Sustainable Transport Systems
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Lecture 57
Material Flow Analysis Tool – STAN

Hello friends, so, we are discussing the different kinds of tools which are used for analysis purpose like openLCA we have seen. So, in that category today we will discuss about Material Flow Analysis Tool STAN. Which is quite popular and it will give you a kind of a skill if you go through it and this is freely available software which can help you to see how this material flow analysis is done and how can we use it in terms of like transportation sector or any kind of other activities.

Basically, this is versatile. But you can also use for transportation systems also, but it is as such it is not particularly for transportation system, but, so, we will give the introductory part about this material flow analysis which we have already discussed, but we will discuss briefly. And then we will see about this STAN this tool how it is downloaded and how it is installed.

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Then what are the basic functions and how it is applied what kind of things are there which are to be known, so, that you can use it for whatever purpose you want. But we will focus on largely on transportation systems.
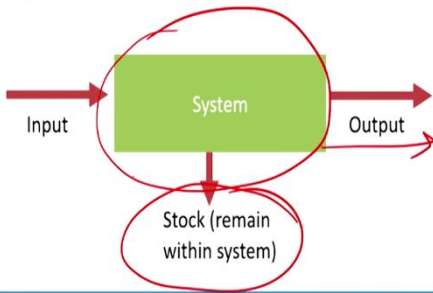
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So, when we define the material flow analysis you already know that it is basically a systematic assessment of the flows and stocks of materials within a system within a boundary system defined in a space or in a time. So, temporal variations maybe there, spatial variations may be there but if you generate a boundary system within that what is the input? What is the output? Import, export and within the boundary system some changes are there in the stock that kind of things are there.

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So, you have seen already these simple equations:

$$Input = Output + Stock$$

So, this is the boundary system and input is coming to this in the system. So, stock is the remain which within the system and output goes out of the system. So, basically output plus the stock is the input. So, that balance must be there.

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And this is the tool STAN which is software for substance flow analysis substance means material. So, material flow analysis is there and it is the free to use but of course it is not open source you cannot see it is all those coding, etc. But you can use it freely that is shown and it was developed by this Technical University Wien, Institute for Water Quality, Resources and Waste Management.

Because material flow analysis is very much used in water quality related or what resources related things. It was funded by Federal States of Austria and this works on Windows operating system. So very easy to use basically.

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When we talk about like how to import data how to export. So, Microsoft Excel sheets are used that the excel programming you can do very simple kind of plus minus that is used and as in the interface in this particular style and it is available in German and English languages and the graphical models are very easy to use as per predefined components like processes, flows, system boundary, text fields.

So, you make some PPT slides, but in comparison to that it is very easy to make those kinds of things here also. And then you can import the known data which are input data mass flows, stocks, volume flows, etc., concentrations whatever quantity is there of the material and for different layers like goods or substances energy, and then you can calculate the unknown quantities that would be kind of output.
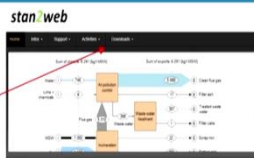
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And the history if we go for the history of STAN, then it is improving year by year. Like in 2006. It was released STAN this first version. And in May 2009 STAN 2, version 2.0 version was released in September 2012, 2.5 version was there and the website is there stan2web dot net and October 2017 this STAN 2.6 the further, evolution was there. Otherwise, they started from 2004. So, last 12 to 13 years a lot of improvements have been there.

