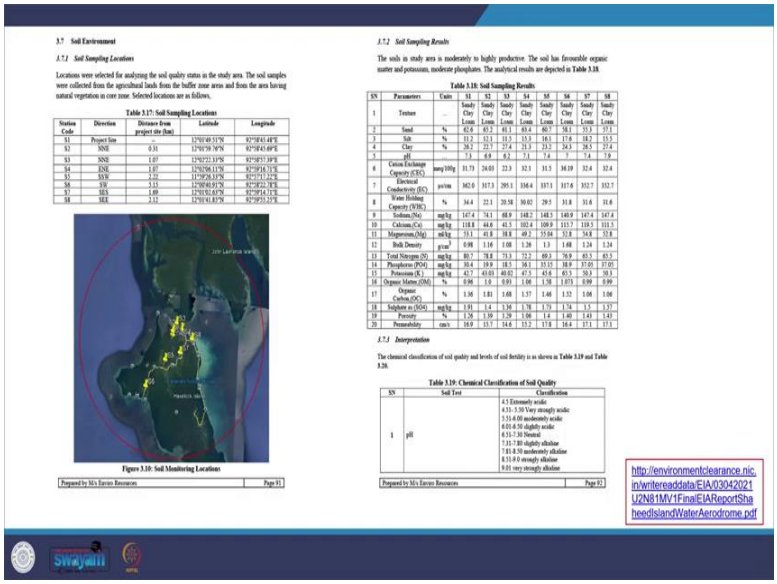

3.7 Soil Environment

3.7.1 Soil Sampling Locations

Locations were selected for analysing the soil quality status in the study area. The soil samples were collected from the agricultural lands from the buffer zone areas and from the area having natural vegetation in core zone. Selected locations are as follows,

Table 3.17: Soil Sampling Locations

Station Code	Direction	Distance from project site (km)	Latitude	Longitude
S1	Project Site	–	12°01'49.51"N	92°58'43.48"E
S2	NNE	0.31	12°01'59.76"N	92°58'43.89"E
S3	NNE	1.07	12°02'22.13"N	92°58'53.38"E
S4	ENE	1.07	12°02'06.12"N	92°59'36.11"E
S5	SSW	1.22	11°59'26.83"N	92°57'27.22"E
S6	S'W	3.13	11°59'40.91"N	92°58'22.78"E
S7	SEE	1.09	12°01'01.63"N	92°59'14.21"E
S8	SEE	2.11	12°01'41.81"N	92°59'53.23"E

Figure 3.10: Soil Monitoring Locations

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3.7.2 Soil Sampling Results

The soils in study area is moderately to highly productive. The soil has favourable organic matter and potassium, moderate phosphates. The analytical results are depicted in Table 3.18.

Table 3.18: Soil Sampling Results

SN	Parameters	Units	S1	S2	S3	S4	S5	S6	S7	S8
1	Texture	–	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam
2	Sand	%	42.8	45.2	41.1	43.4	40.7	58.1	53.3	57.1
3	Silt	%	11.2	12.1	11.3	13.3	16.1	17.6	18.2	15.3
4	Clay	%	28.2	22.7	27.4	23.3	23.3	24.3	28.5	27.4
5	pH	.....	7.3	6.9	6.3	7.1	7.4	7	7.4	7.9
6	Cation Exchange Capacity (CEC)	meq/100g	31.73	24.03	22.3	32.1	31.5	34.19	32.4	32.4
7	Electrical Conductivity (EC)	µs/cm	362.0	317.3	295.1	334.4	337.1	317.6	332.7	332.7
8	Water Holding Capacity (WHC)	%	34.4	22.1	20.58	30.02	29.5	31.8	31.6	31.6
9	Sodium,(Na)	mg/kg	147.4	74.1	68.9	148.2	148.1	140.9	147.4	147.4
10	Calcium,(Ca)	mg/kg	118.8	44.6	41.5	103.4	109.9	113.7	118.5	113.3
11	Magnesium,(Mg)	mg/kg	53.1	41.8	38.8	49.2	55.04	53.8	54.8	52.8
12	Bulk Density	g/cm^3	0.98	1.16	1.08	1.26	1.3	1.48	1.24	1.24
13	Total Nitrogen (N)	mg/kg	80.7	78.8	73.3	72.2	69.1	70.9	67.3	67.3
14	Phosphorus (PO4)	mg/kg	30.4	19.9	18.5	36.1	33.15	38.9	37.05	37.05
15	Potassium (K)	mg/kg	42.7	43.03	40.03	47.3	43.6	45.3	50.3	50.3
16	Organic Matter,(OM)	%	0.98	1.0	0.93	1.08	1.78	1.073	0.99	0.99
17	Organic Carbon,(OC)	%	1.36	1.81	1.68	1.57	1.46	1.32	1.06	1.06
18	Sulphate as (SO4)	mg/kg	1.91	1.4	1.36	1.78	1.73	1.74	1.3	1.37
19	Porosity	%	1.26	1.39	1.29	1.08	1.4	1.40	1.43	1.43
20	Permeability	cm/s	10.9	13.7	14.6	13.2	17.8	16.4	17.1	17.1

3.7.3 Interpretation

The chemical classification of soil quality and levels of soil fertility is as shown as Table 3.19 and Table 3.20.

Table 3.19: Chemical Classification of Soil Quality

SN	Soil Test	Classification
1	pH	4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline

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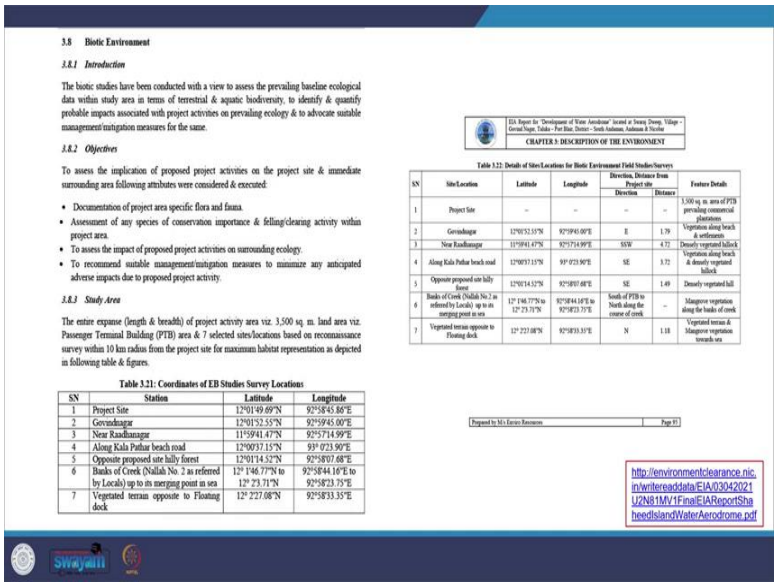

3.8 Biotic Environment

3.8.1 Introduction

The biotic studies have been conducted with a view to assess the prevailing baseline ecological data within study area in terms of terrestrial & aquatic biodiversity, to identify & quantify probable impacts associated with project activities on prevailing ecology & to advocate suitable management/mitigation measures for the same.

3.8.2 Objectives

To assess the implication of proposed project activities on the project site & immediate surrounding area following attributes were considered & executed:

- Documentation of project area specific flora and fauna.
- Assessment of any species of conservation importance & felling/clearing activity within project area.
- To assess the impact of proposed project activities on surrounding ecology.
- To recommend suitable management/mitigation measures to minimize any anticipated adverse impacts due to proposed project activity.

3.8.3 Study Area

The entire expanse (length & breadth) of project activity area viz. 3,500 sq. m. land area viz. Passenger Terminal Building (PTB) area & 7 selected sites/locations based on reconnaissance survey within 10 km radius from the project site for maximum habitat representation as depicted in following table & figures.

Table 3.21: Coordinates of EB Studies Survey Locations

SN	Station	Latitude	Longitude
1	Project Site	12°01'49.69"N	92°58'45.86"E
2	Govindnagar	12°01'52.55"N	92°59'45.00"E
3	Near Raadhanagar	11°59'41.47"N	92°57'14.99"E
4	Along Kala Pathar beach road	12°00'37.15"N	93° 0'23.90"E
5	Opposite proposed site hilly forest	12°01'14.52"N	92°58'07.68"E
6	Banks of Creek (Nallah No. 2 as referred by Locals) up to its merging point in sea	12° 1'46.77"N to 12° 2'3.71"N	92°58'44.16"E to 92°58'23.75"E
7	Vegetated terrain opposite to Floating dock	12° 2'27.08"N	92°58'33.35"E

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Table 3.22: Details of Sites/Locations for Biotic Environment Field Studies/Surveys

SN	Site/Location	Latitude	Longitude	Direction, Distance from Project site		Feature Details
				Direction	Distance	
1	Project Site	–	–	–	–	3,500 sq. m. area of PTB prevailing commercial plantations
2	Govindnagar	12°01'52.55"N	92°59'45.00"E	E	1.39	Vegetation along beach & settlements
3	Near Raadhanagar	11°59'41.47"N	92°57'14.99"E	SSW	4.72	Densely vegetated hillock
4	Along Kala Pathar beach road	12°00'37.15"N	93° 0'23.90"E	SE	3.72	Vegetation along beach & densely vegetated hillock
5	Opposite proposed site hilly forest	12°01'14.52"N	92°58'07.68"E	SE	1.49	Densely vegetated hill
6	Banks of Creek (Nallah No.2 as referred by Locals) up to its merging point in sea	12° 1'46.77"N to 12° 2'3.71"N	92°58'44.16"E to 92°58'23.75"E	South of PTB to North along the course of creek	–	Mangrove vegetation along the banks of creek
7	Vegetated terrain opposite to Floating dock	12° 2'27.08"N	92°58'33.35"E	N	1.18	Vegetated terrain & Mangrove vegetation towards sea

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So, you see here for the similar for groundwater, and what are the results for groundwater, soil sampling also, you see here and then what are the results for that. So, you see how different locations from where they are taking, what are the different parameters you can see on soil sampling all that we had studied about and then and what are the results coming.

