Indian Institute of Science
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National Programme on
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Global Supply Chain Management
Lecture-30
Location Selection

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So this class and the next one we are going to talk about location selection this is a very important topic that is because whenever you have a multinational or any company want to start this business it has to select a location now this location means that it has a locator country it has to locate a city and a place now this is a very very important decision it is that is because it depends it has to close to the markets it has to be close to the resources and it should not have any problems of this and it should not be too expensive for it to start the business.
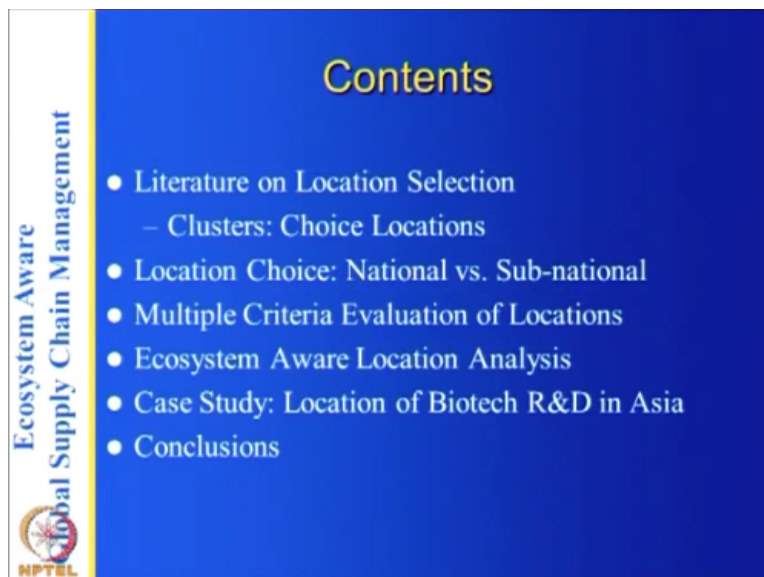
So added this problem is an important one.

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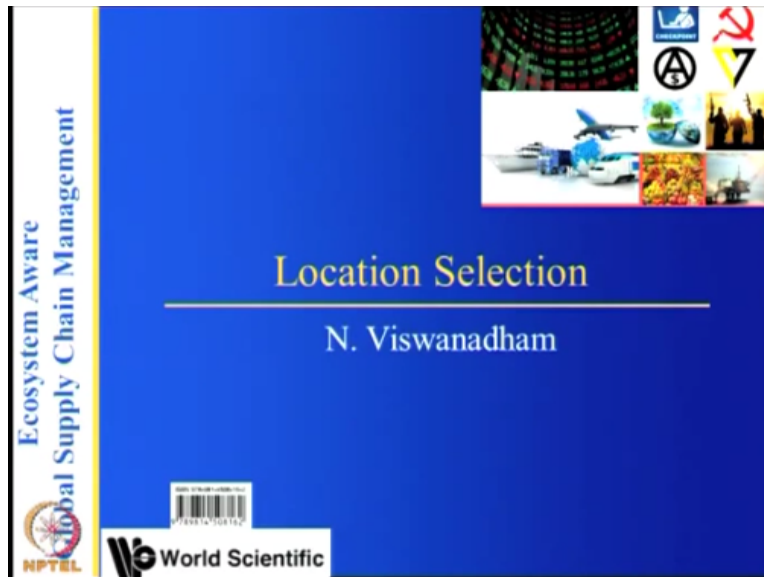
And it is very well studied but our objective here is to look at how after an introduction to the location selection problem how we can use the supply chain ecosystem framework for location selection that is the objective of these two lectures and we will start with this .

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I will start with the literature on location selection and clusters choice locations how do you choose the locations and the location choices national versus sub-national in other words you have to choose a country first and then a city in that country now in countries like India,
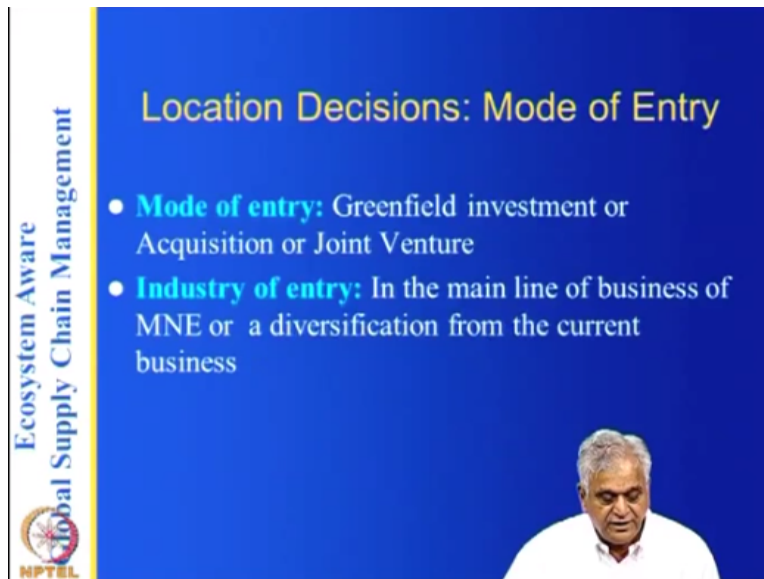
China and so on a country means it has several states India has 28 states 7 union territories and so on so you need location within the city belongs to the state subject so you have national versus state issues in the location.

