Course on Landscape Architecture and Site Planning-Basic fundamental
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Lecture 32
Module 7
Landform Design (Continued)

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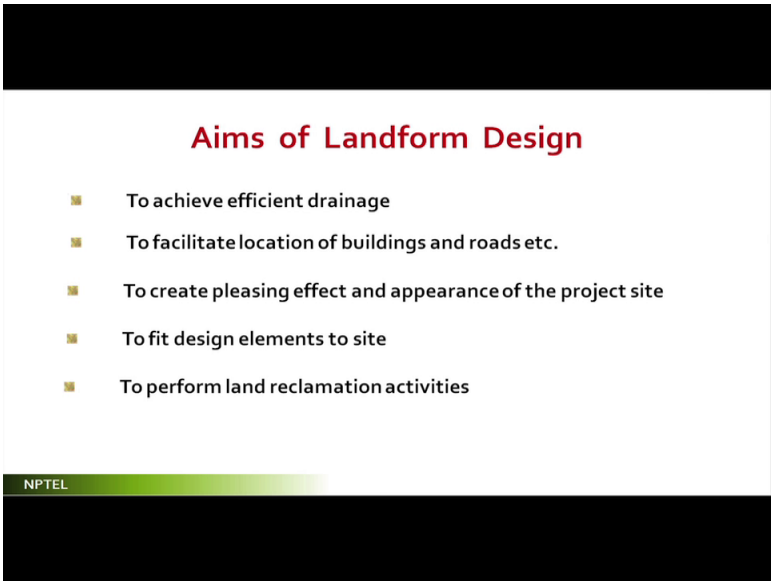

So if you have understood what are the aims of the landform design let us go forward, I am just putting the slides once again to reiterate recap for efficient drainage, for facilitating building and roads and other functions for creating pleasing effects to fitting design elements there and to (lands) landform reclamation activity, these are the primary aims of the landform. Now let us fall back on the analysis, we have done a set of analysis and you remember that I said in the whole process of landscape design you should be the analysis before, not when you are working on these different aspects and trying to solve the issues because if you do the analysis before, then what happens is your priminilary plan is already prepared.

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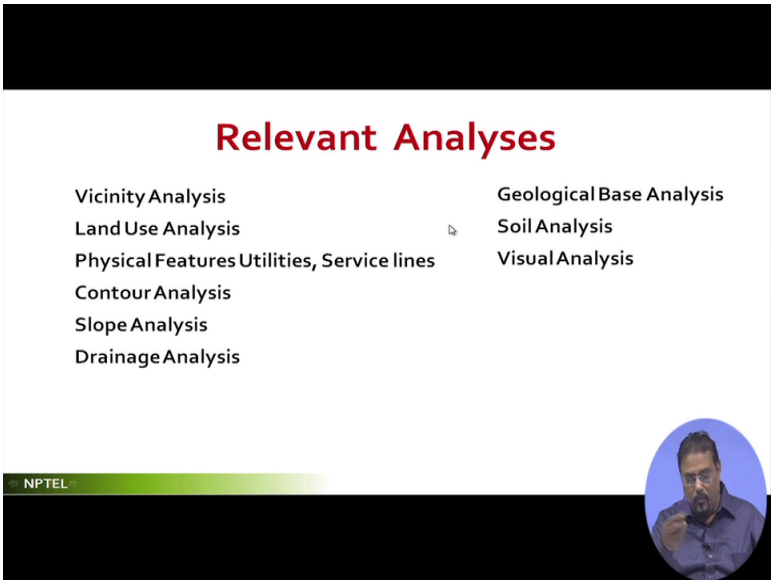

And rest of the things are detailing it out, so what are the relevant analysis that you have done earlier you remember the list of analysis that I have given earlier out of which are relevant for this particular landform work. Here in this you will find, essentially vicinity analysis you require, why this vicinity analysis is required for landform? Then what will be the profile of your entire land will also depend on what is the profile of the surrounding is something like this, if suppose you have a flat land and you have the hilly areas all-around of course to create a contrastic and keep this as flat.

