Port and Harbour Structures
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Module 8, Lecture 41
Preliminary Project Report on Shipyard

This class we will discuss about shipyard I will be discussing about PPR, PPR means Preliminary Project Report. There are various stages for development of any harbour facility for a Shipyard. You have to prepare a Preliminary Project Report, we can also called it as a Techno economic feasibility report. Then we have to prepare a detailed project report that is called as DPR. Then we have to get the clearance from the ministry of environmental forest for which many studies are to be carried out.

So initially I will give what is the status of shipyards in India, then I will give a project which is proposed near Cuddalore and it is not taken up very seriously now. But I will tell what are the steps that has been carried out for the shipyard.

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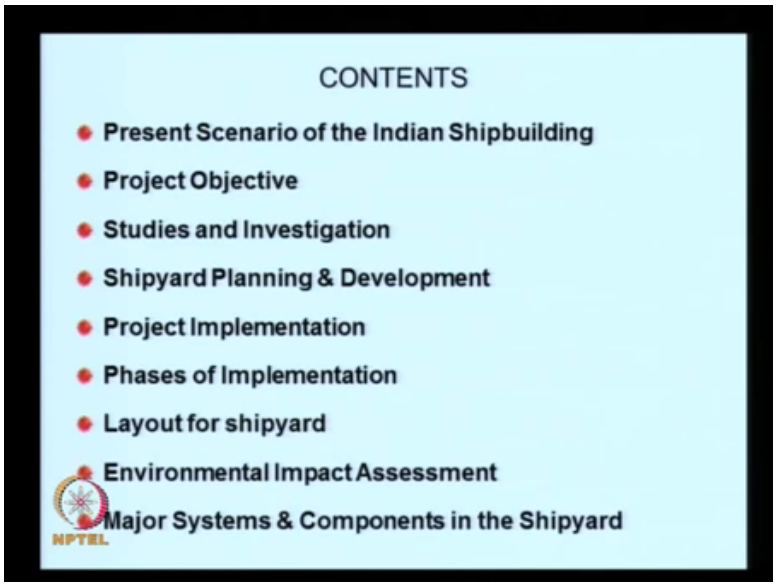

The contents of today's presentation will be present scenario of the Indian ship building the project objective what are the studies and investigation carried out. How to plan the shipyard? How to implement the project? There will be different phases of implementation, the layout of the shipyard, environmental impact assessment which is called as EIA. Major systems and components in a shipyard.

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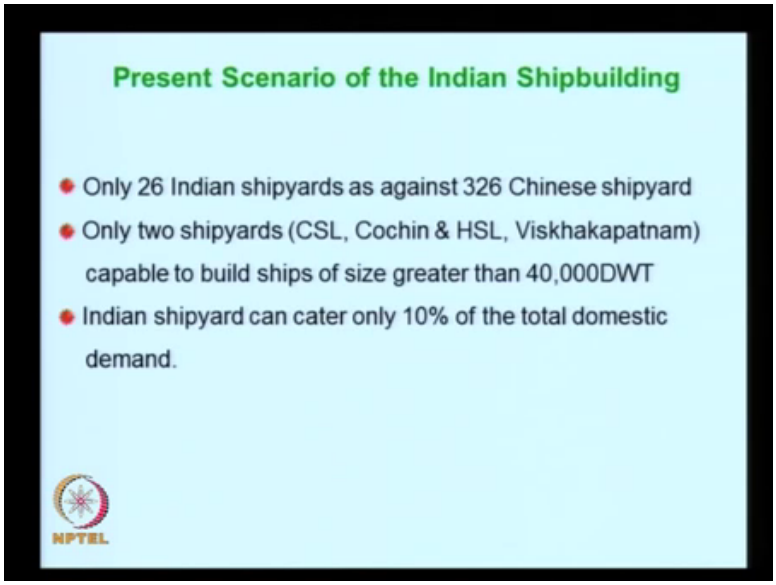

The present scenario of the Indian ship building is not good. I am working on the shipyard project for last 10 years. They will say the shipyard will come to India it is not coming. All of you know the automobile industry is moving to India but our shipyard is not. There are many reasons, now the market is very bad. There are only 26 Indian shipyards as again 326 chinese shipyards. This number is very bad. How many research parks are there in India? How many are in India research parks?

You know what is a research park? Do you have a research park? Yes sir, you are the only people who have the research park.You do not know that, cinese have more than 300 research parks. Out of these 26 India shipyards only 2 shipyards that is Cochin shipyard limited Cochin and Hindustan shipyard limited Vishakapatnam capable to build ships of size greater than 40000 DWT, greater than means do not think it is very much larger I think it can go upto 60000 DWT or slightly more.

All other ships are shipyards are very small shipyards. The shipyards are required not only for ship building for commercial operations but also for navy, you have to build nuclear or submarines also. So strategically we need more shipyards And the last point is Indian Shipyard can cater only 10 percent of the total domestic demand. We are not even fulfilling our domestic demand. If you are asked for car and all we are exporting otherwise we are not able to build the ship for our own self. That is a very pathetic situation.

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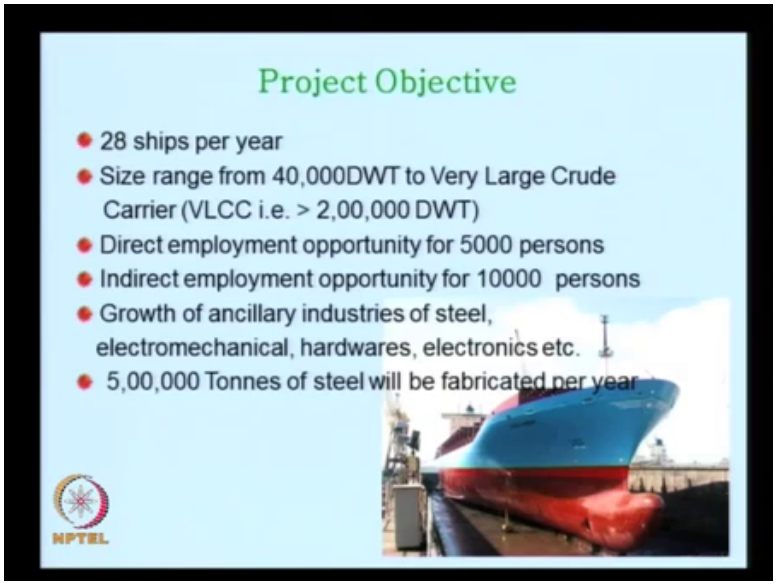

The project objective for this particular shipyard project is they want to build 28 ships per year that means almost 2 and half ships or 2 to 3 ships per month. The size range is from 40000 DWT to very large crude career that is upto 200000 DWT. The shipyards provide direct employment of 5000 persons indirect of 10000 persons. In addition it growths of ancillary industries of steel electromechanical hardware, electronics etc. And about 500000 tons of steel will be fabricated per year. This is what the proposal is.

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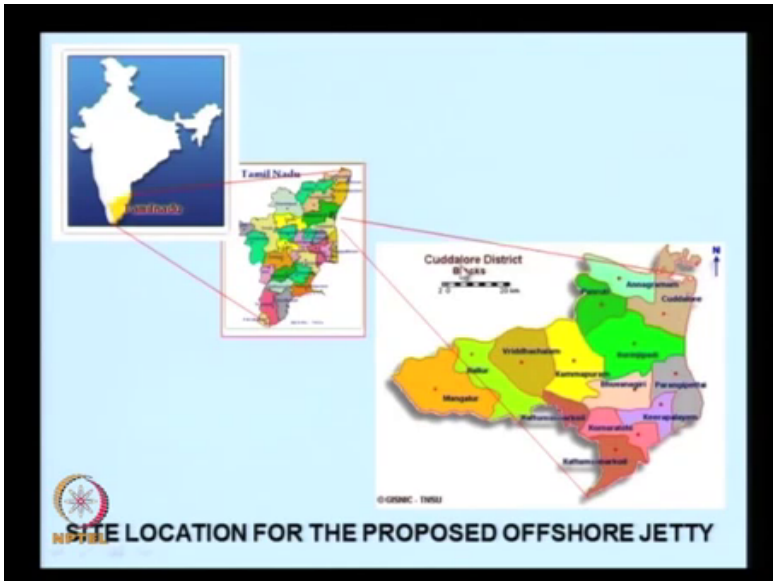

So you are showing the India map, the Tamil Nadu map in Tamil Nadu there is a district Cuddalore where there is a cluster of facilities that will be built along this coastal line.

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I will explain the cluster here. There are 4 clusters that are shown here 7 of the cluster is for cuddalore port company that is cuddalore power company that is what is shown here. Then we have Nagarjuna oil corporation limited that is Trichobram, Nagarjuna is building a refinery project. For this project there is a Jetty which is built for export of clean cargo that is petrol oil and petrol and clean products. Then we have a single biomooring system here this import the crude oil. This project is going on. The cuddalore port company also we want to have a Jetty to import coal.

Then we have a common port facility for many power plant projects that are proposed here then we would like to have a ship building yard, somewhere here this is called as a Silambi Mangalam. This is a place where we want to have a shipyard which was planned here. So this is a power company cuddalore power company which imports coal for that they planned a jetty this Trichobram where we have Nagarjuna refinery where we have a jetty for export of petroleum products.

Then we have a single bio mooring systems from where bigger size vessels will come and import the crude oil to the refinery. And refinery will process and they will export petrol using this. Then we want to develop a common port, this common port will be for many power plant which are situated in land. Then at Silambi Mangalam they want to plan a shipyard. Further south there is another power plant that project also has been sanctioned.