In addition to that you need the investment climate of both the country as well as the city to be congenial to your business so there are multiple criteria for evaluation of location for example if you are following the supply chain ecosystem you have to have resources which is human resources close by you should have power water and so on you should have industrial resources like clusters agglomeration of various kinds of resources that are needed for the business you have to have the approval of the government and the social groups also the delivery logistics IT infrastructure and all that .

So you have multiple criteria that are needed for the evaluation of location so it is not a single cost optimization that you need to do but you have to locate this particular place depending on the multiple criteria so that is where we look at the ecosystem aware location analysis and what are the kinds of issues that it will rise and there is one technique called a HP and its variations analytical hierarchy process it so basically look so cubistic it is used to very much in practice and that is used very often whenever you have multi criteria decision making that is involved .

We will look at this therefore a biotech R&D in Asia in other words a country a company wants to look at it biotech R&D lab in Asia and it has 3 country choices China, Singapore and India and once they select India a variety of reasons they have choices like Bangalore ,Hyderabad, Luck now and Pune. so which one do they select and how do they select so then we will conclude this lecture so this is an important aspect .

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So location, location, location a plant location and site selection guide by Marcel De mail Meirleir TIPS Technical Publishing in 2006 what he said was the location decision for a production facility is one of the most important decisions that a management faces well obviously and there are faulty decisions that were made and management has to retreat and move to some other place for example the Tata Nano plant in single investment in Bengal and the purpose of the location study is to determine the area and the site in which the projected operation and investment can be carried out under optimal conditions with the best monetary return and with the least number of problems.

So the issue is a very general statement but many industrial location problem involves various kinds of steps. so let us look at this particular problem .
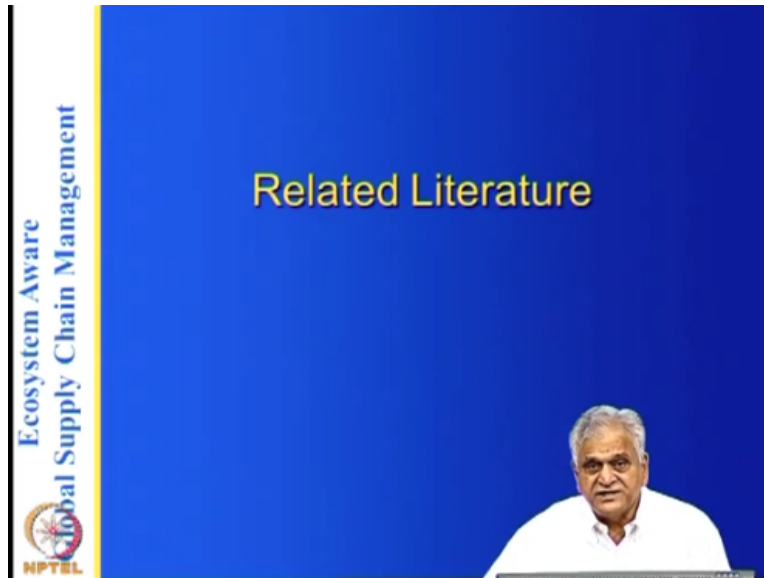
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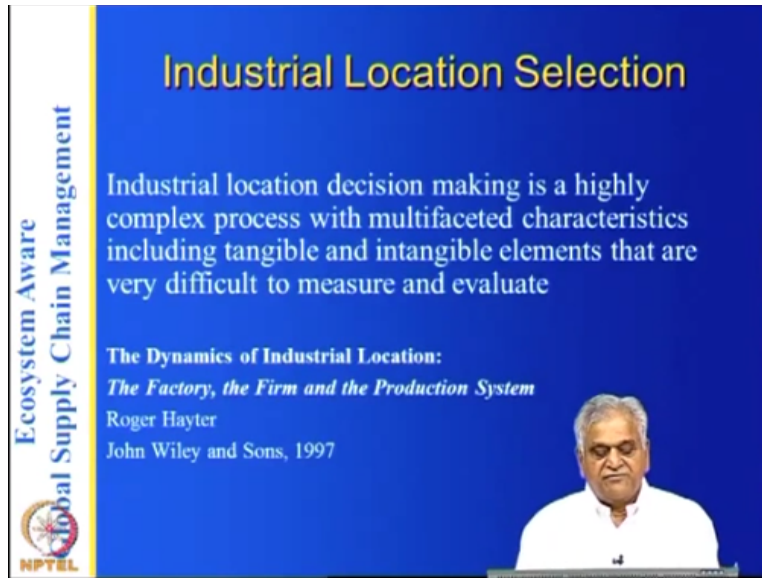
And there is another this one The Dynamics of Industrial Location in factory, the firm and production system by Roger Hayter and it is 1997 book Industrial location decision-making is highly complex process with multifaceted   characteristics including tangible and   intangible elements that are very   difficult to measure and evaluate .

So you can see but from the previous statements   that the location decision problem has   it is not it has measurements but it has   also subjective issues how good is the   government well good very good and so on   how good is the city, quality of life   so you can sometimes   give a number on a scale of 1 to 8   or sometimes you cannot say you can say   only good, very good low, high and so on. so these are the kinds of things   you get into when you are making the industry location problem.

