Lecture -31
Non-Motorized Transportation(NMT) Planning: Other Types of Pedestrian Level of Service (PLOS)

Hello and welcome back. So now that we have looked at the different pedestrian levels of service and how to develop them using flow models, let us introduce you to other types of pedestrian level of service as determined by the IndoHCM.

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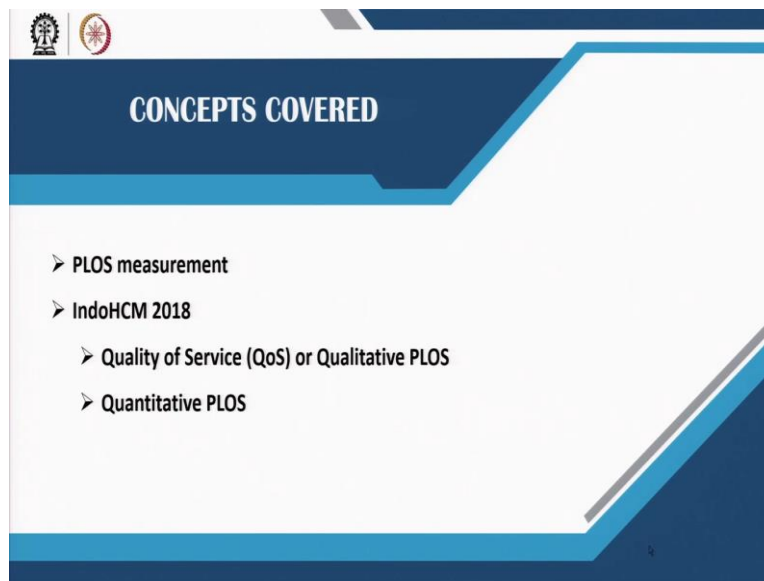
This is especially looking at the quality of the service versus the quantitative level of service. So we will give you an understanding of how these two levels of service have been developed in the IndoHCM that has been published very recently in 2018.

So there have been various drawbacks or criticisms of purely quantitative pedestrian levels of service, right. Because the quantitative pedestrian levels of service are very similar or have been developed along the lines of vehicular level of service, researchers and experts started to question them saying that they may not be very applicable to the walking mode which is very different from a vehicular form of transportation. So when two different modes are so different from each other, maybe there should be a different way of developing levels of service for pedestrians rather than developing it in a similar fashion to that of the vehicular level of service. So then what the first thing that came out of those kind of brainstorming sessions was that perception of safety, comfort etc. have to be taken into account because these involves people who are walking on the streets. As you walk, there is in always a degree of comfort that allows you to gauge how well the physical environment is. So perception of safety and comfort started becoming very important in the development of pedestrian level of service. Hence the terminology was coined which is known as quality of service. Rather than level of service or qualitative pedestrian level of service it is started to be as called quality of service and the measure of effectiveness is users' perception. If people perceive that the facility is not good that means they will not use it right even though it may be even engineered in a very good way or though the flow or the speed and the densities are all indicating that this is good for pedestrians, but ultimately if they perceive that it is not a good facility in terms of safety, comfort then the usage of that facility will be very little. So we will see how all this can be calculated exactly.

The way in which we usually capture the perception of people is on a Likert type scale. So it is called a Likert type scale where you ask people on such a scale for example a question may be asked that how much do you like the footpaths in your neighborhood? If this may be a hypothetical question that may be asked to you as a user as a pedestrian. And you would be asked to give your rating or ranking of all these footpaths in your neighborhood. So you would say how much do you like? You may say that I strongly agree that all of the footpaths are good or the question should be what extent do you agree that the footpaths in your neighborhood are serving the purpose? So if that is the question, then you would say you strongly agree that they are serving the purpose that means you perceive that it is very good or you say that I strongly disagree or anything in between. So there can be variations in the scale. Usually what people do is they fix the middle point and the end point and then play around with the intermediate points. You can have a 5 point scale just like this 1 2 3 4 5 or you can have a 7-point scale sometimes people also have experimented with 10 point scales. Now all of this have their own advantages people usually started with a 3- point scale but they have moved away from it to capture a user's perception in a better manner right, a 2-point scale is usually yes or no, whereas a 10-point scale would be there are a lot of intermediate points where people may strongly believe or not how well are the footpaths in your neighborhood. So this is usually how data is captured about the quality or the perception of comfort or safety or any other parameters from the users of the pedestrian facilities.