But it is always desirable that the profile of your landscape land also goes in harmony with the surrounding landscapes you remember I said that earlier, so vicinity analysis you are now going to take care of. Land use analysis because the land use is going to be here since you are mixing land use and the landform together so the land use analysis you have to know if it is such kind of activity whether land use is such that it is not very much manipulable or changeable, then this land use analysis will going to guide you on that.

Physical features utilities and service lines because here I will discuss this when I talk about the criteria we will see there are certain physical features which are going to be constant to us, there are certain physical features which are going to be you know may be useful to us, this you have to understand. Contour analysis because I need to see how is the (())(2:41) contour. Slope

analysis I need to know how is a slope, now if I say with respect to the aims you will find the contour analysis will you the relative idea of the levels.

The slope analysis will give you the idea of the slopes and the steepest of this, now how where you are going to put what kind of functions that means the facilitating the function positions of all these, locations of all these will be now very much guided by the contour and slope analysis. And then again fitting the design elements to the site is also going to be supported by these two. Drainage analysis because drainage is one of the prime objective of my landforms so drainage analysis I must know I should not do any kind of landform activity which is going to stop my drainage I will just give one simple example of this.

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I had a land like this where the entire regions water was passing and it was following like this because of the slope and I have my property which is limited to this I am drawing a section in section my property is limited to this and my owner or me as a designer I wanted, no I do not want this kind of slope land I want to make it flat here and then sloped here possible anything is possible you can do this, the moment you do it your landform activity you have done and you can always claim that within my site whatever I can do but the thing is the moment you have done this what you have done is this particular flow of water now got impeded originally which was flowing like this mow it got impeded over here, interjected.

This is not right, so what happens is your drainage analysis will guide you, you know when you are trying to do some bit of landform changes, then immediately the drainage analysis has to be followed, okay let us see refer the drainage analysis and if you find it is not creating much of a drainage problem, then you go ahead with it or in case if you find that there are certain areas where you have the flatness and you want to take the water you rather you want to enhance the drainage because the drainage is being blocked or rerouted with the landform, okay these details I will discuss one after another but this is how the entire set of analysis will be required. Geological based analysis is for this soil and it is sub soils soil analysis for the top soil because that is what we are going to handle and the visual analysis how it looks like the profiles.

So all these set of analysis I do not remember about 14, 15 analysis I listed earlier and explained. Out of these so many such analyses already would be helping you or (())(5:13) in your landform (pla) design.

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Let us go to steps, if you follow the steps I will try to explain the steps as briefly and as discretely possible so that you get the idea of it there will be some broad may be there are some details which I will talk about. The broad steps, first you are supposed to do the landscape design within which the landform design.

So what happens is, now here whether landscape design first or the landform design first? Many of my students asks this question, my point is everything is almost integral they go side by side

because the landform design is a part of the landscape design that you are doing. And within this if it is then when you are creating the landscape automatically the landform also you are creating. So you are creating a landform checking with the overall landscape concept of yours and then trying to adjust the landform and then trying to work out and change your original concept of the landscape.

So do not try ever to contest against each other, no it is always integral and they are simultaneous, okay. So what you do now? First, you study the existing landform profile, whether it is undulated, whether it is flat or there is one slope or whether it is peak like this, whatever you study. And then you study the soil type, within that particular site what are the different soil types that you do have means I am just listing few here there are many more soil types so you can in terms of types there are you know like say Clay soil, Loamy soil, Sandy soil, Silty soil, Black cotton soil, Rocky, Micaceous, Aluvium see different kind of soils what this I will advise you that you please read or go through very fundamental or scientifically written books on soil I would say soil engineering.