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So, when we talk about how do we really go for using this particular software or tool so first of all you need to visit this particular website where from you can download this tool in your, on your computer. So, visit this website www stan2web dot net and go to the downloads. So, you will see this kind of website and there you can see first of all you have to register yourself you have to sign up and then you can click this STAN here after signing up, then you can click the STAN and you can download it.
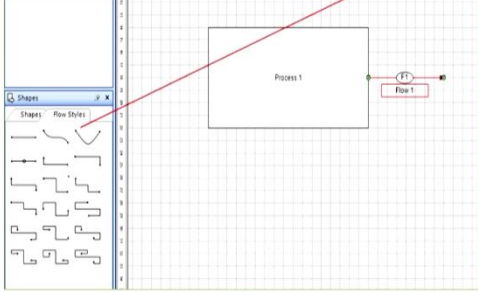
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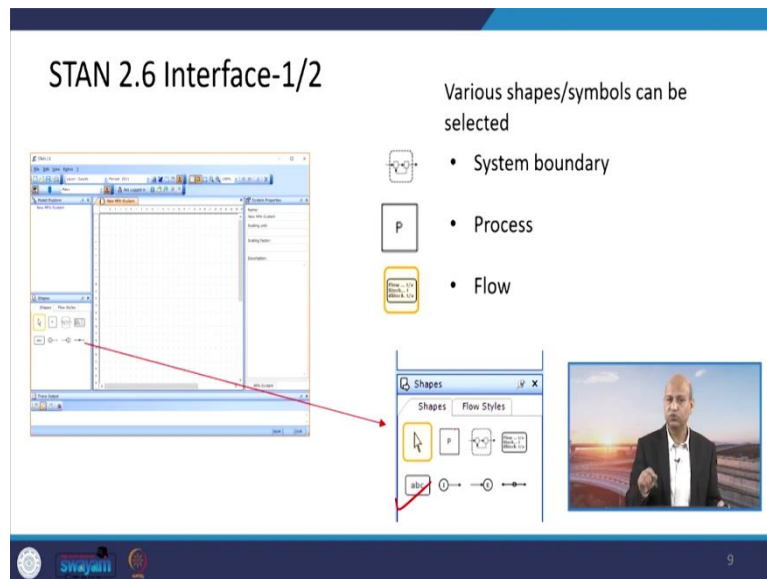
So, this is the interface which we will use, see after downloading when you will start using it. So, when it will be on the screen. So, this kind of screen will be visible and like system bound these kind of symbols are there; shapes and symbols are there. So, system boundary is there, then arrow figure or text is there and flow related diagrams are there, processes related p. So, all these are very easy to follow.
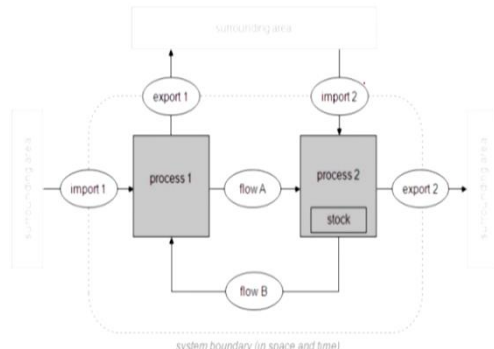
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Then if you want to see like you want to show the flow from one point to another. So, different kinds of shapes of these flow styles are there like if only two points are joined straightway then straight line can be there with arrow. But if there are different kinds of features so, you have to go in different routes. So, depending on that, different kinds of shapes are there which can be used to show the flow style.

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So, this kind of flowchart you can or sample model you can make easily by using those shapes and icons. So, like export 1, import 2, import 1, process 1, flow A then process 2 then flow B. So, interconnectivity and the interaction that can be shown very easily export 2, those kind of boundary system can be seen here in a nice way.
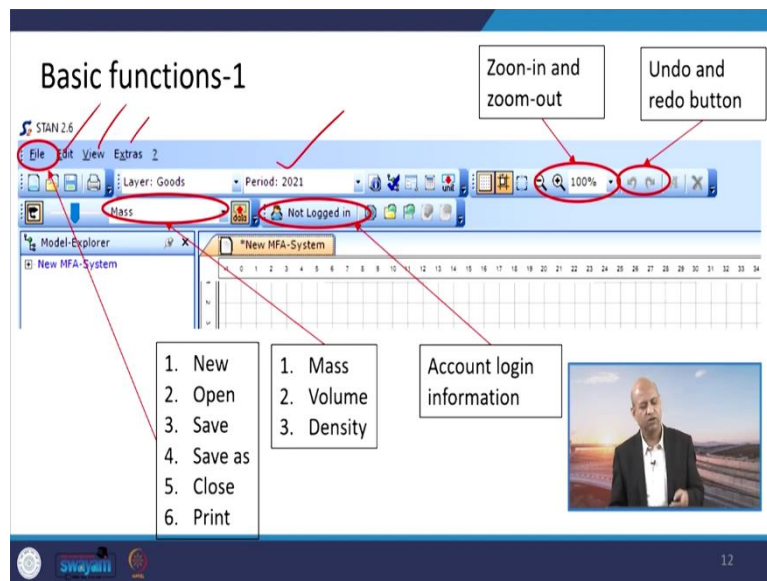
Well, this is the basic function you can see on the windows. So, it is as simple as any other windows tools you use whether Word or Excel or those kinds of file is there within file you can have the new file or you can open or you can save, save as, close those all those features are there. Similarly, related edit is there, view, extras. Then here you can see it you can choose whether mass material flow mass can be there, if it is liquid then volume maybe they are.