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This is what you are seeing is the coastal line, this what you are seeing is the national highway what you are seeing here is the railway line. So this railway line and road line is very important for projects. One of the reason many plants are developed here is lot of lands available not agriculture lands.

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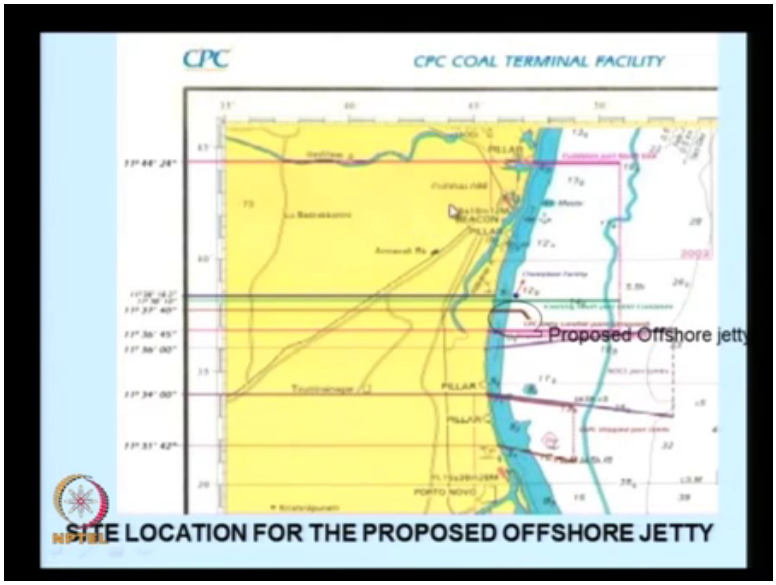

This is taken from Naval hydrographic chart and this line shows 10 meter contour this line shows 20 meter contour that means the water depth is around 20 meters and this line shows 5 meter contour and this is your shore line. The distance to 5 meter contour is very small here compared to many projects and I will show an enlarge figure later on. This is for the coal terminal facility what is planned here.

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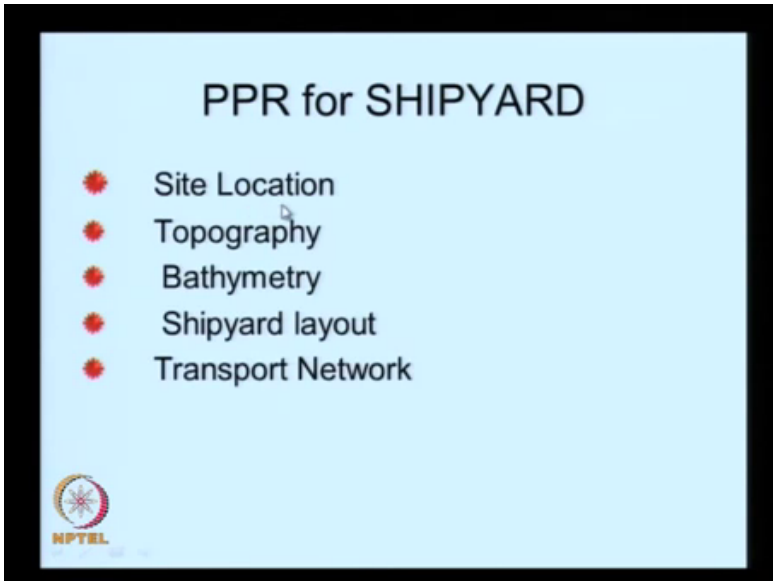

When you want to develop the Preliminary Project Report PPR you have to identify the site location, Topography, Bathymetry, Shipyard layout, and transport network. These are the various studies that are required. Topography means the survey on the land, Bathymetry means survey on the sea. We have to plan the shipyard layout because we have to import the materials and we have to cut the steel plates, bend it fabricate the ship and then launch the ship. So painting and other ancillary requirements also are there, you have to plan the layout for the ship yard.

I will not be going in detail about the shipyard layout because this mainly we will be concentrating on the harbour requirements for the shipyard. First we have to prepare the technical feasibility report. There is another report called as techno economic feasibility. So technical feasibility means whether the project is possible or other wise, then next is techno economical feasibility that means you have to find out the cost and see whether we will be able to do the project with sufficient profit.

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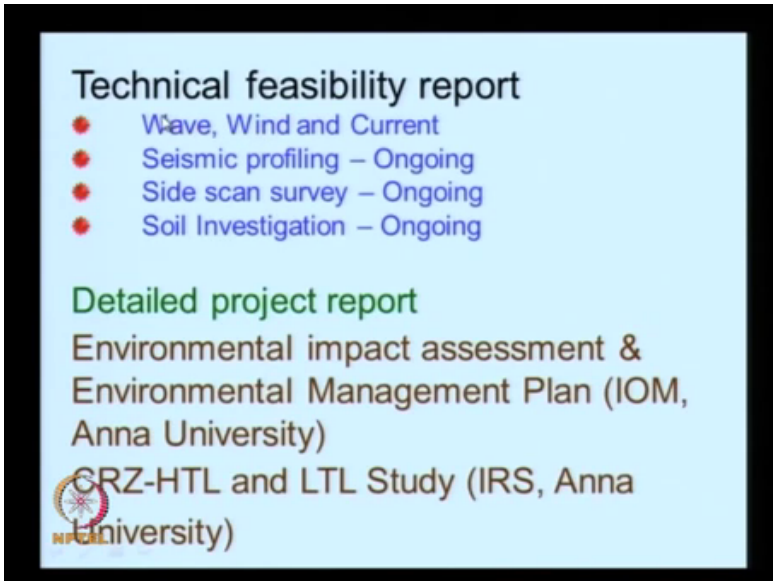

When we talk about this technical feasibility report mainly we have to study the wave, wind and current, this is what is required. So last class we have seen how to study the wave and current along with current we have to do the tide also. One more lecture I will give about the wind. Then we do what is known as the Seismic profiling, Siesmic profiling means they will do a survey, seismic survey based on which they will be able to identify what are the types of soil below the sea bed. It will not give indepth detail you have to do a marine bore hole soil investigation to do that.

But seismic profiling may be a 2 kilo meter by 2 kilo meter area they will be able to get what will be the type of soil below the sea bed. Sides can survey means , it will give what is the type of soil in the sea bed if there is any rocky patches, if there is any (())(10:24) sunk which is lying on the sea bed there is any submerged out crop of rock all those things will given by side scan survey. Technologically we will be able to do everything ourself we do not need anybody to do all these surveys it has been done for many projects.

Once we complete this then we prepare the detail for project report which include certain studies like Tranquility, Shore line evaluation this I will discuss later. Then we have to do what is a impact of this shipyard facility on the environment and if there are any undesirable impact what is the management plan what we have to rectify the impacts that is what we will be doing. Then one of the important thing is CRZ: Coastal Regulation Zone this is the map which has to be provided to identify what is the high tide line and low tide line.

So this we all demarket from the high tide line how much distance is 500 meters 200 meters and other things. So if you have a high tide line from the high tide line upto 500 meters you cannot have any residential facility total facility and all where as harbour facility can be planned from the high tide line. So this is very important. There are only few agencies which can do this CRZ mapping one of them is Institute of Remote sensing in Anna University.

Another is National Instiute of Ocean technology at Pallikaranai pralacheri NIO Goa CWPRS like that about 7 agencies are identified to do this CRZ map we cannot get it done from other agencies. So our shipyard layout has to be superimposed on the CRZ map and then only there is a committee Ministry of Environment and forest that committee will review all the documents and give the approval to carry out this project.

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So shipyard planning and development consists of two phases one is the project preparation another is project implementation. The project preparation involves concept development and master planning. Our Institute IIT Madras we are also preparing a master plan originally also there was a master plan now we are revising. So the master plan is very much required for any project. Then we have to prepare the Preliminary Project Report you have to carry out the topography and Bathymetry survey we have to do site survey and detailed project report preparation site survey is seismic survey and site scan survey. Then we have to carry out feasibility studies to assess the suitability of site for the shipyard.

And we have to carry out the environmental studies then we have to prepare the layout, schedules, cost estimate and we have to submit the reports to various statutory authorities.

There are two main statutory authorities one is the central government which is ministry of environmental forest.

There is another approval which has to be obtained from the state government that is Tamil Nadu pollution control board for the purpose of Tamil Nadu state. The Tamil Nadu pollution board has another committee which finally gives the concern to operate and certificate is required so that they can start the operation. These are the two agencies to which you have to approach and get the clearances.