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And then they have also studied the biotic environment. Here you can see different survey locations and then what are their observations related to different features that are coming so you can see that in the table here features detail.

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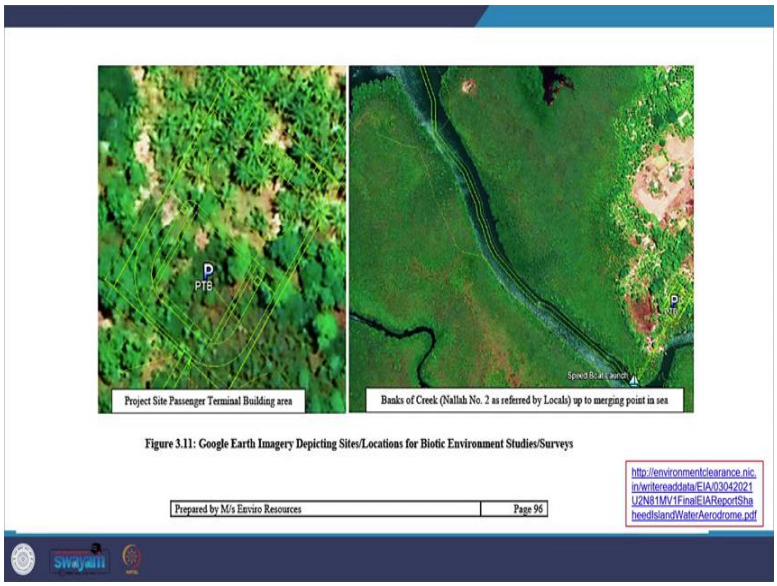

So, some of the photographic evidence of the biotic environmental studies and service. So, how is the site around the terminal building area and then the banks of creeks how they are coming here and see the biotic environment in and around the project area?

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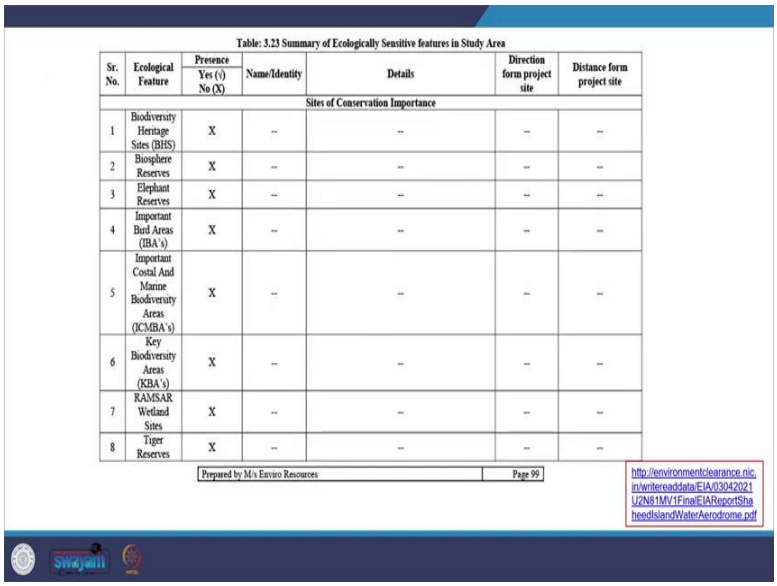

Table: 3.23 Summary of Ecologically Sensitive features in Study Area

Sr. No.	Ecological Feature	Presence Yes (√) No (X)	Name/Identity	Details	Direction form project site	Distance form project site
Sites of Conservation Importance						
1	Biodiversity Heritage Sites (BHS)	X	--	--	--	--
2	Biosphere Reserves	X	--	--	--	--
3	Elephant Reserves	X	--	--	--	--
4	Important Bird Areas (IBA's)	X	--	--	--	--
5	Important Costal And Marine Biodiversity Areas (ICMBA's)	X	--	--	--	--
6	Key Biodiversity Areas (KBA's)	X	--	--	--	--
7	RAMSAR Wetland Sites	X	--	--	--	--
8	Tiger Reserves	X	--	--	--	--

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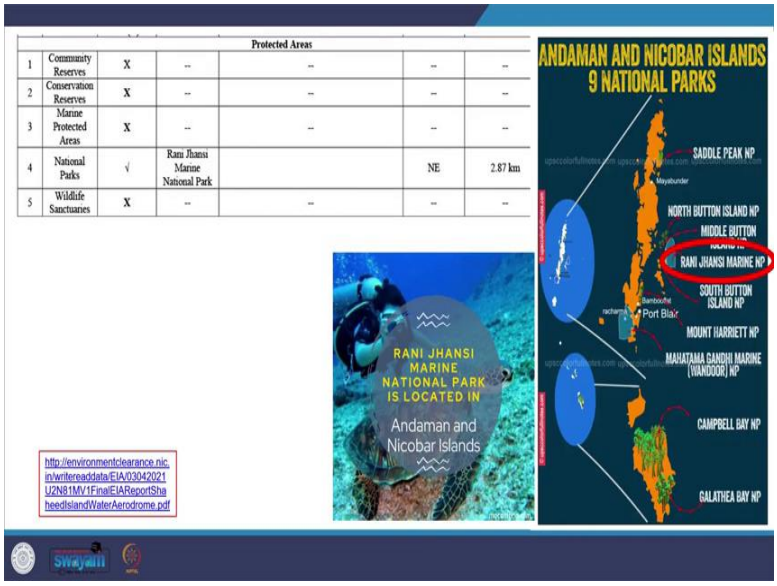

Protected Areas						
1	Community Reserves	X	--	--	--	--
2	Conservation Reserves	X	--	--	--	--
3	Marine Protected Areas	X	--	--	--	--
4	National Parks	√	Rani Jhansi Marine National Park		NE	2.87 km
5	Wildlife Sanctuaries	X	--	--	--	--

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So, they have also given the ecological sensitive features summary here. So, you can see here in the table ecological features, what kind of features are there Biodiversity Heritage sites, so as per all the checklist, you can see that yes, it is present or not, what are the name, identity details, direction from the project site and detail, so you see, like, I have not put all of them but you can see National Park Here which is present Rani Jhansi Marine National Park and which is 2.87 kilometer from here northeast of the project area. So, you can see this here, some of the pictures need for you to understand what the bark is like here.

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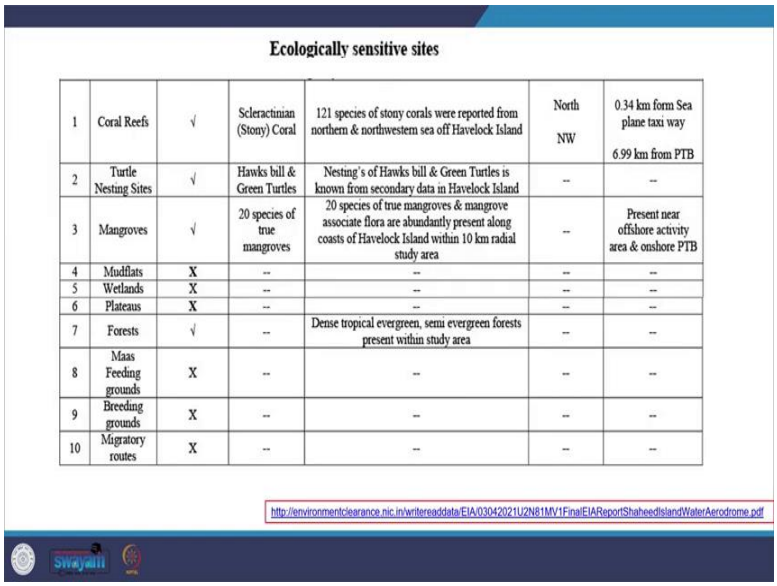

And then ecologically sensitive sites, you can see what all are present. So, you see how sensitive the location is where the project is coming up, how they are following certain norms, and what kind of process they are adopting to understand the environmental status of that particular place. So, here you see how they are describing the environment here.