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So that is where you require the help of analytical hierarchy process or fuzzy hp and several other kinds of techniques of that kind to make the multi criteria decision mosque.
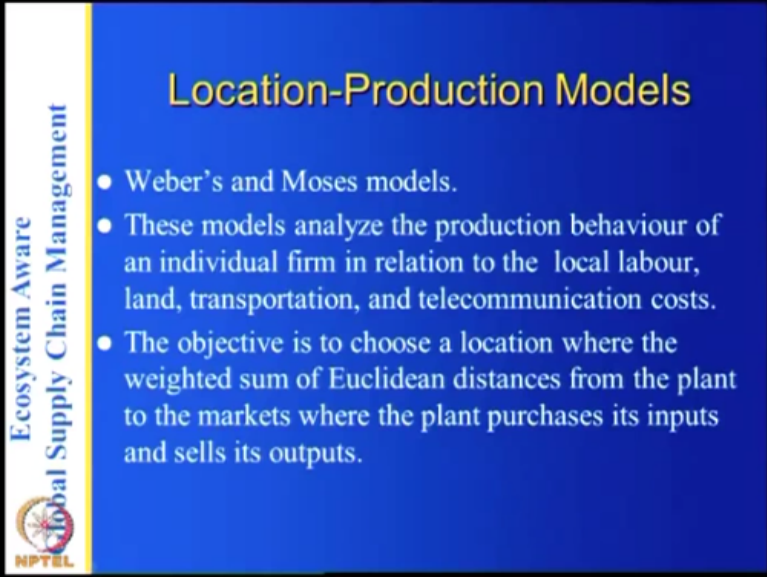
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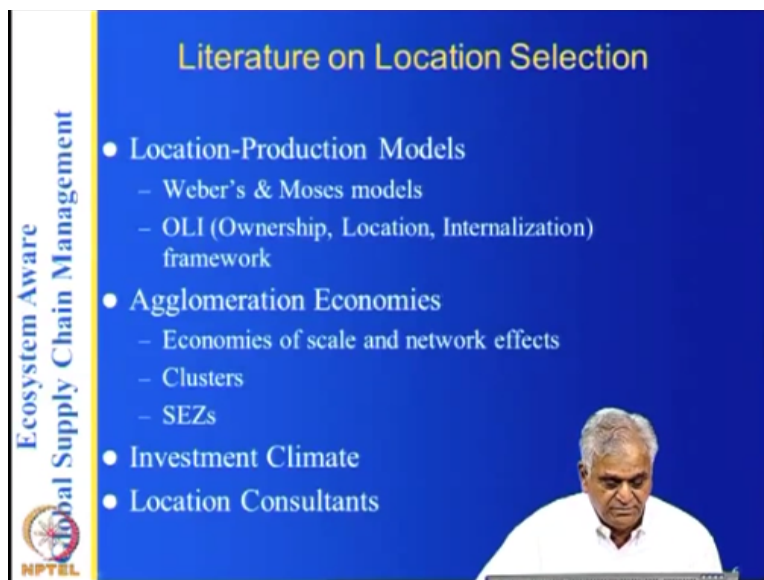
So if you look at the literature on location selection they what are called the location production models by Weber and Moses these are also called center of clarity models and only framework that is ownership, location and internalization framework and we look at that and agglomeration economies these are clusters basically economies of scale and network effects

in other words it is always good to look at your business where there is a an agglomeration in other words there is a group of companies belonging to your vertical.

And it is always you get lot of things Network effects out of this that is where you have clusters like auto clusters biotech clusters and electronic clusters a pro clusters and so on and IC chips special economic zones which basically are these are all zones where the government has all the infrastructure that is needed and also it will give shops for import and export and so on so that this these are all the things where the SEZs have a conglomerate for example in India the software technology works basically and specially clusters of software companies.

Where they have they have a variety of companies both small and big in clustered in an area in various cities and then we look at the investment climate. As we said before the supply chain ecosystem basically has resources, institutions and delivery mechanisms which firm the investment climate that also determines the location and then their location consultants so who are there who make big money in this.

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So what are the location production models their Weber and Moses models and basically these models analyze the production behavior of the individual firm in relation to the local labour, land, transportation and telecommunication costs so you can you want to basically locate it where their resources are available and they are cheap the objective is to choose a location

where the weighted sum of Euclidean distances from the plant to market and plant purchases its inputs and sells its outputs.

So basically you want to locate the center of gravity of both the suppliers as well as the buyers so that you can basically you are almost in an optimal distance both from buyers and suppliers that is the Weber's model.

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Ownership location and this one the OLI framework a firm prefers FDI to trade and become an MNC multinational corporation if the firm possesses ownership advantages not available to other firms in terms of superior technology, firm size and brand name in other words when it enters a country it should be the best that best large and should have a brand and the entry market offers location specific advantages market size ,cheap resources and infrastructure well .

This is what the investment climate is about you have the resources you have of course the market size and the infrastructure for delivery as well as for the people of right and people there internalization advantages of eliminating transaction and coordination costs associated with market interaction .

So here when you are talking to the suppliers under when you are talking to the markets and so on then there should not be too much of a transaction or coordination cost associated with it so the only framework is basically looks an idealistic framework it is widely accepted model
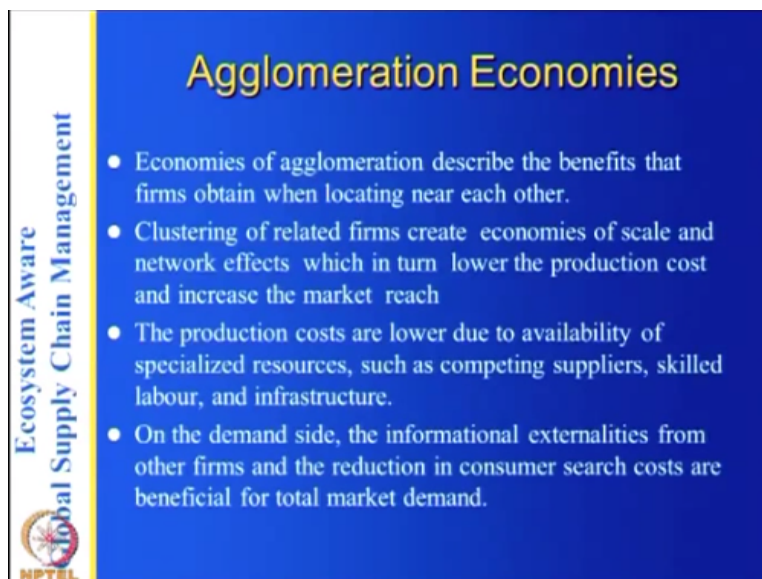
for location choice at the national   level there nothing here to dispute of   this so the firm should be the best within the region of cheap resources and high market size and best infrastructure .