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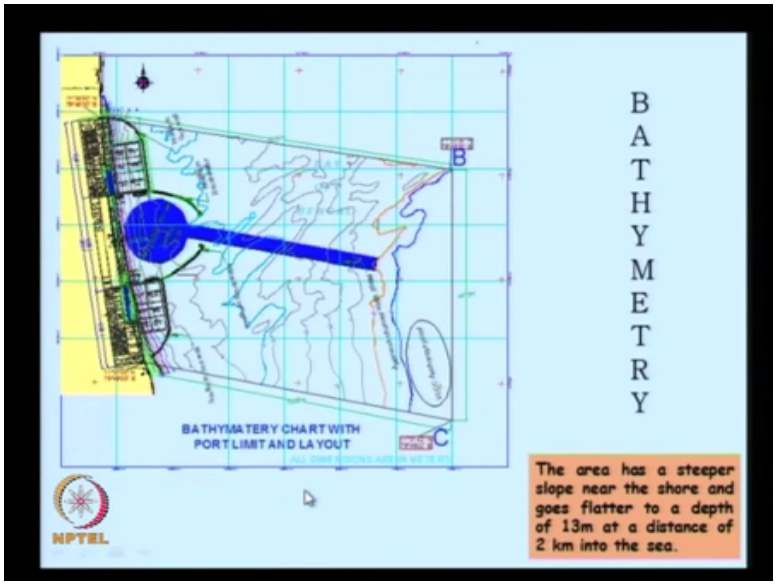

This shows the area which will be developed earlier I have shown 5 meter, 10 meter and 15 meter contour. This survey was taken upto the Tsunami has hit the coast of Cuddalore if you see the contour you can see that the contour is going like this. it is not side lined. So this is a peculiar feature of cuddalore court there is a geomorphical region for getting this type of contours. It is going inside normally the contours will be like a straight line like this whereas it is going like this, this contour is shown here.

There are 4 points marked here A, B, C and D, these are the four control which will be given by Tamil Nadu maritime board. Each state is supposed to have a maritime board coastal state, Gujarat is the first state which had a maritime board, Gujarat maritime board, then Maharashtra maritime board, Tamil Nadu maritime board one or the other states have maritime board. They are having a direct of ports they do not have maritime boards.

So it is essential that there is a maritime board in each state to regulate this. So what it means is this A,B,C,D this area is given to this shipyard projects, so whatever they want to do they have to restrict operation within this area. This is a shipyard which is planned inside the harbour.

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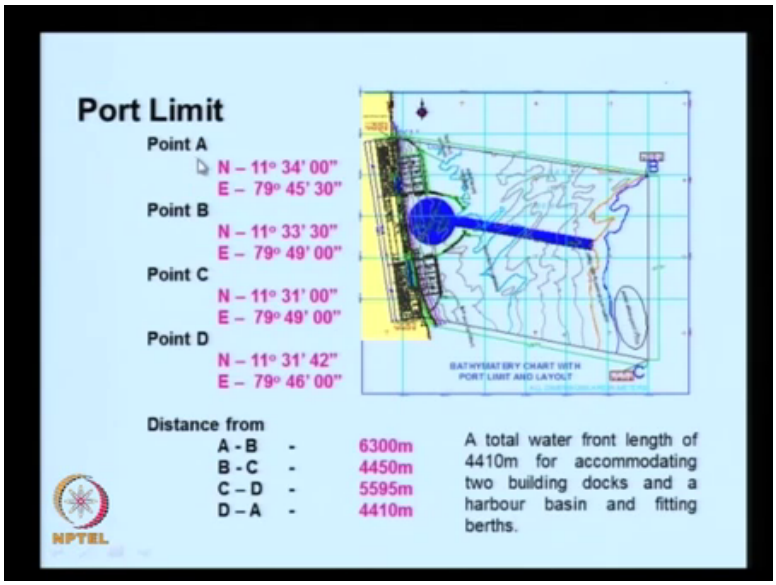

Maybe next slide we will give you some more details. So we have a point A northing and easting that is given here point B, point C, point D. The distances are also marked between A and B it is about 6.3 kilo meters B and C is about 4.45, C and D is about 5.595 D and A 4.41 kilo meters, this is the area that is a year mark for this. Typically about 20 meter contour is a point where they give the offshore location for harbour project they give a distance of about 2 kilo meters for a shipyard they have given 4 kilo meters.

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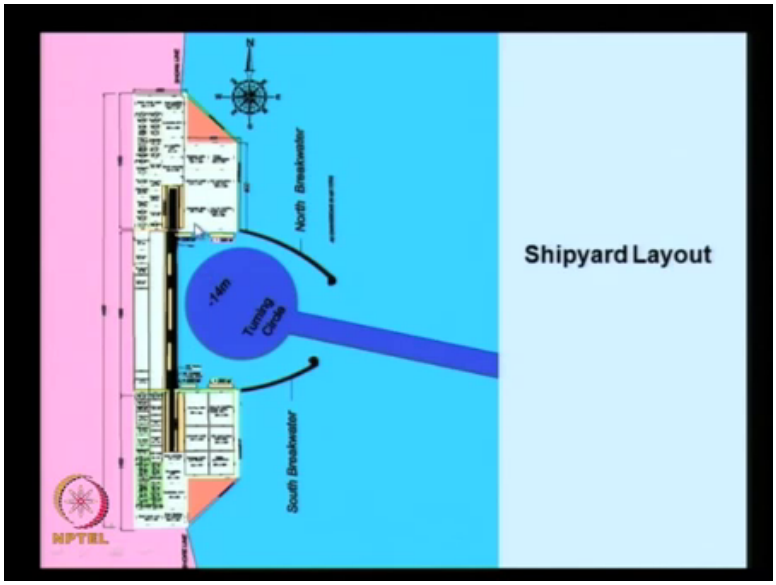

This shows the layout of the shipyard, what we are doing is we are filling up this area like this by a north break water and by a south break water like this. Then we the land area available is very less, land acquisition is a bigger problem so they restrict the land area less by reclaiming the land on the sea. The original shore line is here, they are reclaiming about more than 600 meters here.

So whatever they do the dredging this material will be used for reclamation of this land there are two breakwaters which are built and then we have the entrance channel training circle. There is a doc basin here, there is another doc basin here, there are three berths for outfitting there are two berths. These two berths will be utilized for import of steel materials. The flow will be like this they will take it here and from here one ship will come.

This is also two facilities to import the raw material and then there will be a flow here and they will build the ship here. The under kill portion below the water level will be done in the dry docs whereas the outfitting above the water level will be done in this locations, is it clear? There are two dry docs the ships will be built in these two dry docs. There are two import terminals to get the steel plates either from India or from abroad mostly from abroad.

There should be a flow of materials you have plate cutting yard or pipe bending yard and then modular fabrication, modular means they will not bring the ship in the dry doc the ship weight is let us say about 20000 tons they will build 10 blocks each of 2000 tons and then they will bring it here, so that the time required for building the ship will be less than a month. You have to build 28 ships. So each dry doc will build (48 ships) 14 ships each.

So we will not do all the ship building inside the dry doc. Whatever portion is above the water level that is called the outfitting that will be done in this portion. So when you build the training circle here and the entrance channel the waves will be coming from different directions we have to find out whether the waves are less inside this or our basin. And when you build the brake water like this the southern side there will be a accretion northern side there will be erosion.

So you have to assess how much erosion will be there and suitable remedial measures have to be taken then the transport y network the railway station is at Alapakkam and the shipyard can be reached via feeder line. You have to lay a line from Alapakkam to the shipyard location. The National Highway 45 crosses close to the proposed site. The nearest Airport is at Chennai. But we have they have commissioned a Airport at Pondicherry also.

Airport is also essential requirement, not only for the people to visit there are certain essential components which are very expensive like equipments inside the ship all these things will be air lifted 90 percent only will come by ship other 10 percent will come by air cargo only.

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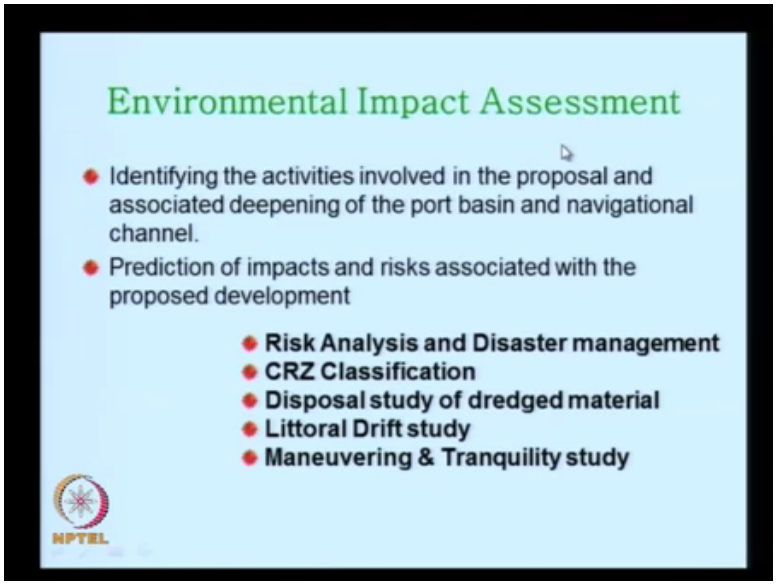

The environmental impact assessment what does this AA means. So we have to first identify the activities involved in the proposal and associated deepening of the port basin and navigation channel. What we do is we artificially develop a harbour basin by building a break water that is one of the component then we deepen the existing sea bed. So the bigger vessels can come so these two aspects has to be very clearly established then you have to identify because of this what are the impacts and the risk associated with the proposed development.

One of them is the risk analysis and the disaster management this has different components both onshore as well as the offshore activities. Then CRZ classification the dispersal study of dredge material that is when you want to dredge the material where are you going to dispose it off, then literal drift, literal drift means there will be some accretion on one side and erosion on the other side that has to be done.

then Maneuvering and Tranquillity study; Maneuvering means when you want to bring the vessel one of the class I told you should come in the FCR following sea condition, if not they have to find out how to Maneuver the vessel in other conditions. Tranquillity study means when the ship inside the harbour basin. The wave guide should be preferably less than 0.3 meter to 0.5 meter even outside is 3 to 5 meter inside should be only 10 percent of that that is Tranquillity study.