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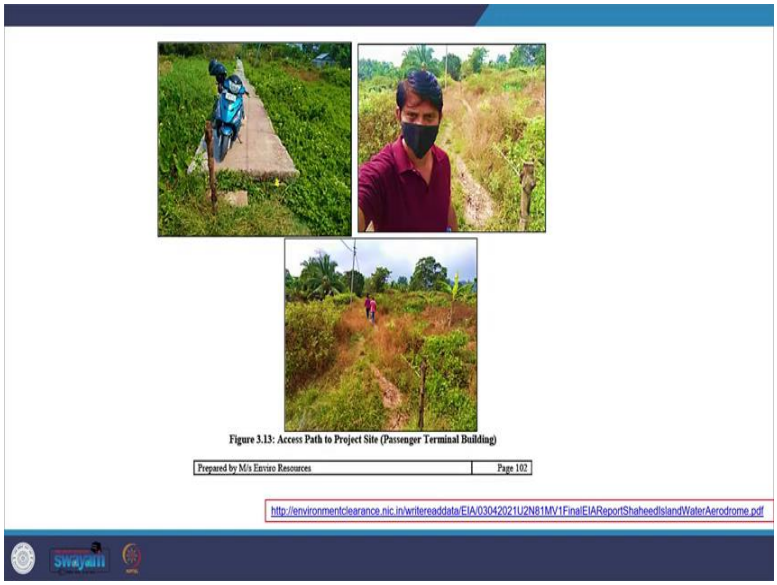

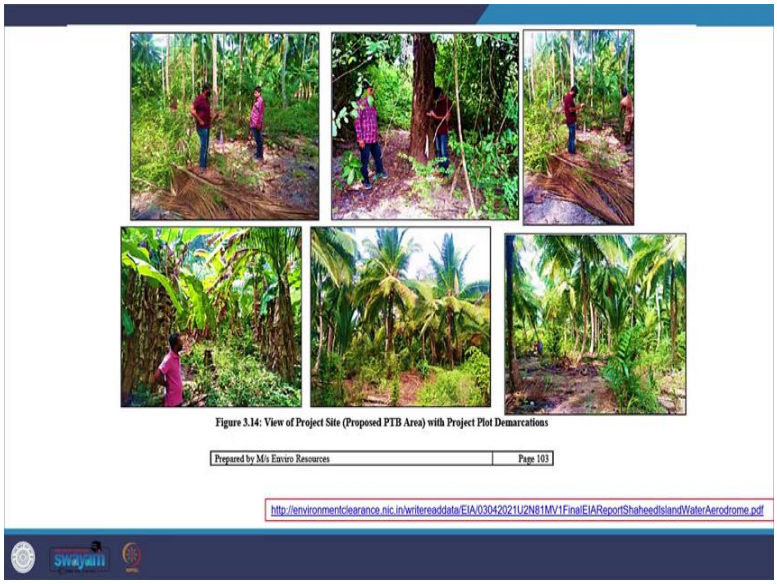

Figure 3.14: View of Project Site (Proposed PTB Area) with Project Plot Demarcations

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And then the related pictures of this site project site you can see here.

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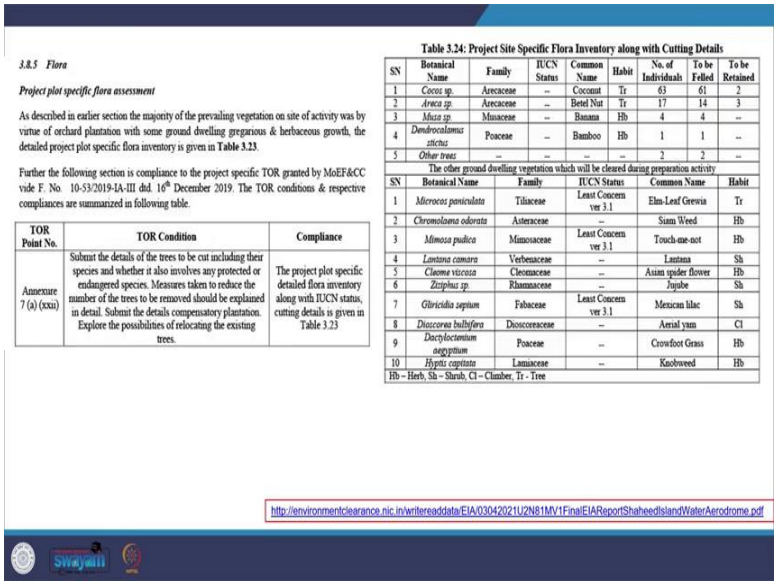

3.8.5 *Flora*

Project plot specific flora assessment

As described in earlier section the majority of the prevailing vegetation on site of activity was by virtue of orchard plantation with some ground dwelling gregarious & herbaceous growth, the detailed project plot specific flora inventory is given in **Table 3.23**.

Further the following section is compliance to the project specific TOR granted by MoEF&CC vide F. No. 10-53/2019-IA-III dtd. 16th December 2019. The TOR conditions & respective compliances are summarized in following table.

TOR Point No.	TOR Condition	Compliance
Annexure 7 (a) (xxii)	Submit the details of the trees to be cut including their species and whether it also involves any protected or endangered species. Measures taken to reduce the number of the trees to be removed should be explained in detail. Submit the details compensatory plantation. Explore the possibilities of relocating the existing trees.	The project plot specific detailed flora inventory along with IUCN status, cutting details is given in Table 3.23

Table 3.24: Project Site Specific Flora Inventory along with Cutting Details

SN	Botanical Name	Family	IUCN Status	Common Name	Habit	No. of Individuals	To be Felled	To be Retained
1	*Cocos sp.*	Arecaceae	--	Coconut	Tr	63	61	2
2	*Areca sp.*	Arecaceae	--	Betel Nut	Tr	17	14	3
3	*Musa sp.*	Musaceae	--	Banana	Hb	4	4	--
4	*Dendrocalamus sticticus*	Poaceae	--	Bamboo	Hb	1	1	--
5	*Other trees*	--	--	--	--	2	2	--
The others ground dwelling vegetation which will be cleared during preparation activity								
SN	Botanical Name	Family	IUCN Status	Common Name	Habit			
1	*Microcos paniculata*	Tiliaceae	Least Concern ver 3.1	Elm-Leaf Grewia	Tr			
2	*Chromolaena odorata*	Asteraceae	--	Siam Weed	Hb			
3	*Mimosa pudica*	Mimosaceae	Least Concern ver 3.1	Touch-me-not	Hb			
4	*Lantana camara*	Verbenaceae	--	Lantana	Sh			
5	*Cleome viscosa*	Cleomaceae	--	Asian spider flower	Hb			
6	*Ziziphus sp.*	Rhamnaceae	--	Jujube	Sh			
7	*Gliricidia sepium*	Fabaceae	Least Concern ver 3.1	Mexican lilac	Sh			
8	*Dioscorea bulbifera*	Dioscoreaceae	--	Aerial yam	Cl			
9	*Dactyloctenium aegyptium*	Poaceae	--	Crowfoot Grass	Hb			
10	*Hyptis capitata*	Lamiaceae	--	Knobweed	Hb			
Hb – Herb, Sh – Shrub, Cl – Climber, Tr - Tree								

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So, you also see that they are documenting the flora of the project and as per ToR conditions, they will support some of the details of the trees that are going to be cut. So, in the table, you see here project site-specific flora inventory has been prepared with the cutting details. So, you see all the botanical names IUCN status list, we have seen it when we studied environmental status, so, they are comparing with that, and then that is helping them to evaluate the significance of that particular loss what is happening.

And, like what they are going to -- how much they are going to retain which ones they are going to cut to be felt, so you can see here like number 1 63 are there 61 will be felled and only two will be retained, so on so they are preparing a detailed list of that.

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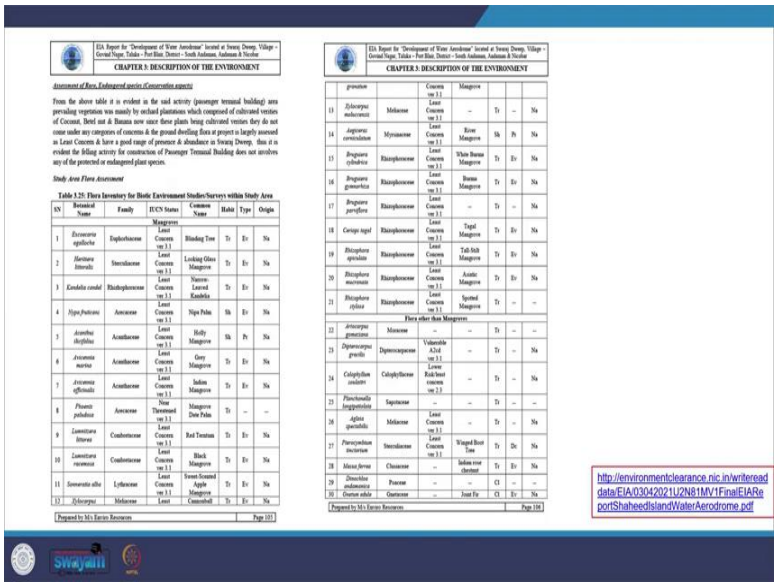

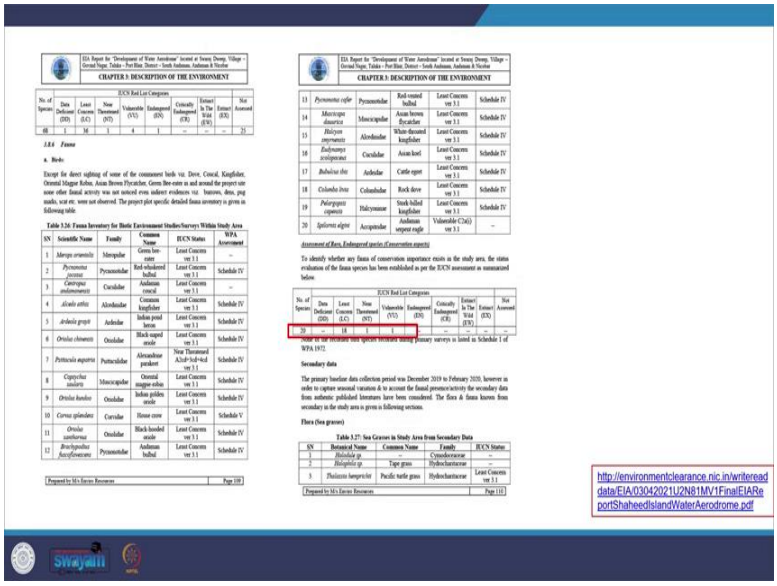

Likewise, you can see the study area flora assessment here complete lists, I have not put the complete list here, you can see the birds they are studying, and then you can see how they are making the judgment assessment. So, you can see your IUCN Red List category in the table here. So, they are saying several species, which they listed, and then out of that, how many of least concern 18 out of 20 are least concern near threatened is 1, vulnerable is 1.