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Then they could be easily converted into quantitative figures, for the ease of calculations. However, one has to be very careful that since these are Likert type data they are ordinal in nature, so it determines if one score is higher than the other but the distance between the points is not known. So we do not know if this and this is the same. We do not know if your opinion has to be changed from 4 to 5, the amount of work that needs to be done on the footpaths is the same versus if your opinion had to be changed from 3 to 4. So in other words when an official or when a public official receives such kind of ordinal data or receive such kind of perception data agency has to take a call, right. So nobody wants to build any facility and the users not liking it. Everybody wants that the users to like the facility. Now if everybody says, or the user says that they are only rating the sidewalk facilities as 3 on a scale of 5. So what the officials would want to do is they want to calculate what they have to do in order to raise the perception of people from 3 to 4. In order to do those activities there is some money involved, a rupee figure is involved. So when you are collecting this kind of data it is not easy to say that the same amount of money would be needed to move from a 3 to 4, versus what will be needed to move from a 4 to 5. So we do not know the interval gap. But all we know is 4 is better than 3 and 5 is better than 4. That is all we know. So that is why a mean and average is not usually a good measure of central tendency. Using mode (i.e. the count) is always better.

So in the IndoHCM 2018 method, what they have is, a measure that is called the walkability index. What the walkability index does, it asks such questions to every pedestrian and determines the importance of physical and user characteristics. It determines the importance and it also determines the satisfaction. There are two different questions that are asked. For example, you may be asked how important are sidewalks for you to walk? Meaning do you even care there are sidewalks for you to walk or you would just walk on the pavement. So you would be asked to give an importance on say a 1 to 5 scale. So you would say it is very important, meaning you will rate 5. However, you will also be asked how satisfied are you with the current sidewalk network in your neighborhood? Then you would say well it is very important but I am not at all satisfied. So I am only giving 2. So on the importance you give a 5 out of 5 whereas on a satisfaction you only give a 2 out of 5. So all you do is you do a weighted average of these two and you keep on asking this for all the users or a sample of the users in your neighborhood to get what you call a walkability index score. Now I will just give you an example of one question but this could be done for different questions as well.

Eventually after you calculate, get all of those weighted averages, you can then use this table which was empirically developed to determine what the quality of service that your pedestrian facilities are providing. So, if your score is greater than 124 you are at a very good quality of service, whereas if it is less than 52 you are at a poor quality of service. The next thing to remember is to give actually or to define actually each of those physical and user characteristics. So, the physical characteristics have been defined using five different parameters. One is footpath surface, one is footpath width, one is obstructions, next is potential for vehicular conflict and the other is continuity. If they are standardized and if they are defined, then you can ask the same question to everybody without worrying about the the answers to each question. Because of the variability in the way you are asking questions people will answer it differently. So, there is always a problem when you are collecting perception data if you have not defined the questionnaire properly, then people may give you different answers based on the way you ask the question. So, to frame the questions you will define the questions properly. So, when you say footpath surface, you are to say that a smooth surface without any cracks or bumps for comfortable walking is a very good surface, right, that is rated as the highest surface quality and then you can have different layers up or different levels for footpath surface.

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Similarly, user characteristics are also defined using five different types of measures. One is encroachment. The other is availability of crossing facilities, security, comfort, the walk environment. So, these are all user centric or user behavior questions. So, you ask these 10 different questions; 5 pertaining to the physical environment where people are walking; 5 pertaining to what people feel about their walking trip. You combine the findings of both of these questions converted into a walkability index score and then get a quality-of-service measure.

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Again, these are importance scores on a 5-point scale and satisfaction score on 5-point scale. Remember, we will for each question you will be asked 2 different subsets of questions, how important is it and how satisfied are you with the current situation and based on this you can then measure the quality of service.