These two studies are not giving the same kind of layout. For tranquillity you may need a different layout. For Maneuvering better Maneuvering you may need a different layout. This point you should understand. Both the purposes are different for Maneuvering the layout may be different from Tranquillity but you have to come to a compromise. The best layout may not satisfy 100 percent Maneuvering and 100 percent Tranquillity.

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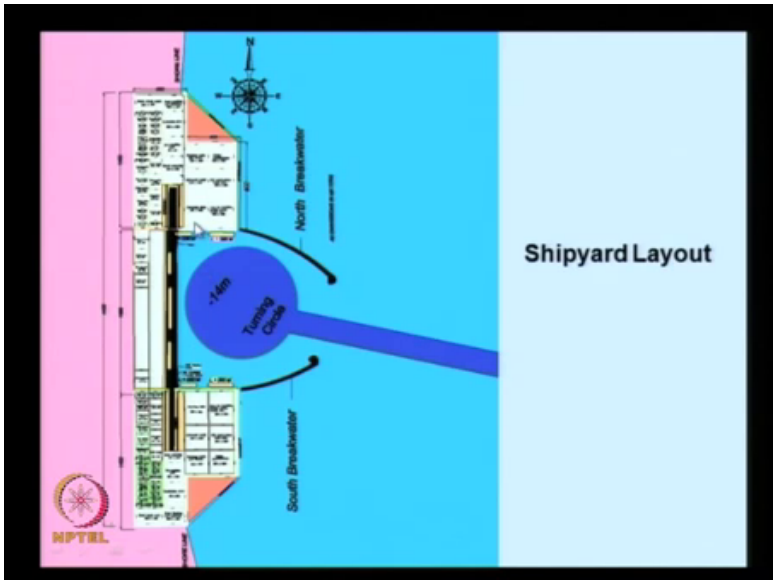

If we see the harbour basin here some of the areas here and here it may have better tranquillity. This berth also may have better Tranquillity whereas the others may not have better tranquillity. When the ship is coming in this direction for some waves which are coming from south during south east monsoon south west monsoon this will be in beam sea

condition, but the wave heights are smaller in monsoon. So that time we have to use more tuck boats to bring the vessel inside.

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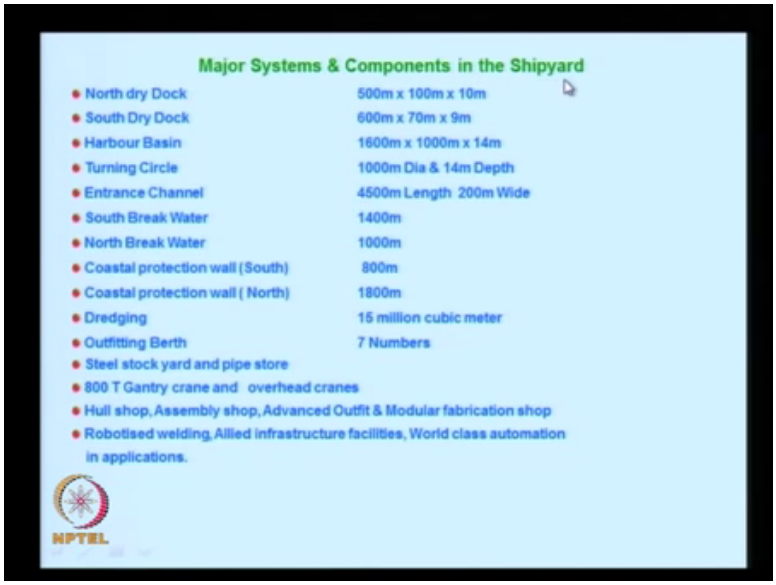

What are the major systems and components from the shipyard. We have two dry docs one is the northern side another is the southern side we want to have 500 meter by 100 meter by 10 meter and another is 600 meter by 70 meter by 9 meter. The harbour basin size is with a larger draft of 14 meter. This larger draft is required because once you build the vessel then bring it outside then we may blast it and then take it for trials outside.

And many bigger vessel come for repair they will come to the harbour basin then they will deblast and bring it inside the trader, training circle typically twice the length of the ship we need with a larger depth entry channel length should be about 7 times the length of the vessel that is provided the south break water is 1400 meter and north break water is 1000 meter. The length of the break water if it is more the cost will be more.

Here the Bathymetry is very close to the shore line if you see the ancient ports in Tamil Nadu they are located either at Cuddalore or at Nagapatnam because at these two locations the 10 meter contour is very close to the shore line. This is one of the reason why we have to locate this ship yard in Cuddalore. Then we are providing some coastal protection wall on the south side and north side to take care of the coast line erosion. The quantity of dredging is about 15 million cubic meter the outfitting berths are about 7 numbers.

We need steel stock yard and pipe store. We need a Gantry crane which can lift upto 800 tons each model. Then we need a the over head crane, we need hulshop assembly shop advance

outfit and modular fabrication shop, robertized welding allied infrastructure facilities automaton in application all the things are required for the shipyard.

One of the reason our shipyards are not developed is the government is not subsidizing any of these shipyard construction whereas China most of the shipyards are government owned and they give lot of subsidy. The subsidy in two parts one subsidy is for the ships built for China another subsidy is for dumping the ships abroad. So the cost of the ship which they want to sell abroad will be atleast 20 percent cheaper than what they are selling inside China, the 20 percent will be given by the Government.

Then in addition we need this a township and associated facilities including schools, hospitals and we also need water to all the ships. We need a drainage system and also a desalination plant and sewage treatment plant. These are all the components of a shipyard facility. This we are ending this, any doubts? Any questions? Hmm? Nothing everything is clear.

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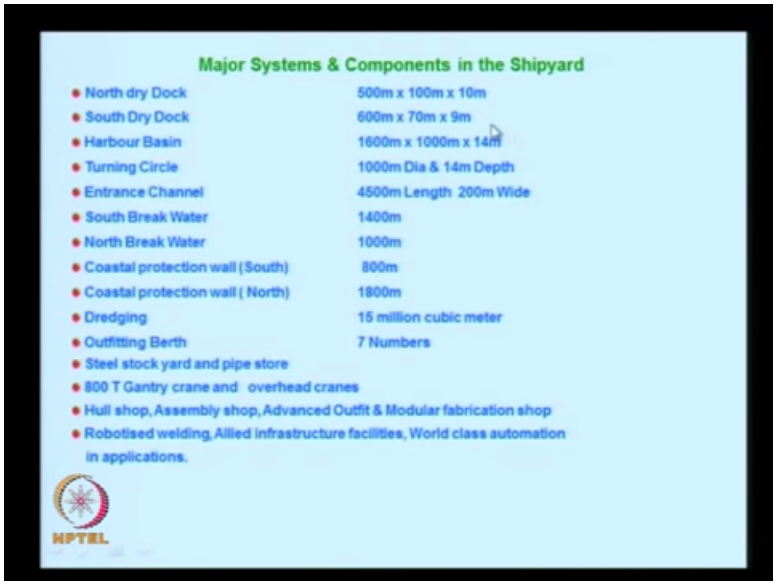

(())(25:53) You are telling that ship(())(25:56) we have skilled manpower we are having (()) (26:00) the car so why not the ship. This is what they are telling. Only thing is we are not competitive in ship building. If we have to be compete the volumes are important.So I have given a picture of shipyard double ambend which is not growing well, where as we are able to develop many ports.

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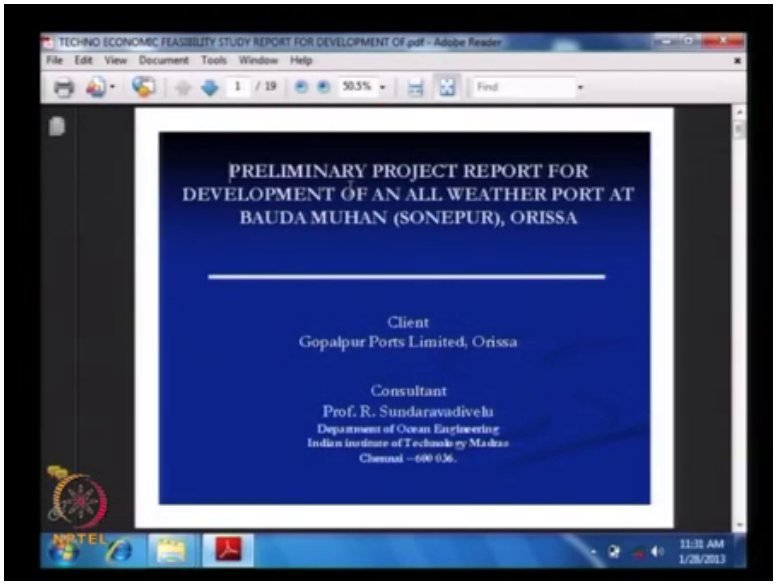

So this is a Preliminary Project report for development an all weather port at Baudamuhan Sonapur in Orissa. This place is very close to Andhra border.