So, none of the recorded bird species recorded during the primary surveys are listed in schedule one of the document here. So, here like how they need not undertake special measures for that.

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Butterflies

The publication reports 84 species of Butterflies under 5 families & 58 genera from Ritchie's Archipelago, out of 84 species of butterflies, 79 species were reported from Havelock listed as under.

Sl.No.	Common Name	Islands of Ritchie's Archipelago								
		Havelock Lawrence	John Lawrence	Henry	Inglis Button	South Button	North Button	Middle	Outram	Neil
1.	Pale Palm Dart	√								
2.	Common Snow Flat	√	√	√					√	√
3.	Common Awl									
4.	White Banded Awl		√							√
5.	Plain Banded Awl	√						√		
6.	Brown Awl		√	√	√		√		√	√
7.	Giant Red Eye	√	√	√		√			√	√
8.	Common Spotted Flat	√	√		√					
9.	Paint Brush Swift	√								
10.	Common Banded Demon		√	√	√				√	√
11.	Great Jay	√	√	√	√		√			√
12.	Fivebar Swordtail	√	√	√			√			√
13.	Andaman Swordtail	√	√		√		√	√	√	√
14.	Tailed Jay	√	√	√	√			√	√	
15.	Andaman Helen	√			√	√	√	√	√	√
16.	Andaman Mormon	√	√	√					√	√
17.	Great Mormon	√	√	√	√	√	√	√	√	√
18.	Common Mormon	√	√	√	√		√	√	√	√
19.	Lime Butterfly	√	√	√	√				√	√

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Reptiles & Amphibians

Table 3.28: Reptiles & Amphibians in Study Area from secondary Data

SN	Common Name	Scientific Name	Family	IUCN Status	WPA Assessment
Reptiles					
1	Saltwater crocodile	*Crocodylus porosus*	Crocodylidae	Lower Risk/least concern ver 2.3	Schedule – I (Part II)
2	Tokay gecko	*Gekko gecko*	Gekkonidae	Least Concern ver 3.1	--
3	Common house gecko	*Hemidactylus frenatus*	Gekkonidae	Least Concern ver 3.1	--
4	Andaman Islands day gecko	*Phelsuma andamanensis (Phelsuma andamanense)*	Gekkonidae	Least Concern ver 3.1	--
5	Andaman green calotes	*Calotes andamanensis*	Agamidae	--	--

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			ver 3.1	
5	*Stichopus chloronotus*	Green Fish Sea Cucumber	Least Concern ver 3.1	--
6	*Holothuria impatiens*	--	Data Deficient ver 3.1	--
7	*Comanthus parvicirrus*	--	--	--
8	*Comanthus samoanus*	--	--	--
9	*Comatella nigra*	--	--	--
10	*Lamprometra palmata*	--	--	--
11	*Stephanometra indica*	--	--	--
12	*Cuktita novaeguineae*	--	--	--
13	*Ophiocitis savignyi*	--	--	--
14	*Macrophiothrix longipeda*	--	--	--
15	*Ophiothela danae*	--	--	--
16	*Ophiothrix exigua*	--	--	--
17	*Ophiocoma erinaceus*	--	--	--
18	*Ophiolepis superba*	--	--	--
19	*Echinoderma calamaris*	Banded sea urchin	--	--
20	*Echinoneus cyclostomus*	--	--	--
21	*Lovenia elongata*	--	--	--

The study conducted during 2001 revealed presence of 21 echinoderm (other than holothuroidea) species sea off Havelock Island in Ritchie's Archipelago the IUCN assessment of the recorded species is as under.

No. of Species	IUCN Red List Categories								
	Data Deficient (DD)	Least Concern (LC)	Near Threatened (NT)	Vulnerable (VU)	Endangered (EN)	Critically Endangered (CR)	Extinct In The Wild (EW)	Extinct (EX)	Not Assessed
21	2	1	--	--	--	--	--	--	18

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So, for the butterflies also they have undertaken you can see also they have taken for reptiles and amphibians, you can see how they are going on comparing with the IUCN Red List categories here.

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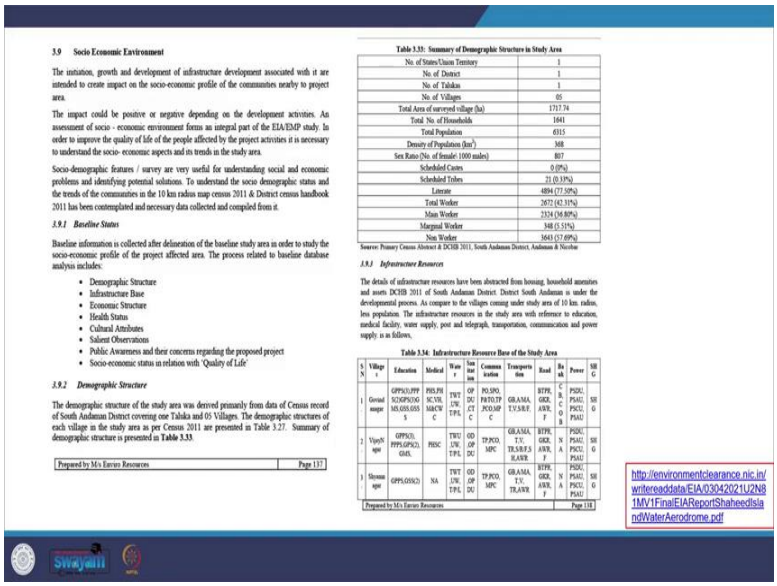

So, they have also done socio-economic environments here. So, they have undertaken baseline status. And you see here the demographics. So, the number of states 1, District 1, and villages which will come within this are 5, and then the total population is nearly like 6000 plus and then the density of the population, sex ratio you can see here. There are no scheduled casts, then you see scheduled tribes the indigenous people here 21 percent.

The literacy rate, the total workers, main workers, you can see marginal workers. And so you also see evaluate what is the employment rate here or what is the sensitive community which is located here. So, what kind of things they have evaluated, and their socio-economic impact assessment, so that all you can review?

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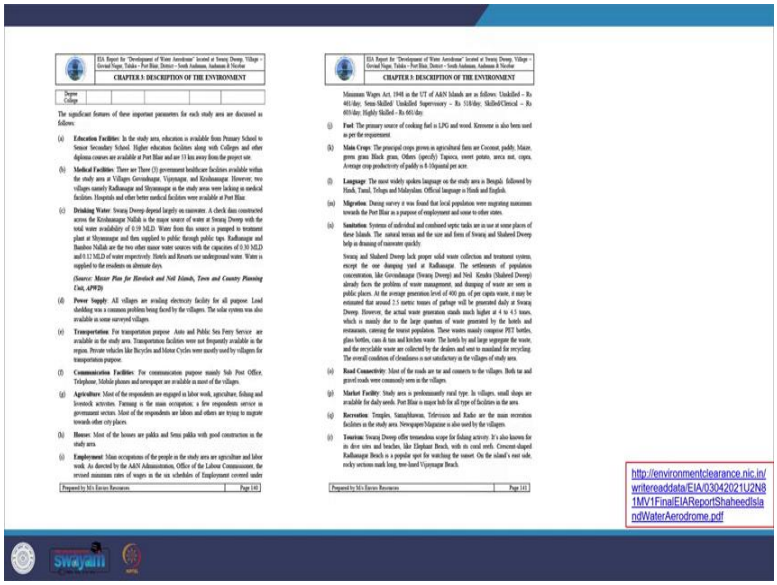

And what kind of resources they have, they have evaluated the education facilities and all kinds of facilities which are there. So, that has been reviewed. So, recollect and rethink what we studied when we did the socio-economic impact assessment. So, they have studied all this. And you also think about what they have not studied in detail.