Now when you know about the soil basically what happens is the soil is the component that you are going to handle and if you understand the soil well it is not necessary that you are going to (soi) use only one category of soil in your landscape or landform. If you understand the soil well, then I such case what happens is you know how to handle it how to manipulate it, okay. So basically it is nothing but you know as if like cooking you are trying to cook a dish and you have multiple such components and each of these ingredients that you are going to put in the recipe you know what is going to make what change is similar.

And I can also tell you that if suppose you have a if you are lucky to have a little larger landscape site, then the soil also need not be just one type there may be by virtue of the you know natural creation of the earth crust there may be a little bit of variations of soil within your type soil landscape domain itself. So try to understand different kind of soils, okay and then you study the composition of the soil, this let me explain a little more. The composition of the soil if I try to show with respect to the pie diagram is something like this.

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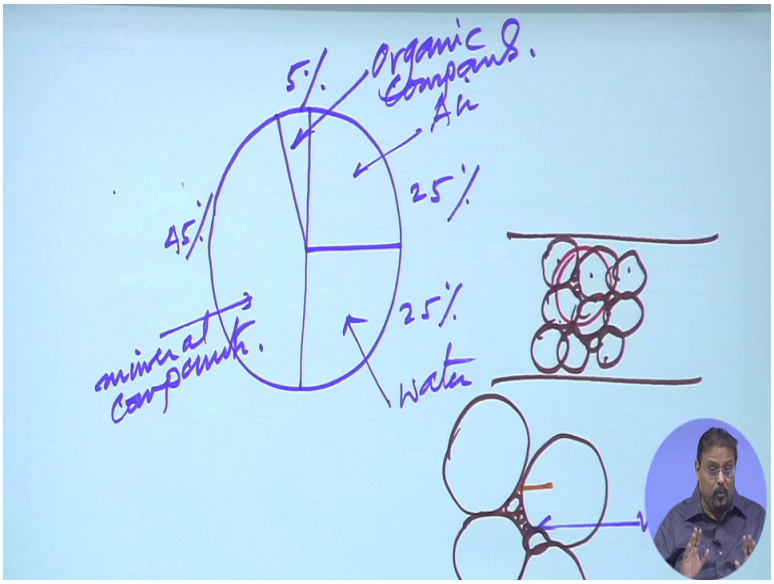

If this pie diagram represents the soil it is something like you dig out a bundle of (ars) you know clot of soil and try to analyze it and try to see the composition of it. The very common composition that is understood is like the soil would be having almost 50-50 of the materials one is the set of soil particles then another is most of most common deviation of the composition is 5 percent, 45 percent and then it is 25 and 25 percent, what is it? This 45 percent is actually the soil that you do see and this is nothing but mineral components of various size different granulated size mix of different sizes.

This 25 percent is filled with air and this 25 percent is filled with water and what is this 5 percent, it is organic components or let me write organic compounds which is this organic compound mostly being contributed by the vegitations which had decade, which where there or even some organic components which came and got mixed up with this because it is the whole process of the natural soil that you see it has grown over time and it had undergone lot of changes, there had been erosions what erosions wind erosions over this.

There had been vegetative growth over it, they had been decay of vegetative growth, there have been death of vegetative growth, there had been burring of this vegetative growth all this things happened and in the whole process what happens is some time you might find that there is a soil area which is very very one tide but does not have a much of vegetation, but still if you dig the soil you will find that there is a good quantity of decade vegetation this you should you know

attribute to a situation when the (uppers) from upstreams some vegetation had been flown away by water brought here and then got stuck here and ultimately decayed and got embedded, this you have to understand.

So this is a very typical composition of it, now the question of 25-25 you of this water and air. Very interesting, sometime you dig a soil you find is very dry, sometime you dig a soil you find it is moist. So the moistness and the dryness is nothing but a you know a quantum of the water that is contained within and if you find that the water has crept in to this particular soil and you are digging and you get the soil so easily, then you should be very clear that there are there is more quantity of water. In this (pictu) sheet itself let me draw one more thing, basically what happens is let us consider a soil as (composi) say combination of lots of particles.