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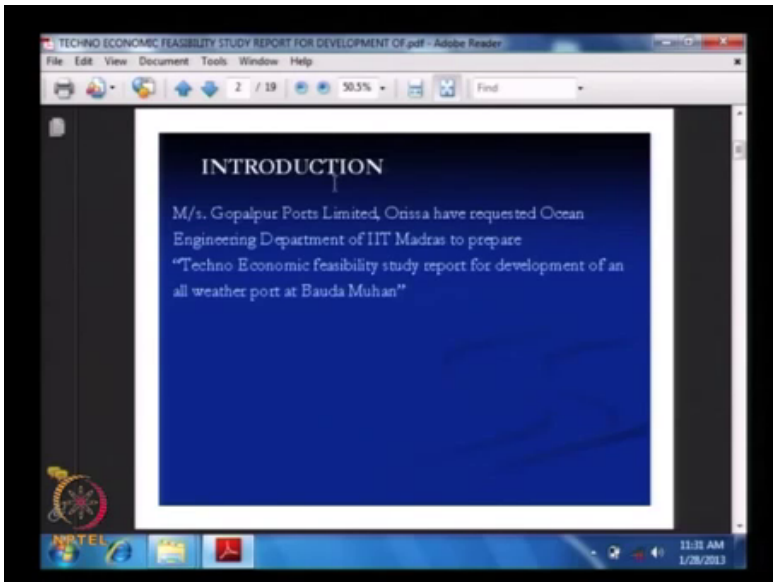

The various facilities that are required for development of port is explained in this particular slide.

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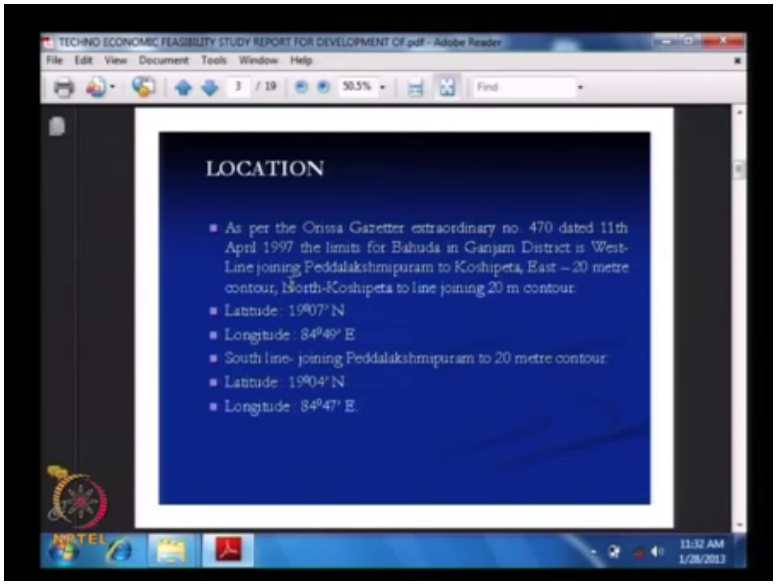

The Orissa government has identified this particular location with this latitude and longitude for development of the port upto 20 meter contour.

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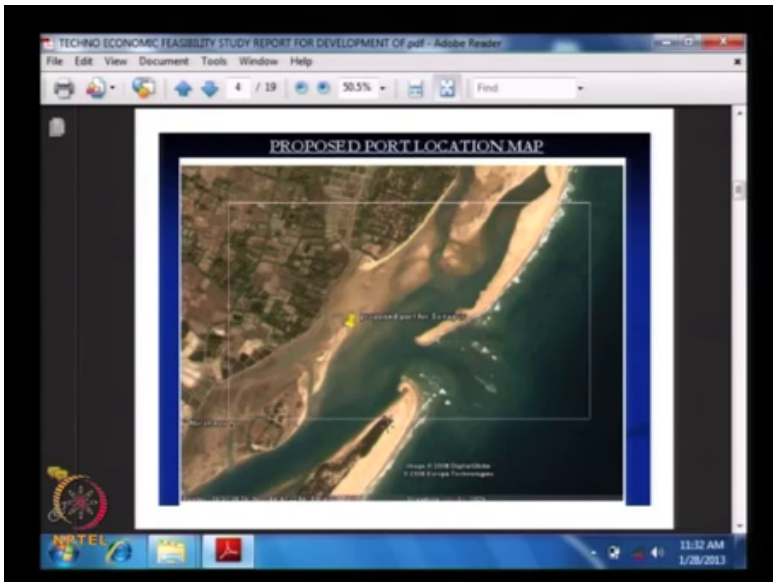

This shows the satellite imagery where the port will be developed this there are different layouts of port this particular port will be called as a lagoon harbour, lagoon means we develop a training circle somewhere here. So the berthing facilities will be constructed along this line we will build one break water here and another break water here.

This is only to create an entrance channel whereas the whole harbour will be developed inside this area lot of land is available here. Already this mouth is open most of the times in a

year and the contour also very close the shore line 10 meter contour this much land is also available that is where you want to develop. So here it will be a lagoon harbour all the facilities will be prepared will be inside this land area.

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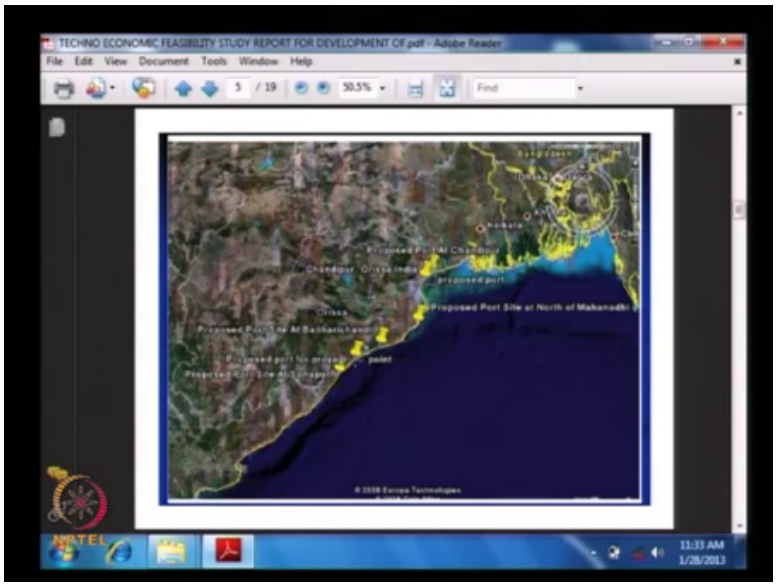

Orissa government has identified many locations all along the coast where they can develop the facility. So this is the place what we are talking about Sonapur. There should be a master plan for development of port in Orissa also I have identified about 10 locations to develop the port in Orissa.

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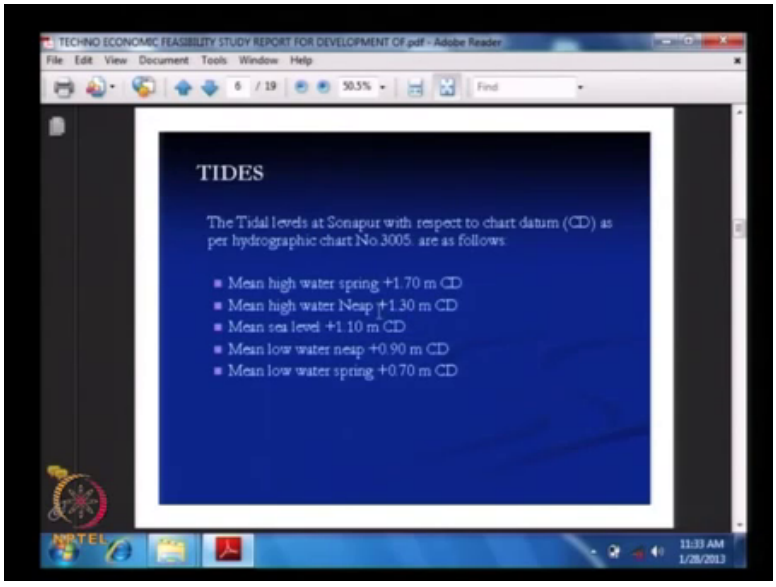

One of the class we studied about the tidal levels, so we should know what are the tidal variations. Mean high water spring is 1.7, mean lower water spring is 0.7 that means the tidal range is 1 meter in spring tide when the tidal range is 0.4 meter in neap tide.

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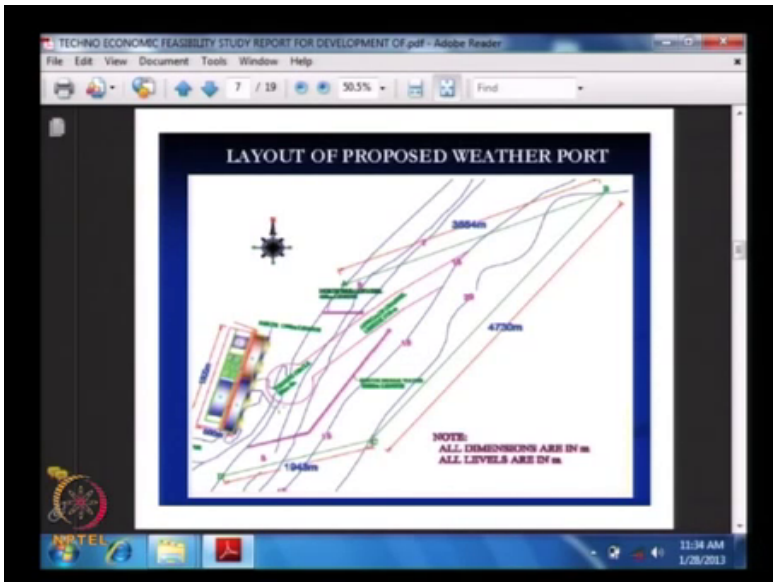

This is the layout of the harbour. So we have a small break water here on the northern side we have another break water on the southern side from 15 meter contour we are putting an entrance channel and the turning circle, then we have the harbour basin here and we are putting about 5 berths along these lines. This is the 5 meter, 10 meter and 15 meter contour and 20 meter contour. So they have fixed four points which will be ggiven as the locations for port limits. These are called as the port limit.