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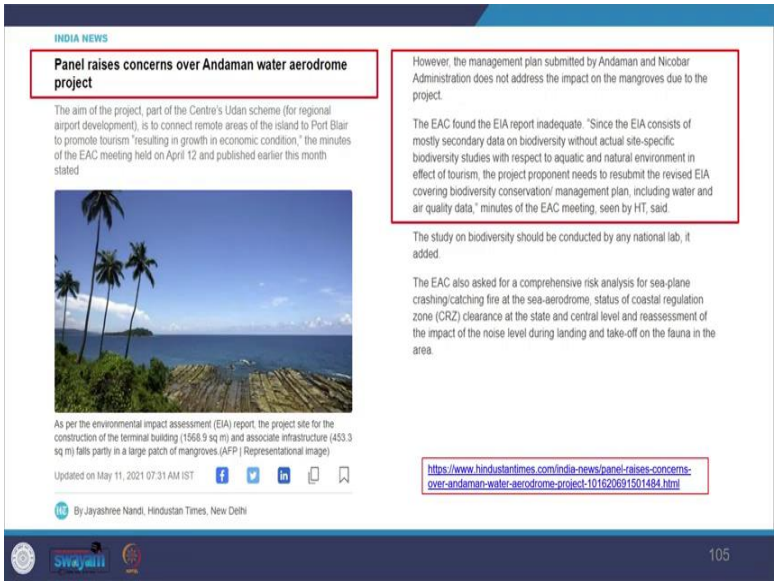

There are also news clippings, which we have also given you in the suggested reading which suggest that this EIA was also opposed for being inadequate in terms. So, you also give your inputs and what ways now you have studied a lot of aspects in what ways you see this particular EIA to be adequate or inadequate. So, what is your judgment and discussion on it?

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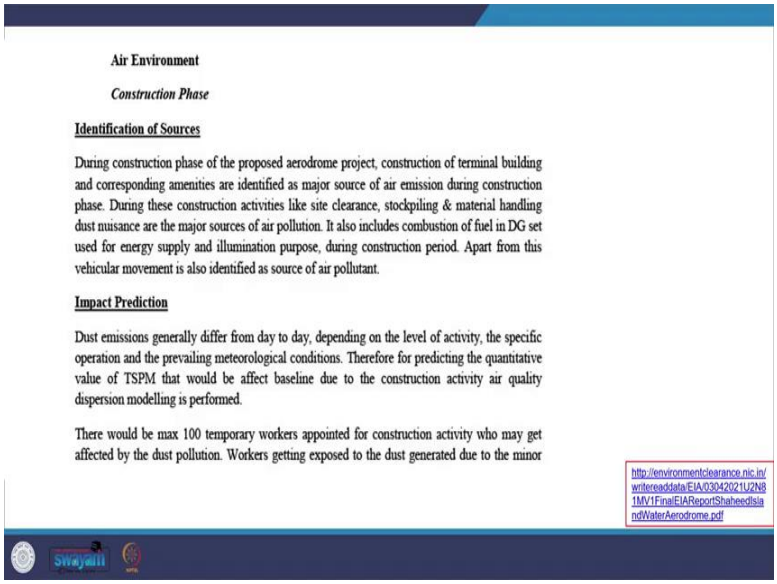

So, now looking at the environmental impact and mitigation measures, after this after looking at all these areas, they came up with the what kind of impact it has and then what are the mitigation measures. So, you can see where they have one for the air environments during the construction phase.

So, they saw that during the construction phase, there would be a lot of emissions, and also during the operational phase they would have so how they are going to control the dust and other things and then you see you can reconnect with the methods part which we had studied.

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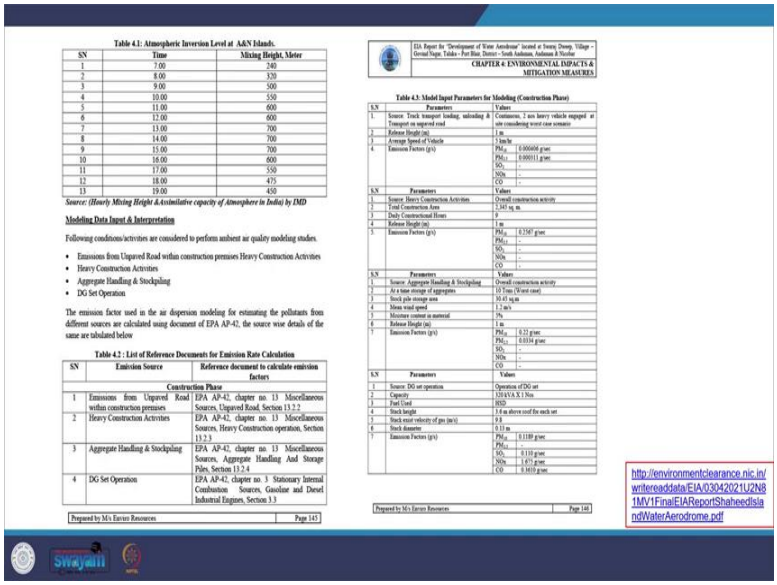

So, the model which they have opted for the computation purpose. So, all the models have been listed here, listed here which were available to them as per the CPCB norms also. So, we had seen as per the ToR for different domains they give in the Indian context and what the standard as per the literature also we have studied what are the different available models.

So, you see how what model options were available to them, what did they adopt, and what modeling procedures did they follow here, and then how did they document all those emissions, calculations, and what was the -- You can see in the table here what are the model input parameters, and what were the values which they got here.

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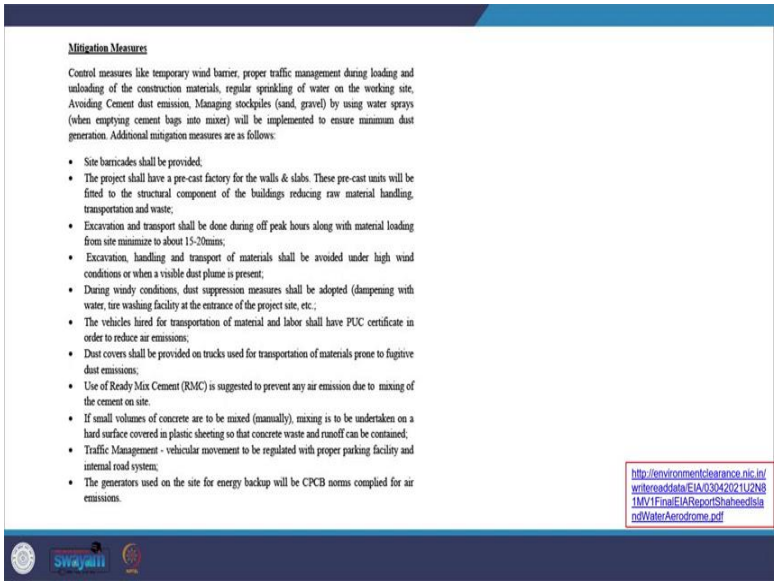

And then what were the mitigation measures? So, point by point, they are giving mitigation measures. So, like, they are taking care of the site barricades, and then also a precast factory for walls and slabs, how they are going to reduce the onsite pollution, here excavation and transport shall be done during off-peak hours and so on. So, those kinds of mitigation measures have been taken.

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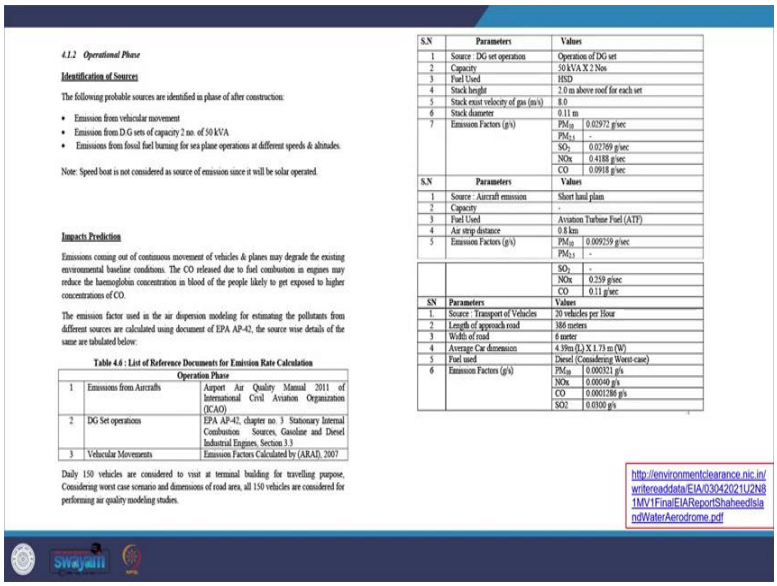

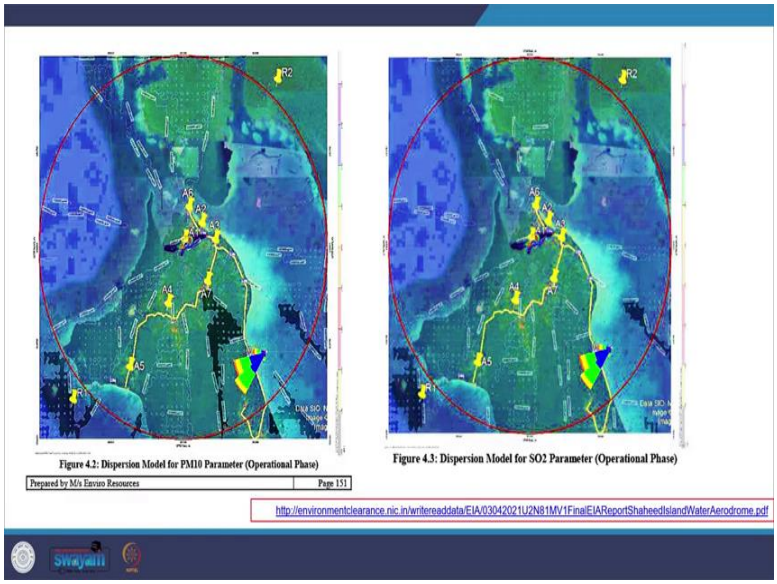

Figure 4.2: Dispersion Model for PM10 Parameter (Operational Phase)

Figure 4.3: Dispersion Model for SO2 Parameter (Operational Phase)

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As well as you see mitigation measures are also taken during the operational phase. So, they have identified possible sources. So, you see emissions from vehicular movement emissions from DG sets, emissions from fossil fuels, and then what kind of impact they are predicting. So, you see here that emissions, what kind of emissions would happen and what are they and how are they studying were using various model dispersion models here, you can see for all the parameters they have used.