So, mass, volume or density you can choose from here. And when you log then your name will be there as user ID will be there it is not logged in so, that is why it is shown like this. Similarly, period you can choose from year 2021 or whatever year you want to use layers maybe goods or any other like services or different kinds of trades, products. Zoom in, zoom out, you can do redo, undo those kinds of buttons. So, all simple, whatever windows features are there, all those features are available here.

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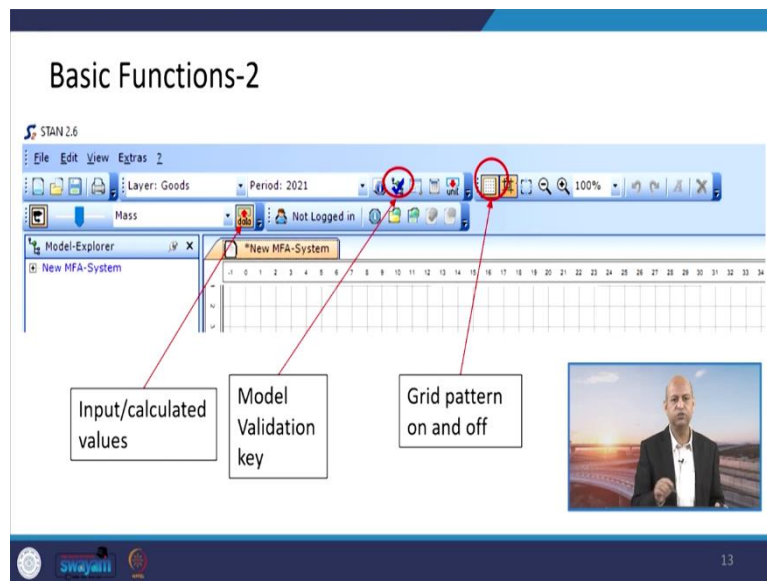
When we talk about like data, so, the inputs calculated values are available here you can see. Then model validation key can be seen here. Grid patterns, on and off that can be done from here. So, all these features you can see and use very easily.

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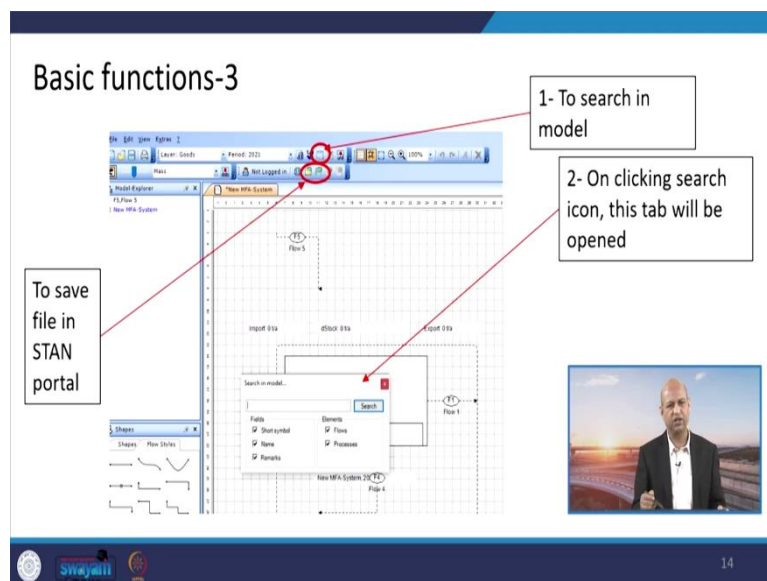
Similarly, when we talk about like saving, so, these are the buttons which can be used for saving and then these different shapes are there which can be used for after you want to search for example, you have done all the kinds of things you want to search. So, there is a search button and you can see whether symbols related search or they are named related or remarks or flows all kinds of possibilities are there.