So within the port limit another port will not come, the distance is 20 meter contour on the northern side is very large about 3554 meter along this line and this is only about 1943 meters. So this location 20 meter contour is very nearby.

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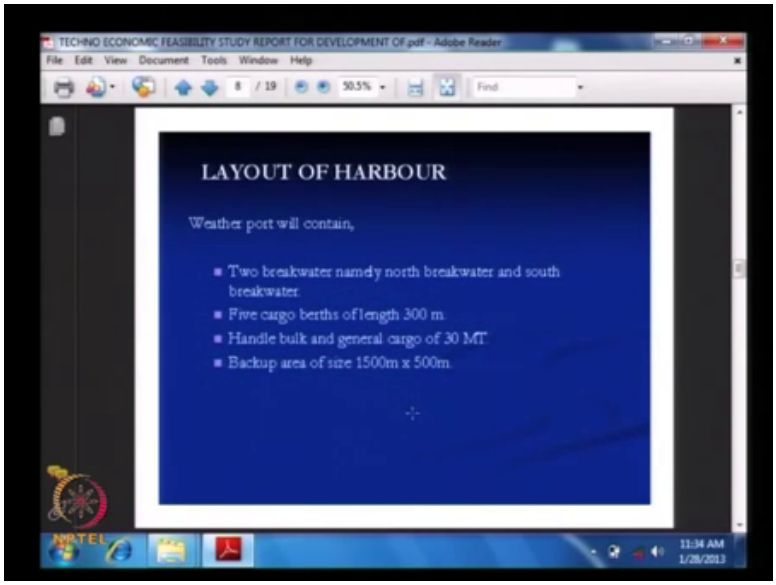

We need to break waters one on the north side another on the south side, sometimes you may have 3 break waters also. We need 5 cargo berths each of length 300 meters and we this is being developed for 30 million tons that means each berth will handle 6 million tons. To be to have a simple arithmetic 1 million ton you can develop Greenfield, Greenfield means nothing is there you are just starting and then developing a port.

The cost will be between 60 crores to 100 crores, that is a range of cost. 60 crores is very you can do it for liquid cargo and the profit margin will be very high it is 100 crore still you will have a profit margin but it will not be as high as for the liquid cargo. So 60 cargo is for liquid cargo and 100 crore is for bulk cargo like iron, ore, coal and all.

We need this backup space 1500 meter by 500 meter that means this is about 75 hectares that are required. The total length is 1500 meters and backside we need about 500 meters this is a minimum requirement and I am going to give you the cost estimate for this also We will just have some idea how the cost is?

The length of the break waters are given north break water is for a small length so it is for a longer length. The top level of the break water is for fixed plus 7 meters. We have to plan the break water. This I will discuss separately how the break water is, it has different layers one is a bedding layer two mound, core layer armour layer and tertapod. It is armour layer is using a tetrapod of 18 tons each weight.

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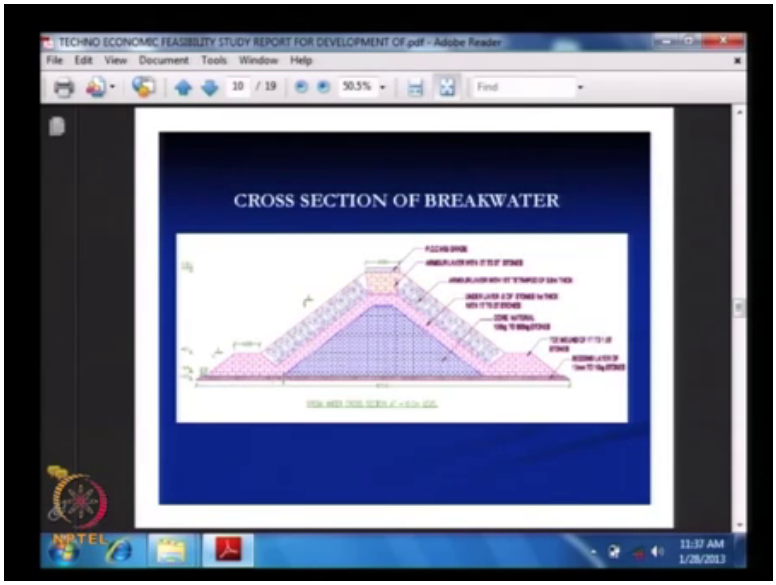

So this bed level is here and on top of the bed level generally we give a filter layer then we give what is known as a toe mount, then we put a core layer, then we put under armour layer or called as simply under layer, then we put a armour layer, then we have a road width. Generally it is 8 meters the slope is 1 is to 2 or 1 is to 1.5. So basically it is called as a rubber mount break water. This consists of a filter layer, in this area it is sand on top of the sand we cannot big a bigger size stones.

What we do is beak a slightly bigger size stone here, this is about 10 millimetre to 10 kg stone. Then we put the core material 1 kg to 1000 kg stones. Then we put a under layer which is 1 ton to 2 ton stone, then we put a specially made armour blocks not made of stone concrete units. These armour layers depending on the water depth it will vary from 2 tons to 18 tons, smaller water depth may be 2 tons bigger water depths it may be 18 tons. This is how we have to build the break water.

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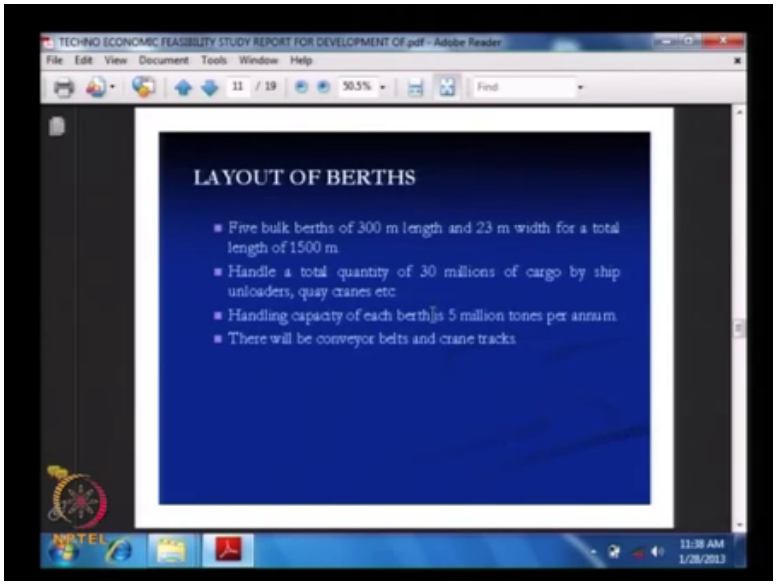

We will discuss about the design of break water, most probably before the first case. You will get a there is a formula called as Hudson's formula we will be calculating the weight of the stone I told the armour stone weight is to be calculated. So there is a formula using which we will calculate the armour stone.

The width of the berth is generally about 23 meters because the crane has two rails, the rail spacing is about 18 meters. Front the rail should be 2 and half meter and back also we need some space. There will be conveyer belts also to transport the cargo.

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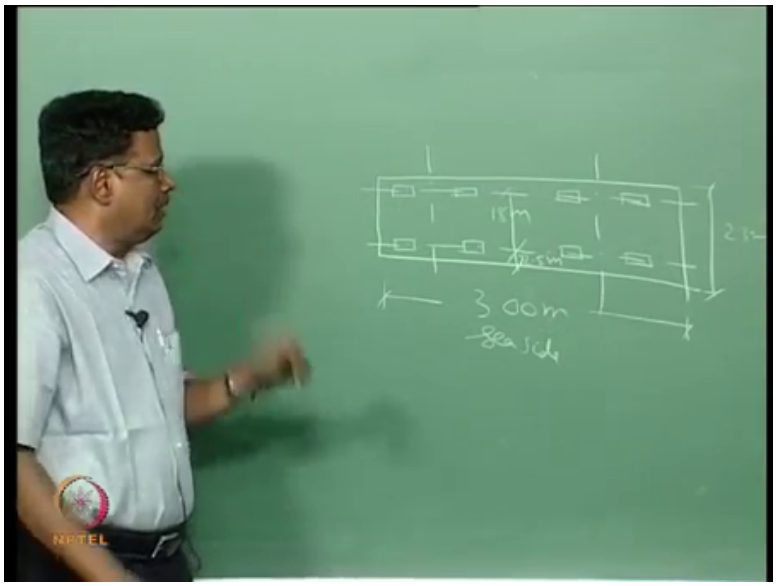

So normally we have one typical berth this berth will be about 300 metres by 23 metres. We have a crane rail typically they put two cranes sometimes they will put three cranes also. There is a centre line of a crane there is another centre line of the crane. The crane will have two legs on the sea side two legs on the land side. Let us say that this is a sea side.

Similarly here also we will have 4 legs spacing between them is 18 meter and from here to here it should be greater than 2.5 meters because you have to put the fenders and bollards that is why this gap should be more. So you need some space behind also for accessing this.