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Then of course there are clusters of choice economies .

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This is called   agglomeration economies. Economies of   agglomeration describe the benefits of the firms obtained when locating near   to each other what are the benefits when   you are near to each other of the same with the same vertical so clustering of related firms create economies of scale   and network effects which in turn lower   the production costs and increase the   market reach but obviously if for example a set of refineries or royal firms at the same place well if the or some other   factories are in the same place .

You can have a common repair and maintenance site where you know which can be shared which can be shared service buttons you   can have a cloud which can be shared   service so you can help transportation from the city which is a shared service and also in addition to that within the network within the vertical industry domain knowledge you can share the   knowledge across this one .

So that is what the effects of clustering and the   production costs are lower due to   availability of specialized resources such as competing suppliers ,skilled labour and infrastructure and on the demand side, the informal externalities from the other firms and   the reduction of the consumer search   costs are beneficial for total market   demand so since every firm is looking   for the customers ever firm is   looking for suppliers and for the suppliers also since there is several   l firms inside in a cluster. So there is a scale for both the supply and   demand firms to make connections with the cluster firms.

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The clusters are for example the clusters are geographical concentrations of interconnected companies, specialized suppliers, service providers and associated institutions in a particular vertical if you take the wine cluster in California the auto cluster in India or some other cluster in China or a pro clusters in the South Tamil Nadu so many of them have specialized suppliers and they are all interconnected companies their service providers like while providing the logistics and other associated .

We have power looms then there could be repair and other service providers and associated institutions like universities ,training institutions and so on current belonging to that vertical now the proximity of the companies and institutions fastest better coordination and trust lowering the transaction cost, minimizing inventory important costs and delays and so on because you know any service firm like logistics firm which is a truck or a train or a ship .

What it can it has the advantage of scale for running their business that is because there are very large number of companies doing within the business and clusters allow companies to operate more productively and sourcing inputs accessing information, technology and human resources .

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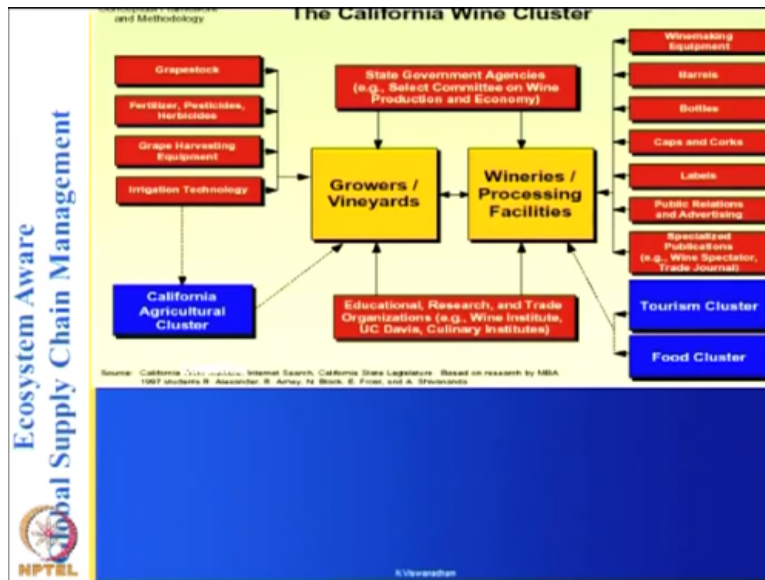
So both the clusters for example this is the cluster of California wine cluster you have this contains all the ecosystem parameters here you have wineries processing facilities the growers wine yards and the state and set of government agencies you have education research trade organizations and you have all the people who are making the things for wine bottles and wine and you have tourism cluster and a food cluster.

And you have this is the agriculture part of it ,this is the grape fertilizer pesticides grape harvesting equipment and irrigation technologies and this is agriculture cluster so you have the agricultural cluster this is the wine yards the wineries and all the other associated this one for export and so on so this is one of the very famous cluster names that care.

California is now a significant player in the wine industry challenging Italy, France and other European countries. UC Davis helped with the new techniques of mechanical harvesting, drip irrigation and field grafting ,so there are several advantages to having these clusters here .