Then when we talk about like how to add the new process. So, for example, we have just given a randomly name because this is NPTEL course. So, we are talking about like symbol can be used NPTEL, NPTEL course sustainable. So, you can give whatever name you want to do that then mass related values volume related values all these values can be chosen from your fill, you can fill manually also and then then you can apply.

So, that would be the input there you can say. Then you want to add the flow patterns. So, you can use these kinds of shapes and flow styles. So, you can put those all shapes and ultimately you can come up with a very good model, shape on the boundary layer all those things.

Addition of flow

2- Stretch
through mouse

1- Select flow
from left bar

Flow details 1/2

1- Go to right
corner of
interface

2- Fill up the details
including short
symbol & name

3- Add specific
remarks if any

Then when we talk about different kinds of the flow details, so we need to go to the right corner
and see the interface where you can see f1 for example, here you can see these f1, f1 flow 1.

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So similarly, you can give them the name and here you can get those, values like different kinds of as per requirement these values can be taken and filled in these spaces.

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Well, when we see the system boundary we want to make. So, here system boundary related shape is there which you can use and then as you see you when you go for a screenshot, etc. So, that we simply you can stretch and have the boundary layer within those particular activities.

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Well, when we talk about like import or input and export or output related flows. So, these are the symbols or shapes like for import and for export these you can use.

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And you can see your import related, export related. So, that kind of things you can add and model you can make.

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And then you can add text also when you want to define. So, text box will be there these in Windows it is very simple. So, you can stretch and type what whatever you want to see.

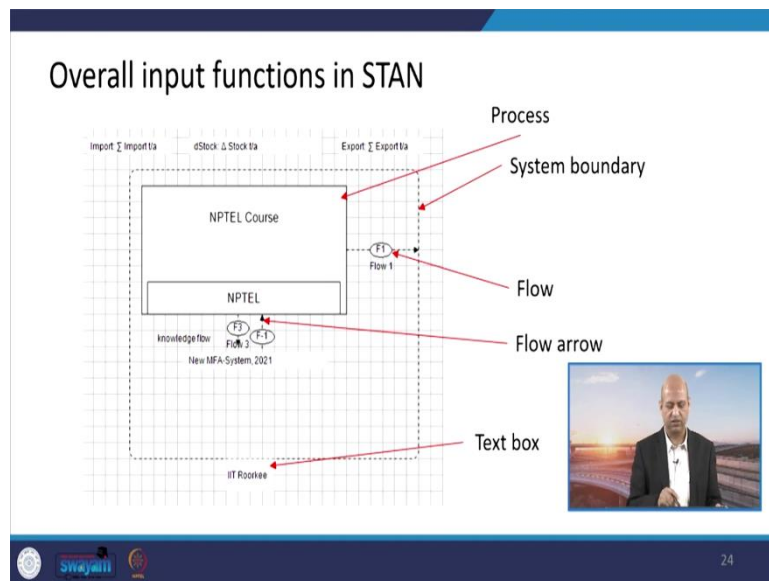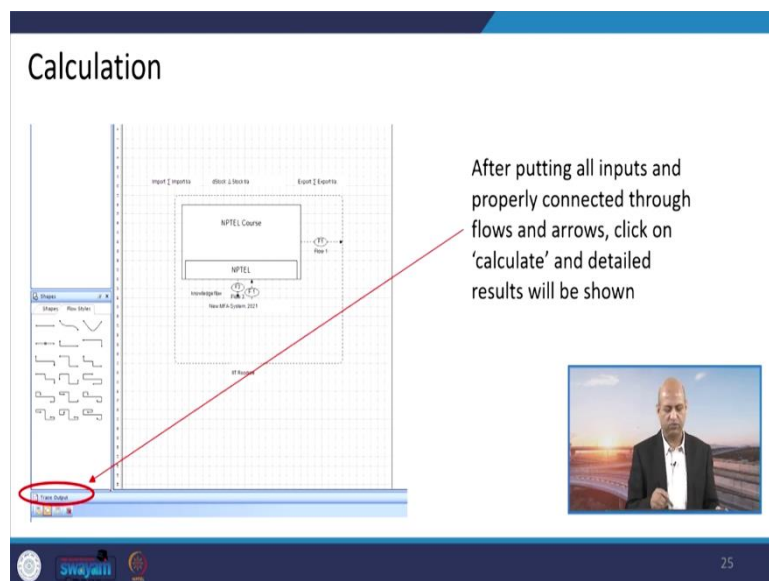(Refer Slide Time: 10:45)

Then you want to show the flow lines so, whatever shape you want to use according whether it will go straight or it will go taking round. So, accordingly different shapes can be used.