So in general what happens is and all these particles of whatever kind of crystalline or geometry form it is for my convenience of explanations let me draw it as sphere, in my drawing it is circular. So what happens is there are such soil particles which are of different sizes, so basically when you dig a soil from this particular part it is a combination of multiples sizes of these particles big to small too small small powders of you know such kind of structures.

Now if I just enlarge one of the part a little more, say this particular part I am enlarging it is basically one big particle, another big particle in an another big particle here in between there is a large particle and a small particle another small particle and another big particle another particle here. If you do see here definitely you can identify that there are air spaces in between, so basically what happens in the realty when the soil particles of different size and their of irregular profiles not necessary it is only in sand that we do see that if you take say multiple such sands particles and if you take a magnifying glass and see they are almost of the same profile sizes are different maybe.

So same profile but in soil it does not happen, in soil what happens is multiple different sizes of profiles different sizes of minerals they are mixed and ultimately came to us as a soil. In such case what you will find is since the profiles are different so they cannot match on the edges very uniformly and if they do not, they are in between they have interspaces this interspaces are the ones interspaces are voids let me call void it will be easy for you to remember so there will be voids, these voids are filled with either water or air.

In fact there is no no scope for air and water to be at the same place or reversed together because you know the water effect has entered in some area then air must have been escaping and it has replaced air. So in such case what happens is when you are seeing this basically if you take now a clot of soil and then you have a magnifying glass and try to see through, then you will find there are lots of voids in between where there are trapped entrapped water and that portion is moist and there are other portions which maybe may not have entrapped water but they have the air.

So this quantum of air and water is a matter of how much water kept in how much the water went into the in between spaces, how much water could escape make the air escape and fill it up and at one point of time when you find that the entire air has been escaped, so now the particles are held with only water. In some cases when you find that the water has escaped, how the water will escape? Either by drainage natural drainage by populations or by evaporations and then if the water has escaped air has crept in into the voids.

So naturally a standard composition of a soil now you look at the same pie diagram here but mind it this 45 degree 45 percent is the mineral component that is basically the soil that we are getting. And now just look at it, if suppose I compress it press it together basically what I am doing I pushing the particles close to each other and more I do it with some pressure then naturally air and water will tend to escape is just like you take a piece of cloth which is moist and you try to rinse it. Once you try to rinse it basically what happens if the cloths will have a lot of fibers and the threads and they will have interspaces which is filled with now water that is why it is moist.

And the cotton fibers are also filled with water that is why it is moist you rinse it you allow the water to escape and also the air to escape then you find it has been almost like very semi dry this is the same situation with the soil when you handle this soils in such cases try to understand what is its composition, okay the next one.

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Study the chemical properties of the soil, the chemical properties of the soil will be (())(15:52) essentially with chemical components that is within it is potassium, calcium, nitrates all these are (())(16:08) you know these are all different kind of minerals or (mat) materials that metals that we have do have in this and these chemicals makes the difference in terms of the soils quality.

It is by this when we find that there are some of the you know chemicals which are more in quantity we termed this as a soil as acidic some which has more of salinity we say we call this a saline, some we call as alkaline. So if you now fall back another your knowledge of chemistry that acidity, alkalinity and salinity and neutrality this this is the basic way by which we always try to identify what is a chemical property of our soil.

You know this chemical property of the soil here it does not make much of a difference in terms of his landform works, but understanding of this is important for reason, this chemical property of the soil which is going to be finally aiding or helping the vegetative growth or the structural (composi) structure of the vegetation there this chemical properties will start playing role. A soil which is very acidic soil which is alkaline if there physically strong enough and equal it does not make any difference in terms of chemical properties.

So the chemical properties we should know not essentially for landform landforms profile making or stability or (bare) to increase the bearing capacity. Basically we need to know the chemical composition just to see that this landform over which my vegetative growth will take

place and how the vegetations that you are thinking to place over this and is going to be helped by the soil which contains some chemicals this is how you should look at it, okay. Study the soil structure, see soil structure there are two things which you must not ever miss, you know why I am highlighting all this things quite often I have found many of the architects many of the designers are not very clear about all this things landscapist also not very clear about all these things.