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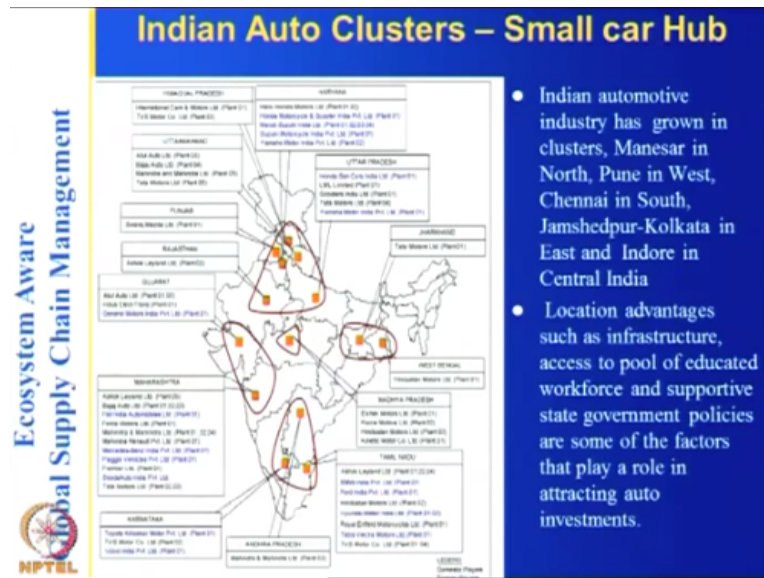
So you have for example the Indian auto clusters India has become a small car hub in this and the small car hub in this is there for example you have in Delhi near Delhi and North and you have near Kolkata, Bombay and Chennai these are all the cluster elements of auto clusters so basically if you want to look at any firm relating to the auto cluster basic where would you look at in one of these regions. So the reason be that you have interconnections with all this you have all the infrastructure that is developed for these clusters already .

You can use that infrastructure and you need order to and you have a trained manpower and so on and also the culture .so you have the Indian automotive industry has grown in clusters Manesar in North , Pune in West, Chennai in south and Jamshedpur-Kolkata in the East and Indore in Central India of course there in Central India there is Madhya Pradesh there are some plants here. so location advantages such as infrastructure access to pool of educated workforce and support state government policies are some other factors that play a role in attracting the investments.

So when you have this auto cluster or wine clusters or a pro clusters or electronic clusters it is always advantages to locate the firm towards that when you locate your firm in such locations then of course there you have an advantage of using all the facilities including educated man power and the training schools that they have already those .

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So they are special economic zones that come and mainly India and China idea has a lot of things every country almost has several   special economic zones special economic zones or geographical areas that has economic laws   different from the   rest of the country so if you look at   the rest of the country and the economic   laws in these in the economic zone then   there are they are basically different how are they different they are different because you know for example   the infrastructure is very good   in a special economic zone in other   words the water power and other facilities are all available .

And also there is transportation within the zone   that is available and then there are   trade laws that are this one once you   manufacture get into this you need not   to pay import duties when you export you need not have to pay duties so these are basically locations but you employ people within the local people but you can also sell locally but you have to   pay tax so these are special regions   different from the country the goal is   to attract foreign investments.
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So there are all kinds of special economic zones in ITes in pro in electronics for   example in Chennai who have in   electronics in auto and so on so the   SEZ have established in many countries China, India, Jordan, Poland ,Philippines Russia and North Korea and also United States   they have few SEZs the Indian SEZs are not as effective as those in   China probably because they are not focused.

For example China's growth is not attributed to the special economic zones that the government has created but India is also some India probably has   created the special economic zones much

before China did in 1968 but it did not   take off as much as this one and I think   the success of special economic zones   in India is not that very good then   we look at what is called the investment climate and other indices you   know every country has an investment   climate.

 If you look at the World Bank reports World Bank reports talk about investment guarantee investment climate or the human resources the power, water and other resources the infrastructure on the government ,loss the business climate business friendliness of the government and the   quality of life because when an industry   wants to start a business in any country   then their employees look for quality of   life.

So the quality of life and ease of   life and the education   for children all these factors are matter for the employees so that is where I think the investment climate has not improved.

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 There are lots of reports under the World Economic Forum as well as World Bank and all that and one is Global Competitiveness Report ranking depend on   elements of the macroeconomic environment, the quality of public   institutions and the level of   technological readiness and innovation   in other words every year these reports   are produced by the top agencies of course in addition to the reports by lot of consulting companies like Mackenzie, PWC , KPMG and others they also produce reports on the investment climate and   business friendliness of various   countries.

So the Global Competitiveness Report is one such and also global information technology report this is a report is called Networked Readiness Index(NRI) is a measure of the degree of preparation of the nation to participate and benefit from ICT developments you know information technology is fundamental for the growth of an industry so in other words either the internet or email or the use of use of software packages like ERP and other this one and the trained manpower in this it is very important for the country to benefit from the industrialization.

So for this reason there is a global information technology report which measures how many people have internet connection and how many companies are interconnected how many transact their financial transactions with the bank via email and so on there is several of these factors they take and this is a report that talks about this I mean and there is what is called an investment climate which was defined in 2004 by the world bank and this defines the macroeconomic, fiscal, monetary and exchange rate policies and political stability .

A political stability becomes important political elections even in democracies the elections change the governments one party goes off and another party comes in so and then this change of policies and all that and also the monetary policies exchange rate is a very volatile how they change and regulatory framework entry and exit labour relations, finance and taxation you know for example the taxes to trade tax import and export and the items they keep changing every year or depending on the economic conditions and so on.

I mean some government sometimes liberalized sometimes they turn product protectionists and so on so physical and financial infrastructure power ,transport ,telecommunications and banking and finance this become important now one of the things that this important is the capital. now for example the input interest rates of your borrowings in some countries it is low in some countries it is high and the tax cap the corporate tax is high in some countries and low in some other countries .