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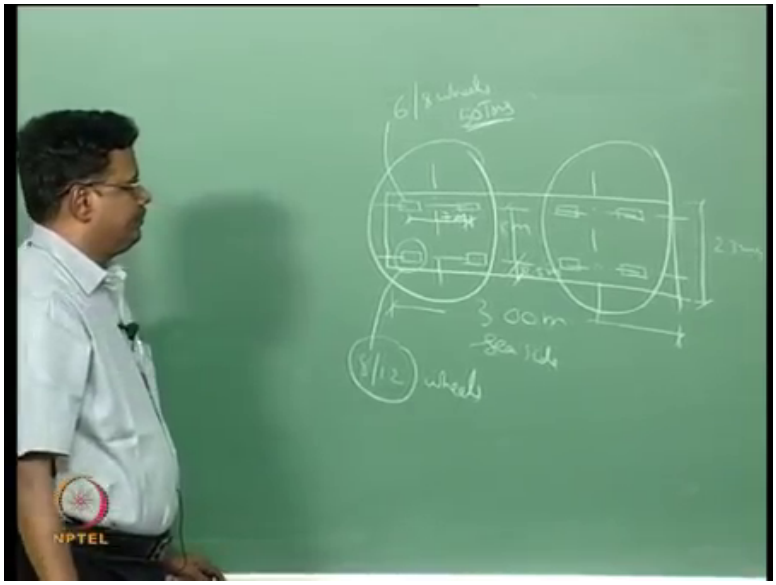

So this is one crane this is another crane each crane is having 4 legs, each leg they have 6 to 8 wheels this side you may have number of wheels more 8 to 12 wheels also will be there. The wheel load will be approximately about 50 tons this is a vertical load and you may have lateral load also.

This distance between this centre to centre may be around 17 metres. So depending on this rail spacing your width of the berth is decided each crane will have can handle about 2000 tons per hour.We need a conveyer system behind the berth to transport to the stockyard.

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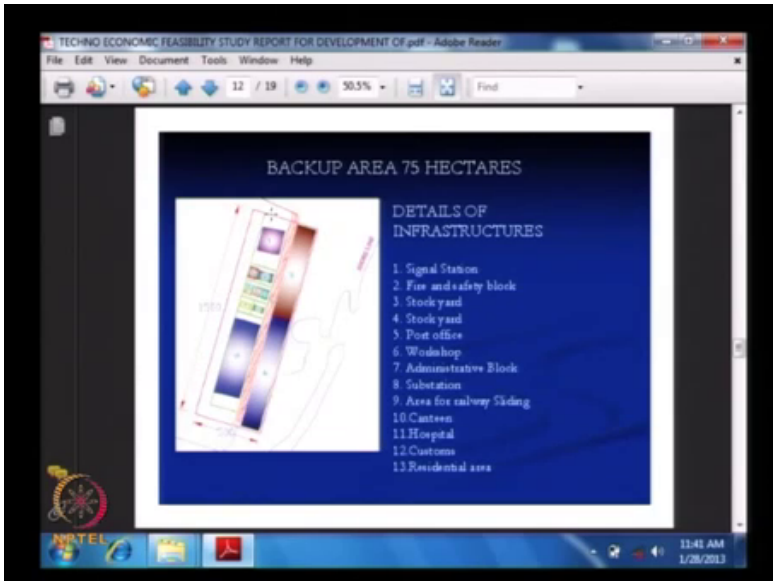

So this is a 1500 meters by 500 metres stockyard this planned here. There are various facilities required here signal station, fire and safety, stock yards, post office, work shop, administrative building, substation area for Railway sliding, canteen, hospital, customs, residential area all these facilities are required for a port development with the backup area of about 75 hectares.

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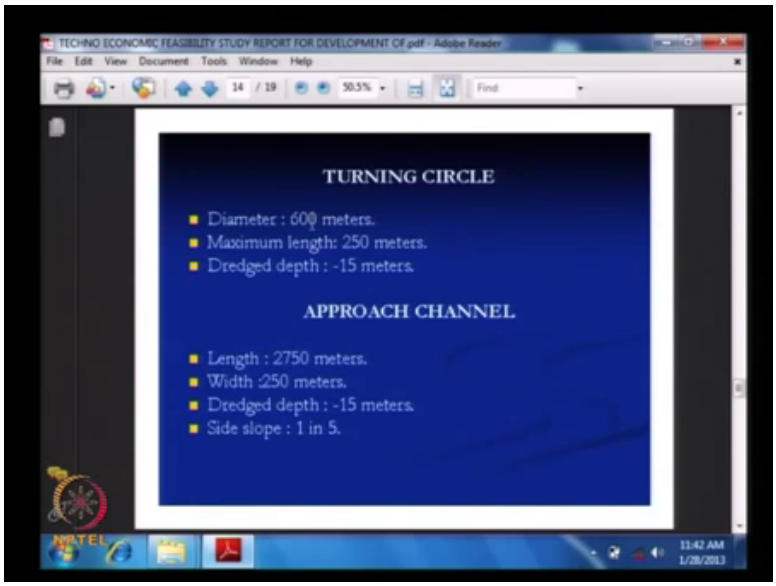

The ship size is the main parameter to design the port facility the ship size what we want to design is 100000 DWT this is something wrong overall length is about 268 metres, width is 42.5 metres, height is height means more than depth is 20.4 meters, and the fully laden draft

is 13 metres. We can handle a smaller size than this also generally we cannot handle bigger than this

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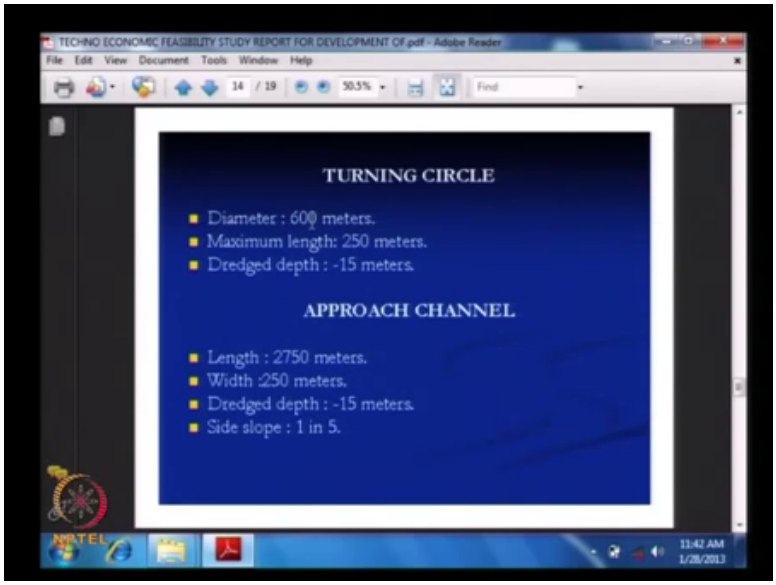

We need a turning circle which is about twice the length of the ship 268 means 2 to 2.5 times and then dredge up this 15 meters approach channel details also are given here. The size slope is when you are dredging what happens to the water.

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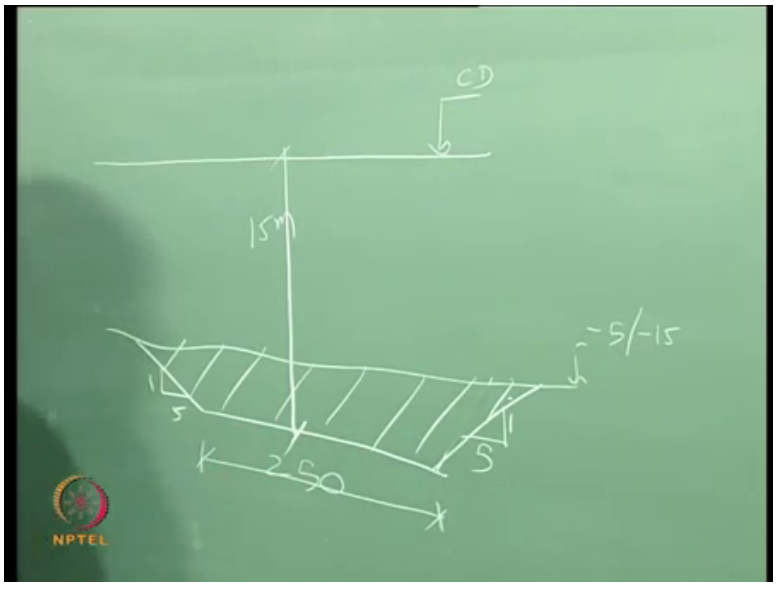

Suppose you have the water level here, this is a chopped item 00 level, suppose your bead level is let us say at one location is minus 5 it may vary upto minus 15. At minus 5 you have to dredge like this and this width is 250 metres and the depth required will be 15 metre. You

have to achieve assume a slope, this slope is one vertical to y horizontal. So this much area we have to remove the soil so that the ship will come in this within this width of the channel. Typically the width of the channel is equal to length of the ship.

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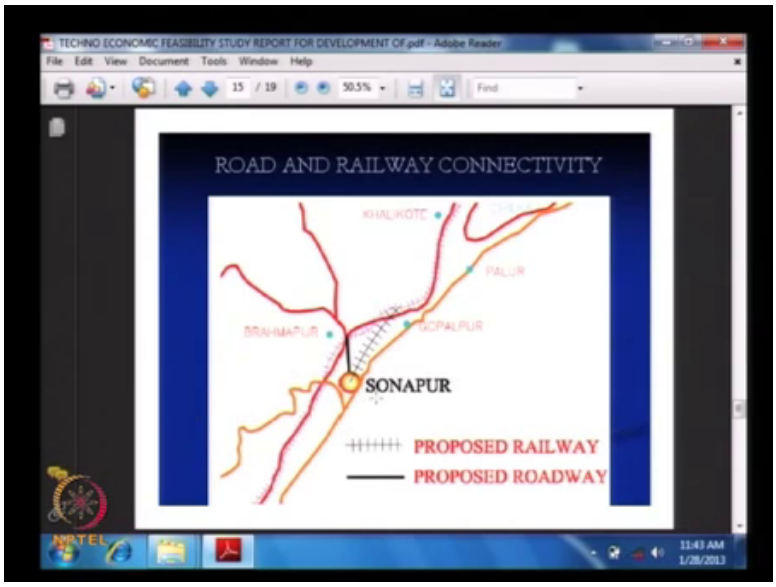

Here we are showing the railway lines this is the feeder line which will be connecting it to one of the main station here this is the Burhapur this is the main line which is going. And we also have I think this is your National Highway this is very close to this. Gopalpur is another court which is being developed now. This will be very close to this may be about 30 to 40 kilo metres south of this.