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Like I just said, so footpath surface once you have defined, let us go back, footpath surface as a smooth surface without any crack for comfortable walking, so then that kind of qualitative definition has to be broken down into five different levels, right. So, the excellent level will be even surface with no cracks or bumps and flooring, right, whereas very poor would be no raised footpath at all, satisfactory would be bad condition lots of bumps and cracks, whereas good would be moderate quality with few bumps and cracks. So, these again remember are qualitative aspects, we are looking at quality of service. So, when you ask somebody about the perception if you start asking numbers then they may not be able to give you a good or a right answer that will help you understand the perception of the user. So, when you are asking to rate somebody how good the footpath surfaces you have to divide them up into these 5 distinctly. But you also have to have a very reasonable or qualitative way of asking the person what you want to know. If you are asking a person how good footpaths surfaces and say that is it reasonable quality walking is comfortable? They may be able to relate, yes, I do not have any difficulty in walking. So maybe I will rate it very good or if you say that well was not there any footpath at all? They said no there is no footpath at all then you would say if there is no

footpath at all there is no question of a footpath surface. So, then you would rate it as poor. So, this is how you have to come up with scales for different parameters. You can have a quantitative scale and you can actually measure it, you do not have to qualitatively ask anybody. Obstructions has to be qualitative scale; potential for vehicular conflict is qualitative; and continuity has a kind of qualitative and quantitative mixed.

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So, once you know all of this, again these are user characteristics similarly defined for different scales.

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You can then go about and collect the data. So, let us give you an example of how we have used it in IndoHCM, say a footpath of width 2 meter in a residential area is to be redesigned and improved by giving importance to the perception of pedestrians in terms of satisfaction and the importance of various qualitative footpath attributes. So, a footpath was already laid but when it was laid, users' perception was not taken into account. So now they want to redesign it taking users perception into account. So, the following are the mean importance and satisfaction ratings from 200 respondents accordingly, so what they found out was all these A1 to A10 are the questions that we have already looked at, i.e. we have already introduced you to and the mean ratings have been found out to be these are importance ratings and these are satisfaction ratings. So, once you know that, you are asked to calculate the walkability index and corresponding quality of service.

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All you do is multiply each of them, each of the sets, each of the pairs, add them up and you come to a walkability index of 98.71 or 99.

98.71 or 99 and you look up the table and you say that your quality of service that is being offered by the sidewalk currently is at a C quality of service, right. So, then you can do always do a post analysis. Now if an improvement is done and you do another survey after an improvement has taken place you would expect that if everything has been taken into account, i.e., if all the users' perception is taken into account this C would at least improve to B if not to A. So that is how you can then qualitatively measure that users' perspective has been taken into account while improving pedestrian facility.

Now of course there are a lot of drawbacks when you are looking at only qualitative stuff, right. Based on users' perception, that captures user's response comprehensively, although people do agree that if you only look at quantitative aspects and do not take peoples perspective it will not comprehensively look at the scenario. However, if qualitative analysis is the only source, then they may be prone to inaccuracy. Reasons being, people are always not willing to or not answering the questions in a very proper manner, maybe they are impatient. Maybe they just want to get over with it. So they always we have a tendency if you are asked to rate anything from 1 to 5 we always try to rate it in the center, right, we always try to tick 3, on a 1 to 5 scale most of the time. So, you are not able to get proper answer. Maybe the questions are confusing. If the questions are confusing then you get different answers from different people then again relating this qualitative measurement with quantitative measurements is difficult. So, if you do not quantify them properly into different levels then it becomes a problem. Hence it is suggested that both qualitative and quantitative PLOS should be used for Pedestrian facilities. So, whenever you are actually judging the performance of a pedestrian facility, do have a quantitative measure, and also have a qualitative measure, do not just go with the qualitative measure or do not just go with the quantitative measure, combine both of them and then take a call, based on the existing conditions.