So all these things matter because ultimately where why do you want to locate your business in a foreign country you want to make money so for that reason it is very important to look at the investment climate of this so their various reports by various agencies some talk about logistics there is a logistics index that is a connectivity, connectedness index and there is the

information technology index there is a global competitiveness report and the doing business with the country kind of reports and the investment climate reports and so on .

So what do these talk about they basically are giving the business friendliness of a particular country but rarely they do talk about the vertical because if you are a company you belong to your vertical you are either health care you are either auto or electronic or your some other service electrical power or manufacture of health care equipment whatever so you are in a particular vertical so what are the rules and regulations for that vertical.

What are the clusters that are there in that vertical what is the kind of trained manpower you have in those verticals and if you want land in some other place what is the kind of land you can get in those places these are the basic issues that you have and that is where the investment climate comes into effect so there are lots of reports this one but the point I am making here is that these investment climate are country based in other words they give you one index.

So 34 for India ,24 for China this kind of range of course it is a detailed analysis and they basically aggregate all this and then give you an index score but our interest here is vertical based or product based why product-based because supposing you are talking of oil and gas then you need refineries ,you need ships to carry oil and then later and petrol you have all kinds of issues like that , if you are talking of electronics then you have light products with like micro processors which are although they are light they are very expensive so you can airlift them.

So the way to value ratio is important when you are trying to choose the mode of transport so if you may want to choose a air transport so air facilities become important if you Intel once locate factory somewhere so they although this these reports are done in a global general fashion ,so our analysis is for a particular vertical or a product and most of these things are empirical and data-driven in other words there is a lot of data that is collected by the World Bank and other agencies and they do they do data analysis using this.

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And of course there are lots of location consultants, the location consultants are supports the whole location selection process, starting from initial search till negotiations or investment subsidies and agreements on land or buildings and so on so of course the location consultant

has charged lot of money depending on the percentage of the investment that you have if you are investing 400 crores probably they will ask for a 5% or 6% of that has the streets ,this multi attribute evaluation of locations is usually done by assigning weights directly, multi attribute value function, linear additive technique.

There are several ways in which you have you have multiple parameters that need to be satisfied you want to have very good resource ,you want to have low taxes ,you want to have high transportation and all that you were yet you want the place that is cheap in terms of the rents and so on so basically all this wish list need to be prepared and then it has to be with assigning weights and priorities to what you want .

But there are lots of popular location consultants like IBM, Buck consultants, Deal Tek ,PWC and so on yet certainly there are several of them .

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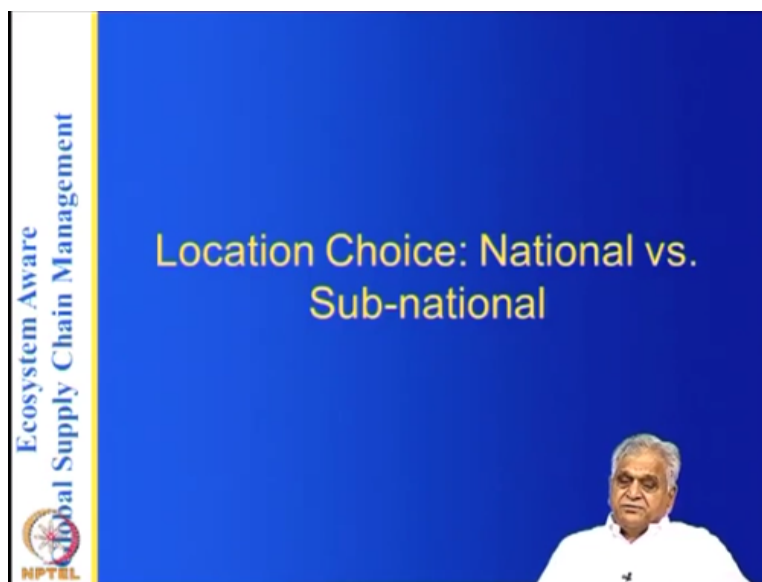
So that is what we talk about how important is the location and there lots of lot of it is basically literature survey of what we have now when we are talking of the location choice now let us define the problem of location choice you have to basically choose the nation or the country where you want to locate your plant and then within the nation as of national choice.

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An MNC face two kinds of location choice problems then it is doing foreign direct investment the first choice is the country for investment this is a complex decision subsumes with this decisions on the mode of entry and the industry of entering the second one is the choice of the city or town in which the chosen country to build and operate the subsidiary this decision involves evaluation of alternate cities with respect to various location factors or negotiation with the host governments. So you have to first choose a country and then choose a location within the country in a state and basically negotiate various shops for your company so this is rarely an optimization problem this really an optimization problem and one has to use an iterative technique .

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So the location decisions are for example the mode of entry the mode of entry could be a green field investment that is you go start to buy a land you build bring the equipment and start building the buildings, operate the equipment and so on so there is an installation time that is involved for the buildings you had to acquire the land and sometimes the land acquisition could be a big problem or you can get it to a joint venture with somebody who is already established that field and you can jointly make all the decisions and so on .

So the advantage of joint decision making is if you are a foreigner the other side is the local and he has the domain knowledge he has the political connections and so on, so joint venture is preferable in complicated cases ,industry of entry the main line of business of a multinational enterprise or a diversification from the current business so you can have the label of a particular big company but you can talk the main line of business of MNE or a diversification for the current .

You know if you are in health care you could be health care instruments you can be hospitals and several other things you could do telemedicine or so I mean or otherwise tourism many medical tourism or something so basically there are several ways in which you can enter any particular industry.