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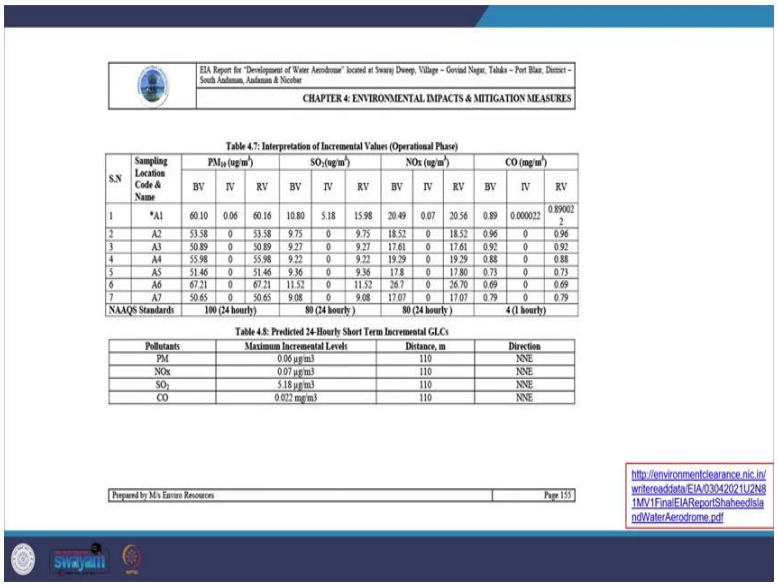

Table 4.7: Interpretation of Incremental Values (Operational Phase)

S.N	Sampling Location Code & Name	PM_{10} (ug/m^3)			SO_2(ug/m^3)			NOx (ug/m^3)			CO (mg/m^3)		
		BV	IV	RV	BV	IV	RV	BV	IV	RV	BV	IV	RV
1	*A1	60.10	0.06	60.16	10.80	5.18	15.98	20.49	0.07	20.56	0.89	0.000022	0.890022
2	A2	53.58	0	53.58	9.75	0	9.75	18.52	0	18.52	0.96	0	0.96
3	A3	50.89	0	50.89	9.27	0	9.27	17.61	0	17.61	0.92	0	0.92
4	A4	55.98	0	55.98	9.22	0	9.22	19.29	0	19.29	0.88	0	0.88
5	A5	51.46	0	51.46	9.36	0	9.36	17.8	0	17.80	0.73	0	0.73
6	A6	67.21	0	67.21	11.52	0	11.52	26.7	0	26.70	0.69	0	0.69
7	A7	50.65	0	50.65	9.08	0	9.08	17.07	0	17.07	0.79	0	0.79
NAAQS Standards		100 (24 hourly)			80 (24 hourly)			80 (24 hourly)			4 (1 hourly)		

Table 4.8: Predicted 24-Hourly Short Term Incremental GLCs

Pollutants	Maximum Incremental Levels	Distance, m	Direction
PM	0.06 µg/m3	110	NNE
NOx	0.07 µg/m3	110	NNE
SO_2	5.18 µg/m3	110	NNE
CO	0.022 mg/m3	110	NNE

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And then like that, you are said that they had to do the incremental values also. So, how they have undertaken it, how they are looking at all the parameters, and how they are also seeing the incremental values for all these parameters.

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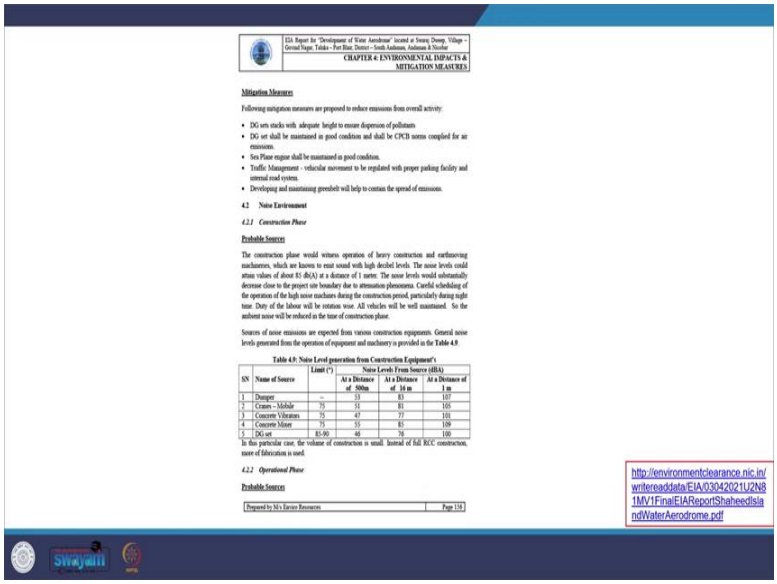

And then they have suggested the mitigation measures. So, you can see that the DG sets stacks with adequate height to ensure the dispersion of pollutants. So, seaplane engines shall be maintained in good condition, the maintenance part of it, and then they are looking at the noise environment and what are the probable source and how they are going to take care of it.

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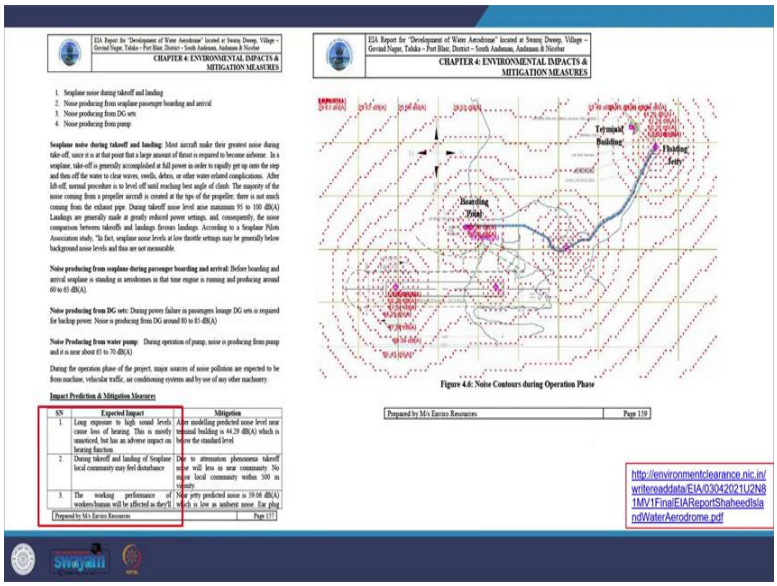

So, here you see seaplane noise during takeoff and landing and the expected impact you can see in the table. So, you see long exposure to high sound levels can cause loss of hearing. So, what kind of mitigation they would do during the takeoff and landing of the seaplane local community may feel disturbed.

So, what kind of mitigation they would take for that, and then the working performance of the workers humans will be affected? So, what kind of things they will do? So, here you see the noise control during the operation phase. So, we learned about what kind of maps are prepared. So, you can see that they have prepared noise control during the operation phase.

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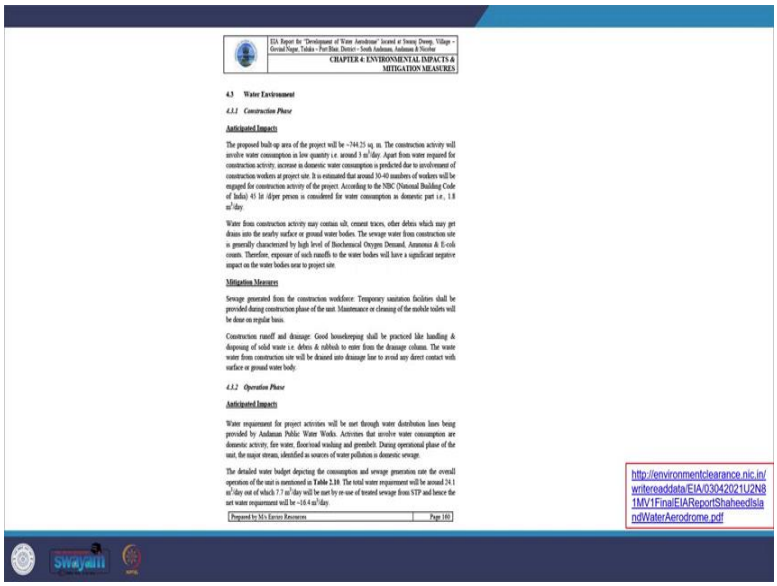

So, yes, you see that they have done water environments, water environments, what kind of anticipated impact they would have. So, water consumption would be there, and then how they are going to adopt what kind of mitigation measures they would adopt. So, during the construction, runoff, and drainage, they have commented about good housekeeping, which will handle how the water is drained out of the site and even in the operation phase.