It is not because of the they have the lack of knowledge it is only because they did not really realize that how much this can make sense in our planning. So I am just trying to give a little bit brief idea about it, two things soil structure and soil texture I will show you through diagrams also. Basically soil structure is how it is bounded, see soil is nothing but again the group of particles held together with something. Now, have you ever seen the soil which is in a drop pone area very hard very hard, have you seen the soil in the moist area very soft, okay.

Basically how it is being bounded how it is being held, how it is being held with so basically what happens is the structure of a soil is nothing but the arrangement of various sizes of particles and types of particles with each other in a place arrangement of that in conjunction with each other whether it is organic compounds, organic components, it is water, air and such. So that is what is structure this you have to understand because if you find that the structure is such that which is concrete to your activity over there, then in such case you have to change the structure, let me give one very simple example, very simple example.

Suppose you have a loose soil it is loosely bounded I hope you will understand this, the loosely bounded soil which you have now over which you want to make a playground, you cannot do that. The moment you find that no the loosely bounded soil cannot be used for playground then you have to now change the structure of it, changing the structure means you will do some activity over there add something, remove something whatever I am not discussing that here, but basically you are changing.

Suppose you want a area where you require a soft soil little soft soil that means you want to make a lawn and you have the soil very hard, people who are very familiar with the lateritic soil will probably understand this. In the lateritic soil if you find that the okay may be the top layer is

just a soil where you do not have the much of the mineral rocks, but more you go down you will find that the lateritic minerals are there lateritic rocks are there.

But suppose now you want to make a grass lawn over there and the grass lawn should be holding the grass roots and the grass roots should be held with a little softer soil, but the soil at that particular level is structurally so strong so bounded that you cannot have the grass lawn, then what would you do? You change the structure of this, how would you change the structure? Two ways, one is you remove that particular soil remove that particular deff and bring in better soil which is softer soil and replace it and over that you grow the grass or else you let the same layer be there over which you put the soft soil and ultimately grow the grass.

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So these are different ways so basically soils structure is the different kind of formations or how it is being held together. Soil texture, soil texture is you know basically the composition or the combination of different particles sizes of the soil. See there is a nice monograph I will show you it is if you take a clot of soil in your hand you will find some part of the soil is very very fine, so the fineness to the roughness or the size in terms of fine to rough or the grains in terms of fine to rough.

This combination is basically represents the texture of a soil, it is not how it is being held, in structure how it is being bonded and in structure what is the composition of it, okay and then once you have understood all these things then you design the landform profile because I am still

in the broad steps, once you have understood this you design the landform profile let me just and also after that once you have profile your work out means you have designed the surfaces and its curves, its contours and it's you know all these undulations.

After that you select the soil material by which material are you going to have this and what is this composition.

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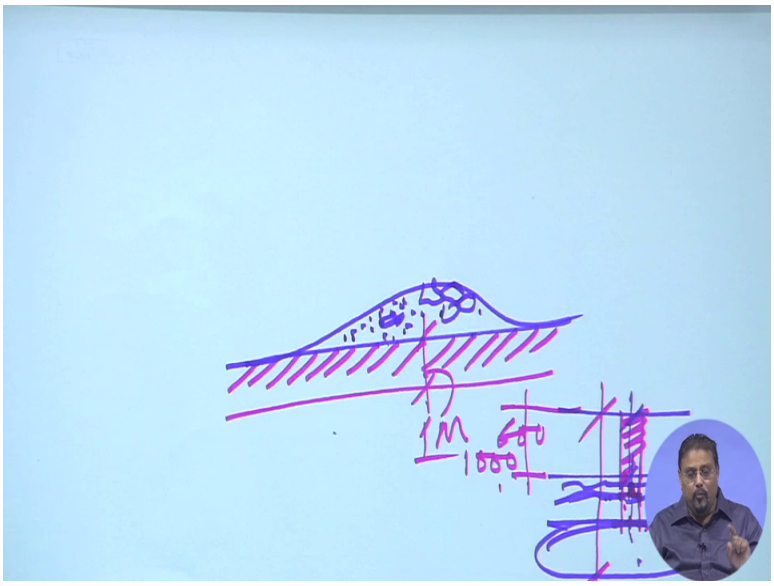