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This location decision what are the types of firms single plant firm the problem is to find a single location from a given set of potential locations so for example you want to look at a country within the country one of those options add a vertical multi-plant firm a firm with multi plant production process and plans to locate each plant in different locations and here the location choice is to choose the location for each plant simultaneously .

You know for some reason it is a distributed manufacturing site and these are located in different parts and you want to simultaneously choose those spots but horizontal multi plant firm a firm with the decentralized plant locations across the country ,each catering to local demands from the nearby plant. In other words instead of having one single plant at the center of the country and supply to all corners of the country that is one way of doing it in other ways you can select all the 8 corners of the city or 4 corners North, East,West ,South and locate the plants there the location choice problem in this case is similar to classical physical facility location problem like the center of gravity approach and so on.

So are you going to have a single firm are you going to have a vertical multi-plant firm or are you moving want to have same firm in multiple locations in the same country so you want to decide about the country, about the locations where it is located right now .

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Sub-National Location Decision

- An MNC is interested in locating a drugs and pharmaceutical plant in one of the four locations Ahmadabad, Mumbai, Delhi, and Hyderabad.
- The location decision process has the following steps:
- Evaluate and rank the four locations with respect to various attributes and the MNC's firm-level characteristics and objectives.
- Choose top two cities and negotiate with the respective state governments for possible incentives.
- Iterate till the final selection is made

So sub-national location decision is an MNC is interested in locating the drugs and farmers proposing if there is a drugs and pharmaceutical plant in one of the four locations Ahmadabad, Mumbai ,Delhi and Hyderabad and the location decision has the following steps.

Evaluate and rank of four locations with respect to various attributes of the MNC firm level characteristics and objectives ,choose top two sides and negotiate with the state governments and go on iterate so first of all you have to choose the locations that will suit your purpose and then negotiate with the state government for this offset can give where in terms of taxes, in terms of facilities in terms of free land whatever so you have to basically look at these issues .

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And finally the location decision problem has two components evaluation of the locations and negotiation of the state government and simultaneous negotiation of MNC with all the state governments is also possible in other words if you find the 2 or 3 locations are equally good and what depends is on the shops that get that the firm gets from the state then one can go into the state government negotiate simultaneously.
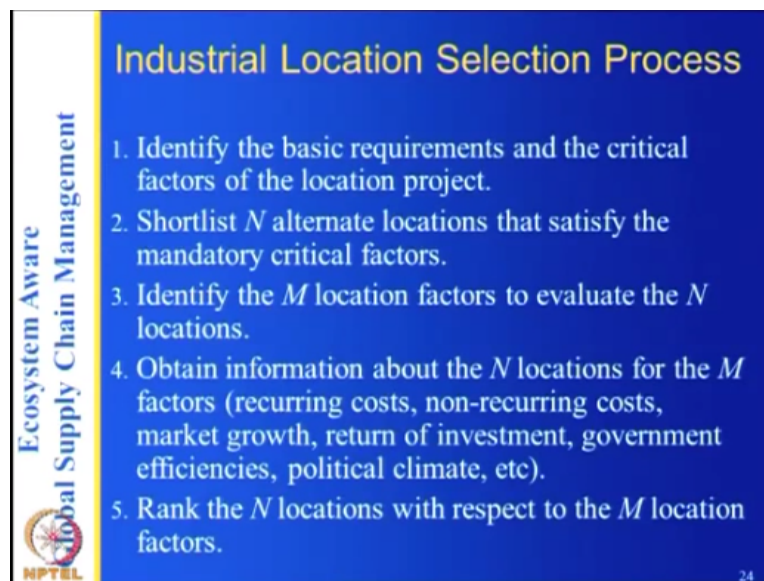
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Because the factors that influence location decisions what are the kinds of things that one needs to industry inputs like for example electricity, water and so on and blue collar workers

training institutes, agglomeration and network effects localization of economies measure economic diversity communication technology number of days to get connections for various technology, telephone wireless and so on and transport that is sea ports, airports , railway stations and so on.

You are looking at laws and regulations that is the difficulty of interfacing with various government departments, Labour ,Customs and Excise, Income tax, Pollution Control and so on and I cannot make on financial issues, Corporate Income tax , Import tax ,Export tax and so on and risk political stability intellectual property friendliness of the government conflicts with neighboring governments communal diseases and so on. Living conditions ,Consumer Price Index ,crime rate, real estate prices, number of hospitals so third party services legal, advertisement, logistics and so on.

So basically if you want to write a wish list so you can always also classify them as resources institutions and delivery mechanisms and but in real terms these are all the kinds of facilities that one needs for making the location decisions.

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So what is the industrial location problem process identify the basic requirements and the critical factors of the location project shortlist an alternative locations that satisfy the mandatory critical factors and identify them M location factors to evaluate the N locations so you have

say 3 locations 1,2,3 and what are the factors on which you want to evaluate this we want to have power availability, human resource availability, clusters .

So you identify M location factors to evaluate the N locations and obtain information about the N locations for the M factors recurring costs, non-recurring costs, market growth ,return on investment ,government efficiencies political climate etc and rank the N locations with respect to M location factors .