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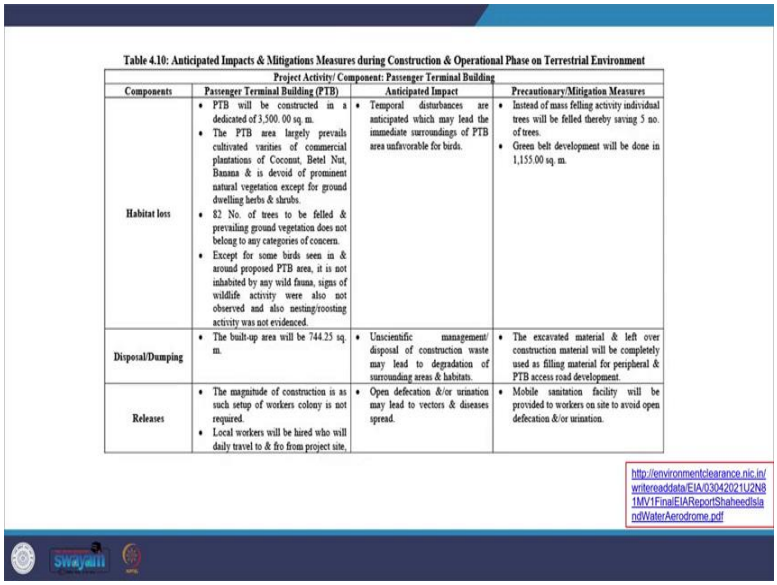

So, here you see how they have all the range of anticipated impact and mitigation measures point by point. So, here you see habitat loss, disposal dumping, release, and then from what activity it will happen and what the precautionary mitigation measures would take and so that is all given here in the form of a matrix.

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	hence any sort of sewage (washing, bathing etc), generation will not occur.		
Emissions	• Emissions from fuel combustion by construction machineries viz. Poclains, Earth Movers, Dumpers, Trucks, Lift Cranes, Diggers will temporally occur. • Fugitive dust emissions during material hauling & construction activity will occur.	• Unchecked emissions may lead to locale specific high incremental scenario in terms of CO_2 & CO gases, which may affect the overall surrounding ecology adversely. • Incremental particulate matter may be carried away by wind & can settle on surrounding vegetation, which may affect the overall surrounding ecology adversely.	• It will be ensured that vehicles & machineries will valid PUC certification will only be used for construction activity. • Material piles will be covered; regular water sprinkling will be done to arrest the particulate matter at site itself.
Disturbances to Surrounding Habitat	• Noise & vibrations will be generated due to overall construction activity.	• High noise & vibrations may cause disturbances & locale specific migration of surrounding faunal species	• Construction activity will be achieved in step by step manner to ensure all machineries are not deployed simultaneously to keep noise & vibrations at minimum. • Construction activity will be limited from 9 AM to 5 PM only to avoid early morning & evening hours.

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So, you can see emissions and disturbance to the surrounding habitat.

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Table 4.11: Anticipated Impacts & Mitigations Measures during Construction & Operational Phase on Aquatic Environment

Project Activity/ Component: Speed boat path & operations			
Components	**Speed boat path**	**Anticipated Impact**	**Precautionary/Mitigation Measures**
Habitat loss	• The speed boats will cruse though gangway point up to floating dock through the Creek (Nallah No. 2 as referred by Locals) southwest of PTB. • The approximate average width of creek is 50 m in which speed of boats will easily cruise through, hence the banks of creek will largely remain undisturbed & mangrove vegetation will not be affected in whatsoever manner.	• Habitat loss will not occur.	--
Alteration/Disturbance of creek bed/creek bottom	• The average depth of Creek (Nallah No. 2 as referred by Locals) is sufficient for speed boats to operate, thus creek any sort of de silting/dredging activity is not involved thereby ensuring the integrity of creek bed.	• Alteration/Disturbance of creek in whatsoever manner will not occur.	--
Releases	• Speed boats will not have urinals/lavatories, the cruise time of speed boat from gangway to floating is dock will be only few minutes.	• Releases from speed boat in whatsoever manner will not occur in creek/sea.	--
Emissions	• Emissions from speed boat operations will not occur since solar operated speed boats will be used.	• None emissions are anticipated from operation of speed boats.	--
Disturbances to Surrounding Habitat	• Unlike the fuel driven boats, electric speed boats are likely to generate	• The magnitude of noise & vibrations to be generated will be	• Electric driven speed boats are already provisioned with a view

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	negligible noise & vibrations.	negligible.	to keep disturbances to a minimum.
Project Activity/ Component: Floating Dock & operations			
Components	**Floating Dock**	**Anticipated Impact**	**Precautionary/Mitigation Measures**
Habitat loss & Alteration/Disturbance of sea bed	• Floating dock will be installed near sea plane taxi way. • The only point of contact of floating dock with sea bed will be through mooring activity. • Floating dock will be moored to sea bed by tying to natural rocks with ropes. • The floating dock mooring area (sea bed) is mainly sand dominated & free from underwater growth.	• Habitat loss will not occur, however at the point of contact of rocks & seabed benthic faunal communities may be temporally disturbed.	In order to ensure minimum disturbances to sea bed activities viz. dredging/digging are being avoided.
Project Activity/ Component: Provision of sea surface as taxi way & run way			
Components	**Provision of sea surface as taxi way & run way**	**Anticipated Impact**	**Precautionary/Mitigation Measures**
Habitat loss & Alteration/Disturbance of sea bed	• The sea surface will be operated as superficial taxi way of and run way. • Since the design of planes to be operated is as such only 2 m water depth is required for taxing/takeoff/landing activities, these activities are not anticipated to in contact with sea bed at any given point of operation. • The sea surface area to be used for taxing/takeoff/landing is devoid of bottom/underwater growth.	• Habitat loss & disturbances to/alteration of sea bed will not occur in whatsoever manner.	• To avoid contact of sea planes with sea bed, the design of sea planes to be operated is already considered to be operable on surface water.

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So, you can see habitat loss, alteration, disturbance of creek bed, creek bottom, releases, and emissions, because of the speed boat path, you can see here, then you will see from the floating dock what kind of what impact it will have on which component. So, here you can see again what kind of precaution mitigations they would take.

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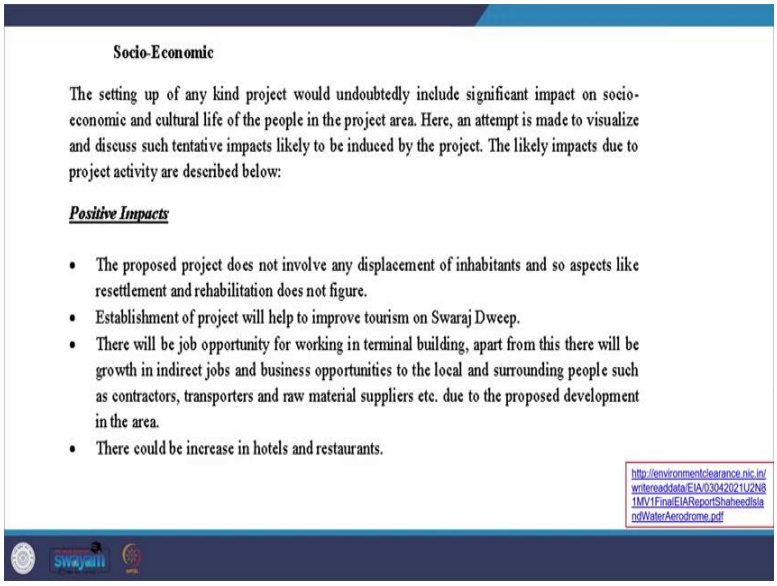

And then also the socio-economic part you will see that they have said that it would have a positive impact, we saw that it is going to generate 40 to 50 employment. So, here it says the proposed project does not involve any displacement of inhabitants, so there is no displacement, but we do not know if it is a physical displacement or economic displacement.

And then you also see the establishment of a project will help to improve tourism. So, tourism itself has its impact, negative and positive impact, and then the range of the rate of change which happens so we are not aware of that here as well. There will be job opportunities for working in the terminal buildings.

So, that is also claimed here but we are not aware how the local community is trained for taking the benefit of this opportunity. And likewise, they say that they can have, they would have increasing hotels and restaurants. But again, the question that we had learned about was how the local community is trained to take the benefit of these opportunities that come up.