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We are looking at a next example on a footpath on an undivided bidirectional road with width 3 meter around a terminal area. Based on a field survey the flow rate is found to be 1100

pedestrians per 15 minutes. The footpath facility is bordered by the kerb on both sides. And the importance and satisfaction are given based on a questionnaire survey that was done. So, determine the PLOS and QoS of the existing footpath. QOS would be the qualitative one whereas PLOS would be the quantitative one. And that would be based on the flow parameters which we have already explained in the previous set of slides, in the previous lecture how to determine the quantitative level of service of the PLOS, and you now we have already looked at QoS. So, let us see if you combine these two what do you get similar answers or not all. So, let us start

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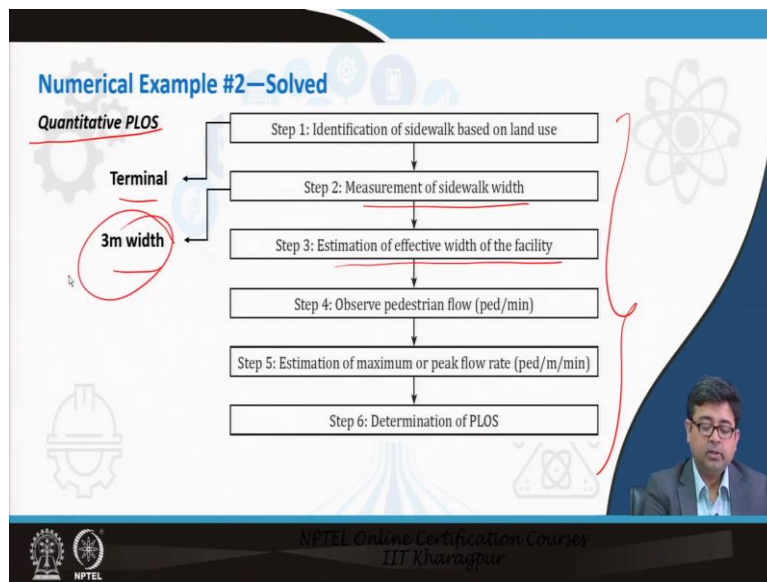
So, in determining the quantitative PLOS, you remember you had to follow 6 steps which are already shown to you in the previous lecture -- you identify the sidewalk based on land use. So here your land use is a terminal land use, you get a measurement of the sidewalk width you know already sidewalk is three meter wide, based on terminal land use you estimate the effective width of the facility. Remember how to determine the effective width from the actual width.

You subtract the different types of obstacles that are there. And each of these obstacles have a certain shy distance associated with it. So here since it says that it is bound by kerb on both sides, so the shy distance is anywhere between 0.2-0.4, and if you just take an average of value 0.3 on both sides and you subtract from the total width, you say that the effective width is 2.4 meter.

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Then observe the pedestrian flow, you are already at given that pedestrian flow is 1100 per 15 minutes, so per minute your pedestrian flow is that you need to then estimate the peak flow rate. So peak flow rate is nothing but you observed divided by 2.4 and you will get your peak flow

rate right because 2.4 is the effective width. So, if you divided by peak flow rate number is pedestrian per meter per minute. So, this for 2.4 meters if you wanted per meter divided by that. So, this is your flow rate. Now you know your flow rate.

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This chart that gives you the quantitative PLOS for each of the land uses. Now you know that the land use is a terminal land use and your flow rate falls between this. So as per the IndoHCM your level of services C, so now you know that the quantitative level of service based on the flow rate. The same time you have already done a questionnaire survey. And you have received the satisfaction and important score to determine the QoS quality of service.

So, you have all of these individual scores again you develop a walkability index WI and you get it as 32.42 or 33.

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Based on 33 you know the table and you see that it is less than 52. So now you see that the quality of service provided by the footpath that you have is E.