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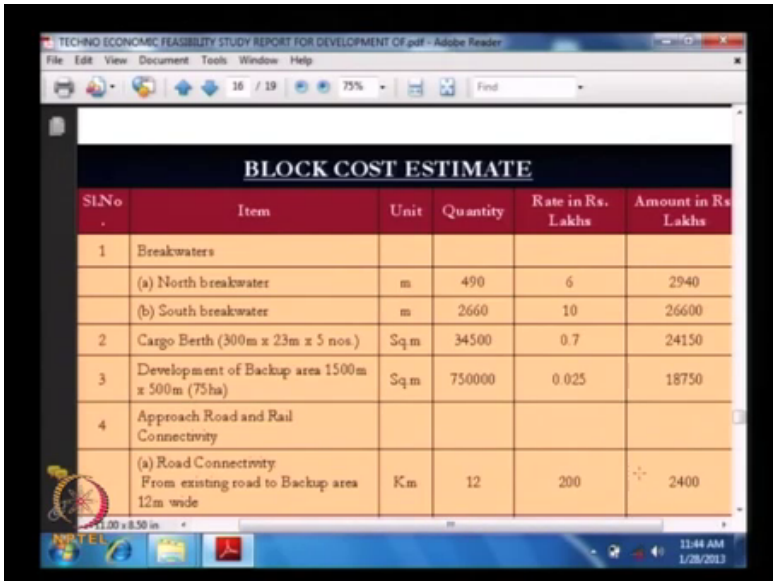

BLOCK COST ESTIMATE

Sl.No.	Item	Unit	Quantity	Rate in Rs. Lakhs	Amount in Rs Lakhs
1	Breakwaters				
	(a) North breakwater	m	490	6	2940
	(b) South breakwater	m	2660	10	26600
2	Cargo Berth (300m x 23m x 5 nos.)	Sq.m	34500	0.7	24150
3	Development of Backup area 1500m x 500m (75ha)	Sq.m	750000	0.025	18750
4	Approach Road and Rail Connectivity				
	(a) Road Connectivity From existing road to Backup area 12m wide	Km	12	200	2400

So here we are giving some of the cost estimates. I will spend some time on this, this break water not break water is only upto 5 or 6 metre contour the per metre length of the break water is called as the black cost estimate is about 6 lakhs per running meter multiplied by the length of the break water you will get the total cost. South break water I think it goes upto 10 metre contour. I put approximately 10 lakhs per running metre.

I put 6 metre means 6 lakhs 10 metre means 10 lakhs. It comes like that but depending on the side situation it may vary the soil is not good the cost may even double. Then we have this berth 300 metre by 23 metre by 5 numbers the area is 34500 square metres. The cost of the berth per square metre is 70000 rupees. What is the cost per square metre of any building?

Civil Engineers; cost of construction, hmm? You want to build your own house do not ask me any question What will be the estimate per square metre or per square feet?hmm? 2000 per square feet or square metre? I think you are having lot of money. You do not know the current market rate I am not asking about the cost of the land and other things. You cannot build a house you can build only a toilet.

Two thousand is near but it is on a higher side 1500hmm what is it? 1500 is close by I am building house I am paying only 1300 rupees per square feet. Hundred only cost of construction in IIT campus is around 2000 rupees per square feet in IIT campus around 2000 rupees per square feet. That is about 20000 rupees per square metre. What is a cost of a house in Adyar or kotturpuram or ,

What will be the cost including the land cost including if you want to buy a flat what will be the cost you cannot buy you can buy 5000 in beyond Medavakkam beyond soniendalor. Adyar, Basant nagar, kotturpuram it is 15500 rupees per square feet, hmm? What is it? Being developed you know Adyar karant we are building a flat quadrant opposite to karanat hotel the cost is 15500 rupees per square feet.

Almost double the cost of this berthing facility. So here it is 70000 rupees per square feet excluding land this is only construction cost. Because you have 15 metre water depth 5 metre top level 20 metre that means it is equivalent to 6 story building so you take 7500 into 6 means 9000 rupees per square feet that is 90000 rupees per square metre, is it clear?

Why the cost is high? Because the height is more the backup area development is given here it is very less cost only, then approach road and rail connectivity I think we have given a lump sum cost kilometre cost 1 kilometre is say 2 crores this is 1 kilo metre is 2.2 crores

railway siding this dredging is about 200 rupees per cubic metre if it sand this cost is very high it is lakhs it is 400 crores dredging. Total cost other everything put together is 1500 crores approximately.

Thousand five hundred crores for 30 million tons is only 50 crores per million ton. But one of the problem the catches you may not get 30 million tons initially even if you develop your berth you may not have the cargo potential initially over a period of time it will come. But this is a very good location where you can build the facility. I think there is I think I have not discussed about the harbour crane each crane is about 20 crores.

Then conveyer is 1.5 lakhs per running meter you have 5 kilo meter of conveyer system. So there are mechanical engineers you have only for 275 crores what you can sell you can include some part of the dredging which is about 400 crores where is that dredging.

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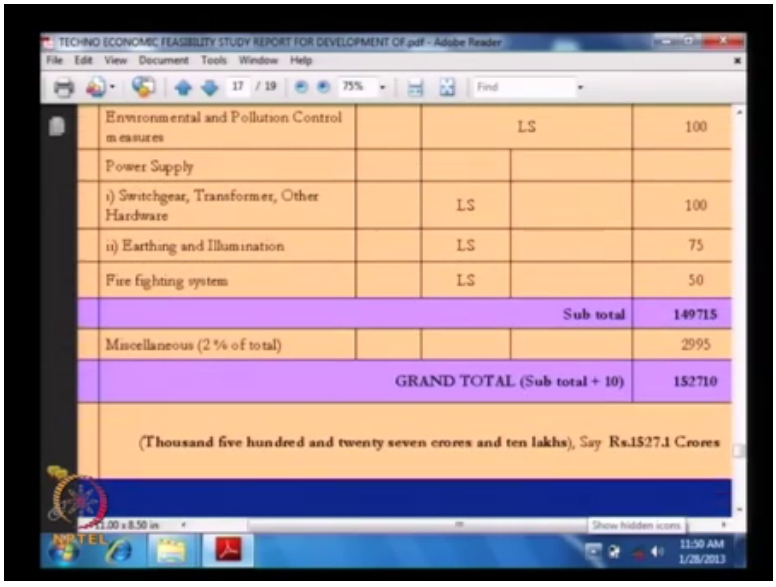

This is the dredging all other things are civil engineers only 40 linear. So in a project approximately 30 percent will go for mechanical work balance 70 percent for Civil Engineers. I think some more things are missed I do not know, ok.

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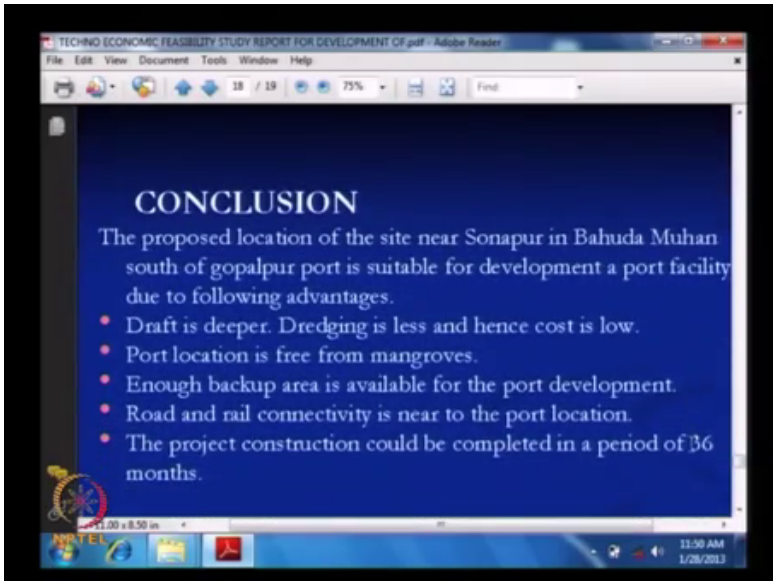

Conclusion: The proposed location of the site near Sonapur in this river Baghdamuhan south of Gopalpur is suitable for development due to following advantages draft is deeper dredging is less and guns cost is low 400 crores dredging is a very less cost for some of the ports we have to do even 1000 crores. Port location is free from mangroves so if we have mangroves then it is not desirable to have you will not get a permission.

Enough backup area is available road and rail connectivity is near the port location and the project can be completed in about 36 months, these are some of the reasons for developing this. So in future classes what we will be studying is mainly about the design of the berth, design of the break water dredging and other ancillary facilities,

Thank you!