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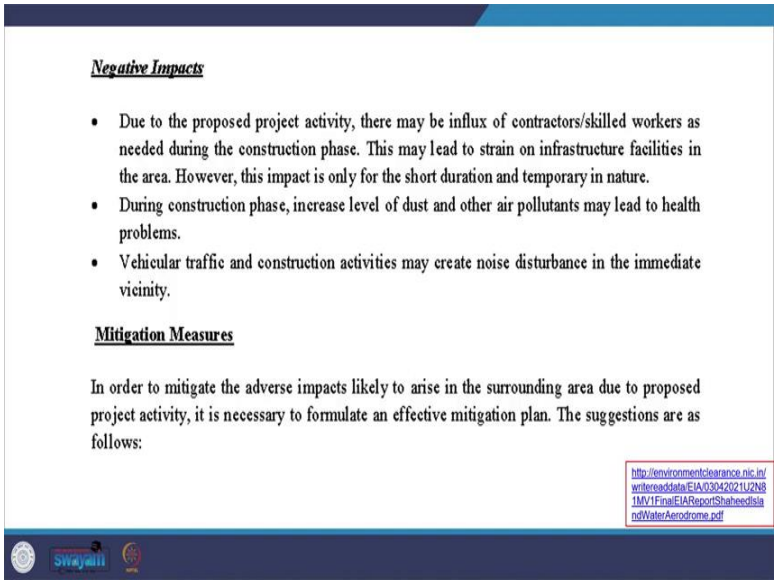

So, it also talks about negative impacts on all the skilled workers or contractors during the construction phase, who would be coming here which can put pressure on the infrastructure, and then they would be increased in the dust that would also have health issues, and then also congestion, vehicular traffic and so on, and then how they are going to mitigate those aspects.

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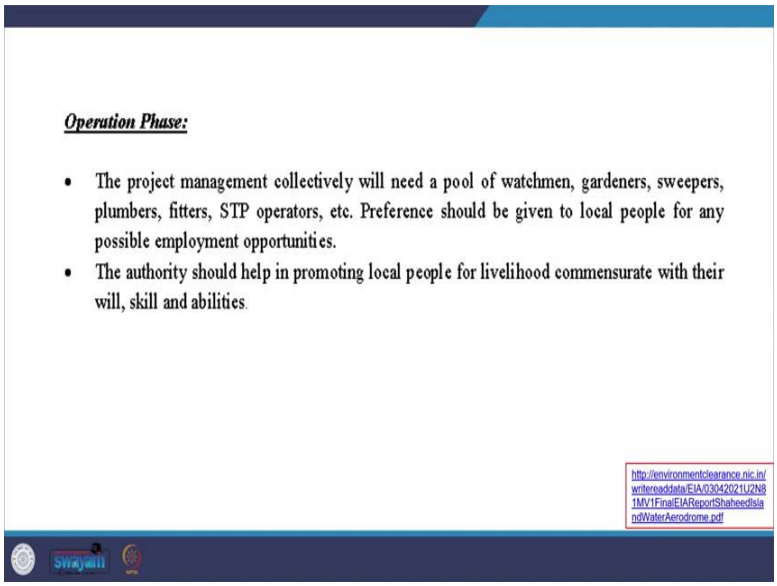

So, we do see that this particular project panel raises concerns over the Andaman water aerodrome project, and they do identify that the EIA report is inadequate. So, you also think and look at it like in what terms it is inadequate, what aspects they have covered to what detail, and what they have not covered.

So, that was part one of this particular case study, we will look into all the details. And I am just going to ask you to reflect on all the aspects which we have covered. So, you keep thinking and keep discussing in the forum. So, we see the part of this particular case study here. So, what is the scenario? What is the project like? What kind of likely impacts might happen?

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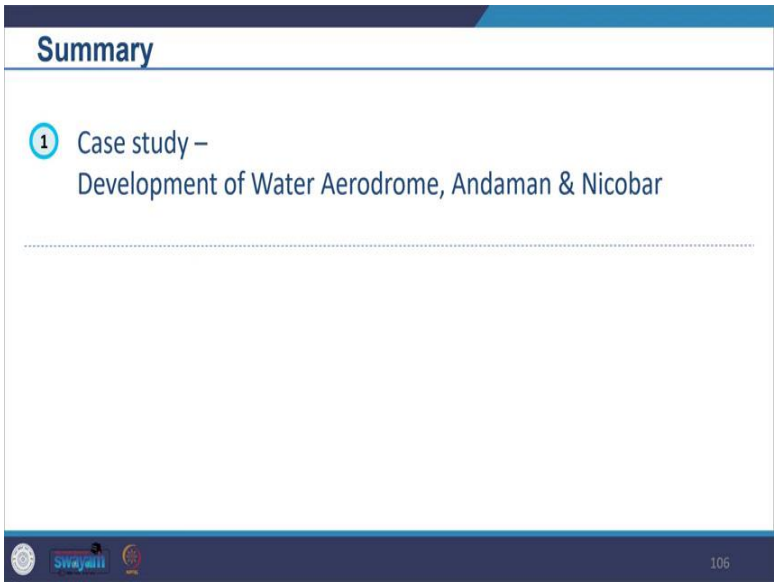

So, that was what we covered today. We will continue with this in the next session.

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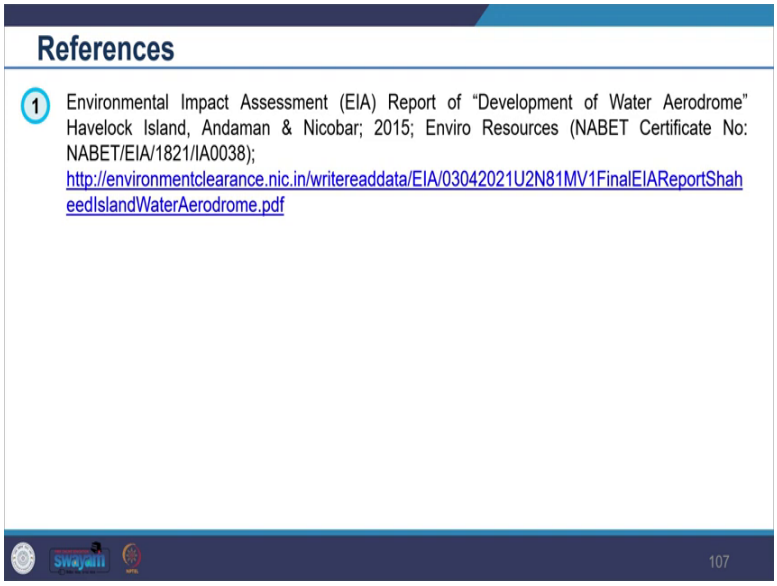

So, our key reference for this is the EIA report itself on the development of water aerodrome in Andaman and Nicobar. And I have also given you the link and we will also share it with you on the forum, and it is available in the public domain so you can also access it.

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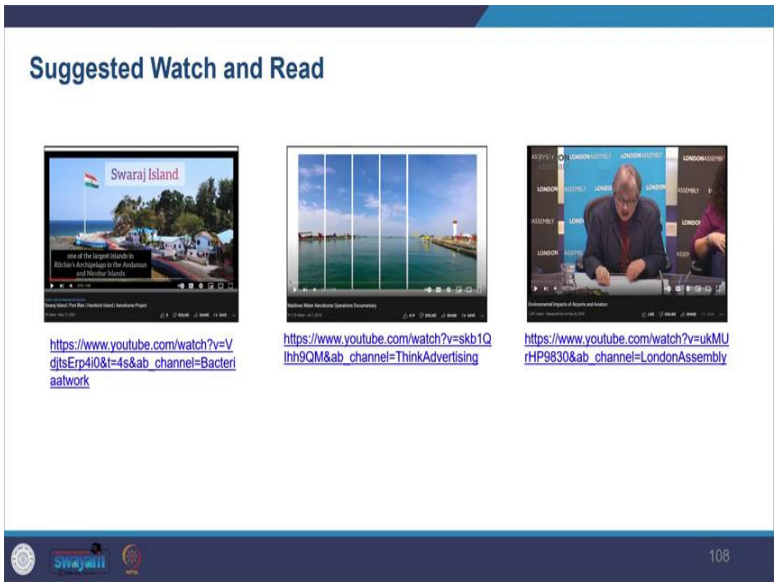

So, there are a lot of suggested watches and reads related to this so you can understand this particular case better. And you can see all these case references which are there.

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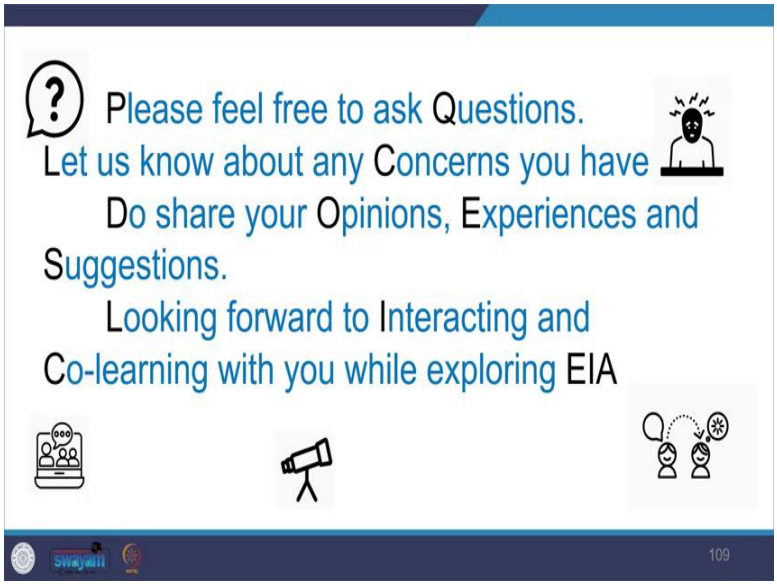

So, winding up today's session. Please feel free to ask questions. Let us know about any concerns you have to share your opinions, experiences, and suggestions. Looking forward to interacting and co-learning with you while exploring EIA. Thank you.