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Fig. 8.1 Dynamics of the location decision process
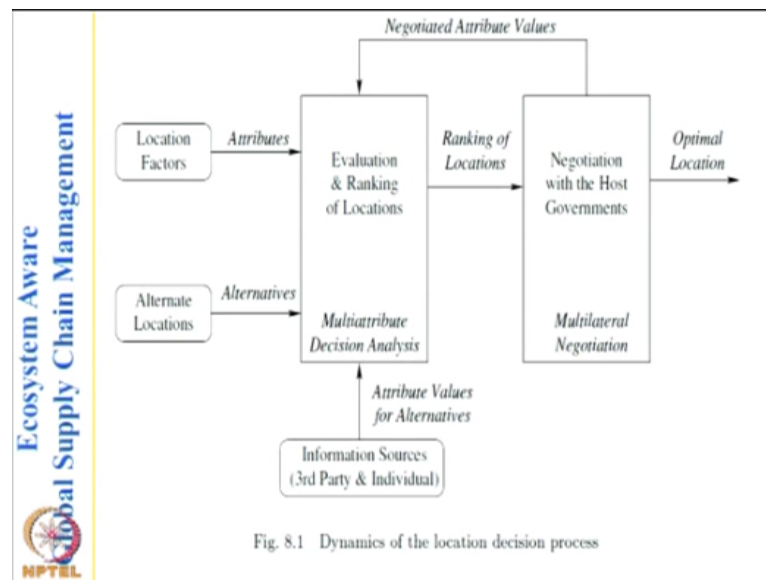
So what you have here is the basically this the particular slide summarizes the location dynamics of location decision process you have for example location factors what are the things that you are looking for you have various alternate locations and this will be to put for evaluation ranking on locations and you can do using multi attribute decision analysis and once you have the ranking of the locations you can start negotiation with your companies .

So once you start negotiation with the companies then with the host governments you get an optimal location so sometimes you may get into multi lateral negotiation on this one and once you have the negotiated what is that you usually negotiate for free land or you negotiate for taxes, no taxes, no sales tax ,no income tax this kind of things you negotiate on some time and then get at the all the alternatives.

So what you have here basically is a scheme of evaluating the location of any particular industry using this now the issues are the following that when you are selecting the location you have to first locate the country and then afterwards you have to look at the state in which this is maintained so for example if in the biotech case if you want to locate you are looking at China ,India and Singapore then you may want to find rank order these in terms of the resources availability and the government regulations and also the social groups also the delivery mechanisms like clinical logistics and all that.

So once you have selected a particular country then you go back to the city and do the same kind of analysis so in each time what is important is the investment climate she is looking at the investment climate that is what it gets too so basically what we have done so far is we looked at the problem of location problem and looked at the ideas of what are the factors that you looked at what are the factors you are going to look at in a holistic way but what we are going to do next is look at the ecosystem.

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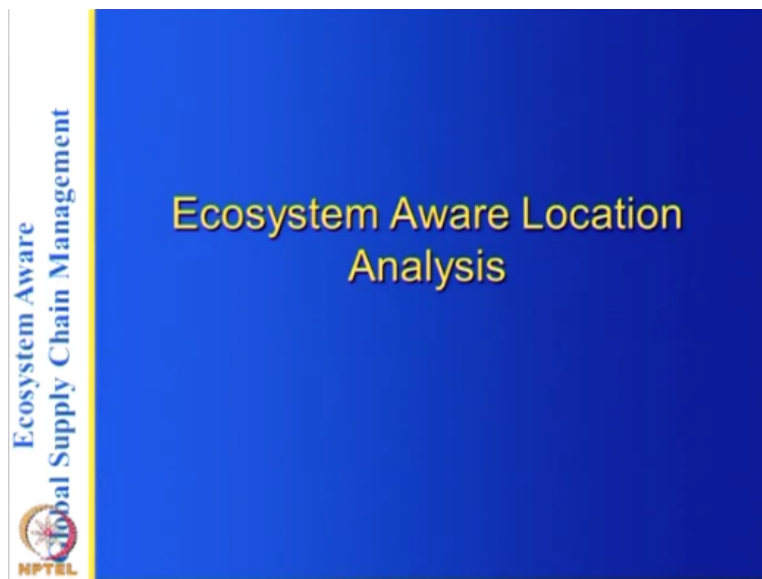
So far and this is what we did is the literature survey an identification of the problem now before I go to the ecosystem aware location analysis let us see what are the disadvantages what are the problems you will find this now each time looking at whatever is the available literature either world bank report or this one they are not vertical based there for the entire

country some of the factors like the business friendliness of the country and the taxes trade tariffs and so on they basically are the same they depend on the country.

There are some other factors which are vertically dependent for example if you have trained manpower English speaking manpower then you are more suitable for IT but if you are starting an auto industry then you require people trained in machine and similarly if you have their kind of resources that you require for IT or basically internet and transmission via various kinds of things cyber internets and so on.

But on the other hand if you are transport want to transport auto components then you require either ships or trucks so the kind of infrastructure that you need for each of these vertical system is different so what is needed is you need a system or a framework where it depends the location analysis is done both using the vertical and its properties and also the location and its properties.

So the location properties are you are looking for all the resources on the government regulations and the delivery mechanisms whereas in the supply chain itself if you have the clusters if you are nearby clusters then in one country and you do not have these clusters in another country then it becomes the automatic choice so what is needed is to look at the ecosystem aware location analysis that what we are going to do .

So what we are going to do in the next lecture is to look at the ecosystem map look at the general map of the ecosystem and look at the various kinds of parameters and define what is the location analysis and of course there are multiple attributes here you had want to choose the resources you want to choose it access you want to choose the free trade agreements and so on the countries to have these so in all this it becomes very important to look at the entire ecosystem parameters that is what we are going to do in the next lecture but so this is the supply chain ecosystem-based hierarchical structuring that is what we are going to do in the next lecture will stop here .

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