Now, schematically let me show you there was original line like this has a soil some soil type and which has a some kind of structure and some texture over which you want to bring in some different profiles, so you change the profile to this so there is a changed profile. The moment you do the change profile I would then advice you that you have you understood what is below at this level, the soil have you understood this? Have you studied? Have you studied with respect to what type of it, with respect to what kind of structure it is? With respect to what is its composition? With respect to what is the kind of texture or structure.

You know means we have experienced quite often when we had been handling building designs and for piling we have found in some portion of the east we have after certain deff we have found decade vegetation. This decade vegetation let me tell me take an example here itself suppose unfortunately your site looks very nice, the soil looks very stable and you have to do some bit of activities over there in terms of landscape works and you want to dig to certain depth and after about 600 millimeter or say 1 meter then you find it is muck it is very very blackish

kind of muck very soft soil then you have to understand that if this was the layer and up to this layer which was very very stable apparently and structurally also fairly stable and at this point the soil is very very mucky keep on digging.

After sometime again you might find that there is a rock (())(24:31) over here. So what happens is when you are trying to put a function over here, then you have to know that up to how much depth you are likely to go. Once you know how much depth you are likely to go you just keep on digging, study the depth by depth this soil straighter. Once you are studying this, then at this point once you reach then you have found the no it is decayed vegetation it is mucky it is sticky, okay decayed vegetation do not stop go dipper dipper and dipper and then find out up to what that this decayed vegetation continued.

You might be very surprised to see that after about say 300 then again a good soil, so you have to understand this lower part and this is what is the see generally what we say is about 600 millimeter about this is very thumb rule we say 600 millimeter to 1000 that means 1 meter we consider this as a top self for our work. And for building works you know the structural designer or architect is very happy if they know about the soil up to the 1.5 meter because a standard building which will have over a 1.5 meter depth of foundation they are happy if they know about the soil of that.

In landscape certainly you are not going to go that deep either, but the thing is at least a 600 or 1 meter you must watch study them carefully and do not relay simply on the surficial (opini) inference on this, so what you do is for doing this kind of work make a study up to 1 meter of depth and once you have understood this in totality and then you are now taking a very you know conscious decision that you are going to do sometime over it because this is also going to add weight to this particular surface, it should not happen that you have decided this particular line of course in nature it does not matter much and you do not care much because that instability which causes a little bit of local subsidence may not give much importance to that.

But I will tell you technically you must get it clear that whether this amount of weight of this particular volume is going to make any kind of subsidence even if few centimeters that you watch. That means you are studying this particular soil very carefully and now you are designing this profile. So what I am trying to say over here is now you are designing the profile only when

you have understood all these, okay and then you are selecting the material this is the profile, fine what material? Is it made of rocks? Or is it made of sand? Or is it made of mix of different granules or is it mix of sands other different granules of soil rocks, shingles, (())(27:11) and all that.

So the thing is this has to be very clearly understood when you are working on it, so this broad step matters a lot and if you are you know at least try one in one of the landform projects landscape projects where you are trying to handle this landform and then you see that you are very clear about the soil (cat) category, the type, the structure, the texture, the composition, the chemical composition all these things you are understood and now you are trying to do follow these two steps I will be very happy and I am sure that you will be doing a great justice to the whole work at least to a great extent you are design is not going to be wrong, but this is not all I will continue again to clear more of the ideas on this.