So here you have two conflicting answers, right. When it comes to a quantitative pedestrian level of service you are getting a C whereas you are getting a qualitative quality of service it is coming out to E. So, what this does is if you had only developed this using engineering principles then you would have thought that well C is the optimal level of service to have. So, this is the footpath is perfect however now, since you had already done a qualitative survey you have said that you can now assess that this sort of a pedestrian footpath will be detested by users. So now by doing that you can understand that there is something has to be changed something has to be improved in order for it to be liked by all users. Therefore, interventions that will help improve the quality of service, has to be carried out, so that you get a balance between the quantitative level of service and qualitative level service. So, you see through this example I hope it is clear that if you only calculate the pedestrian level of service quantitatively you may get a different picture. Whereas if you only calculate the quality of service QoS or the walkability through the walkability index you may get different answers. So, it is always good to combine these two because pedestrians' perceptions are very strong and have to be taken into account rather than only looking at it from the point of view of engineering design.

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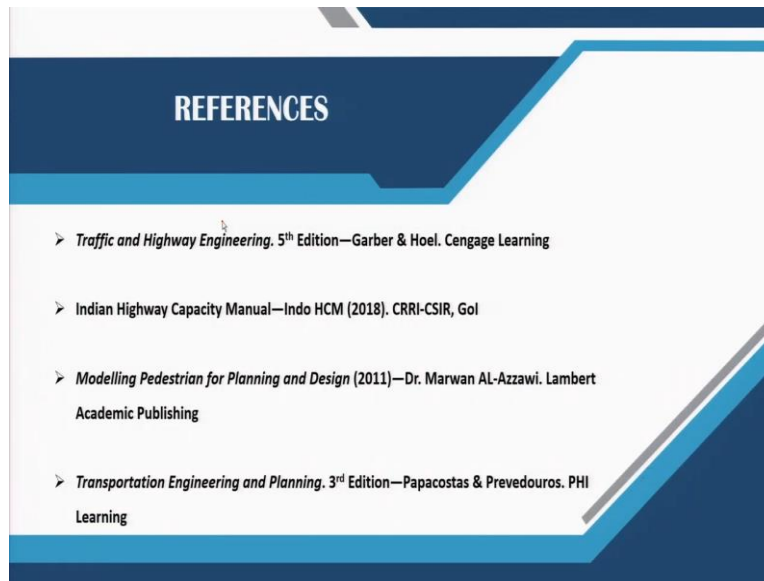
So again, these are some of the references for you for further reading.

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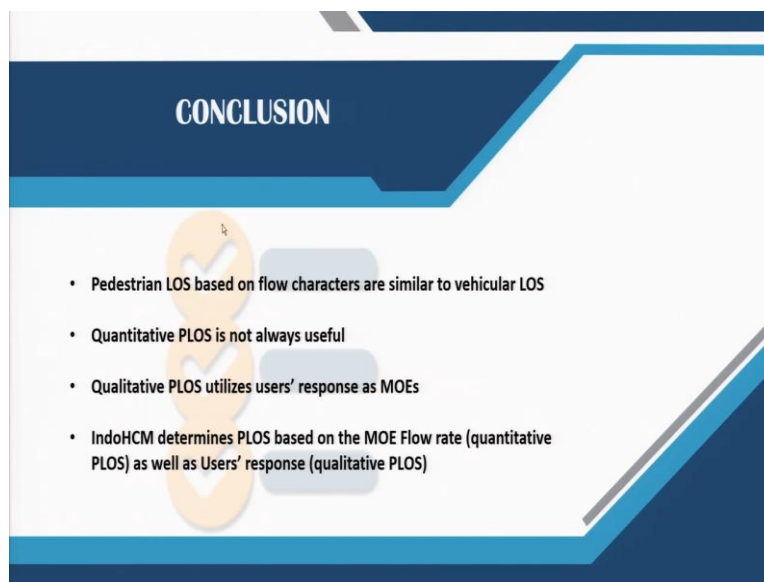
So, in conclusion I hope you have now understood how pedestrian level of services are different from level vehicular level of service and hence a qualitative aspect of it also has to be taken into account rather than only the quantitative aspects but at the same time qualitative levels of service have their own shortcomings. So, a balance has to be developed between a qualitative and a quantitative level of service. And we have given you examples of different measures of effectiveness that can be used to develop these qualitative and quantitative levels of service. Thank you very much.