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And ultimately overall input functions can be seen here. So, the flow related, process related system boundaries related all those textbox related all these things are shown here. We have used those things which we have seen in different steps.

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Then for calculation purpose we go here and the trace output then we can see whatever calculations are there.

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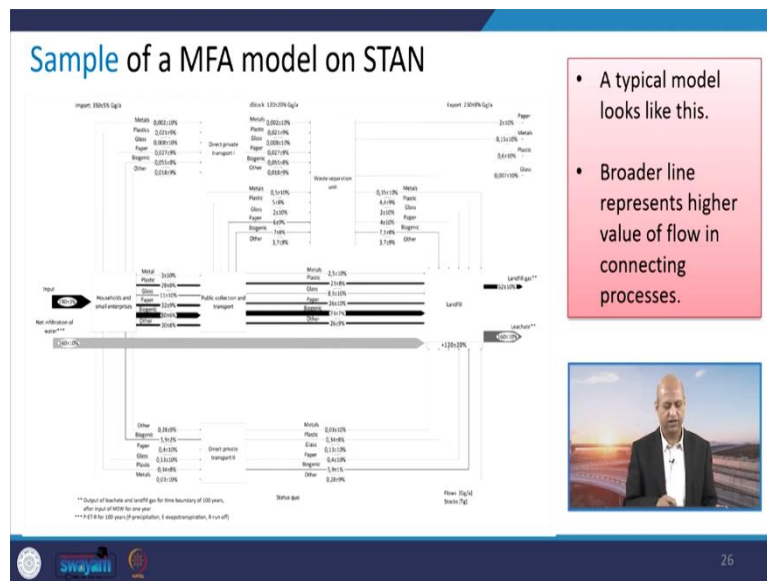
And ultimately this kind of the sample material flow analysis model is created by this STAN tool and you can see different values, different names of the processes or flows and these the broader lines represents higher value of the flow. So, according to thickness of the lines may also vary depending upon their values. And this is very simple easy to read and very nice model.
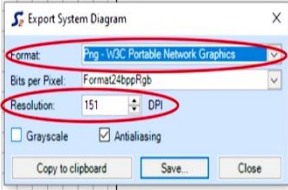
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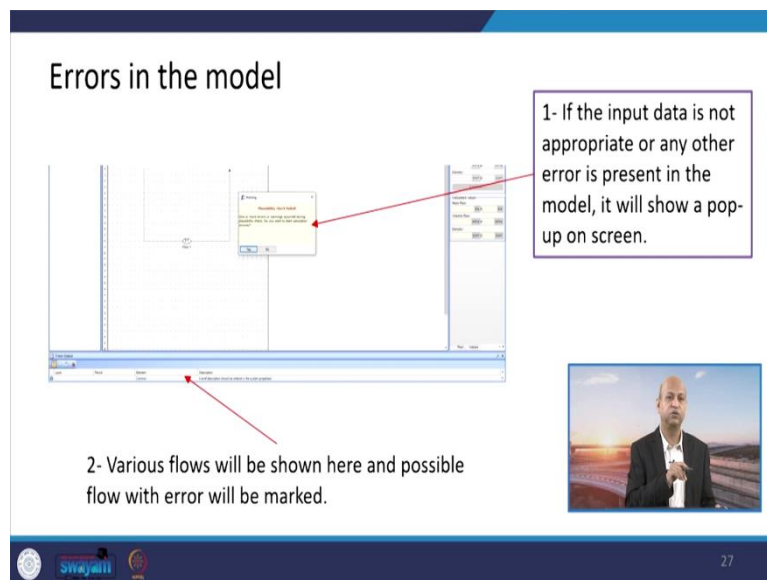
But if there are some errors then this will give like input output values are not making good balance then there will be error and this error will be shown. So, then you have to revisit and see where this error is there you can address it.

Then exports. So, you go to the file, go to the export diagram, you can see, you can change the resolution whatever resolution you want, choose the format and set the picture quality high or low. Either save or copy and ultimately, you can get that particular model and you can use it, you can save it, you can send to your teammates.
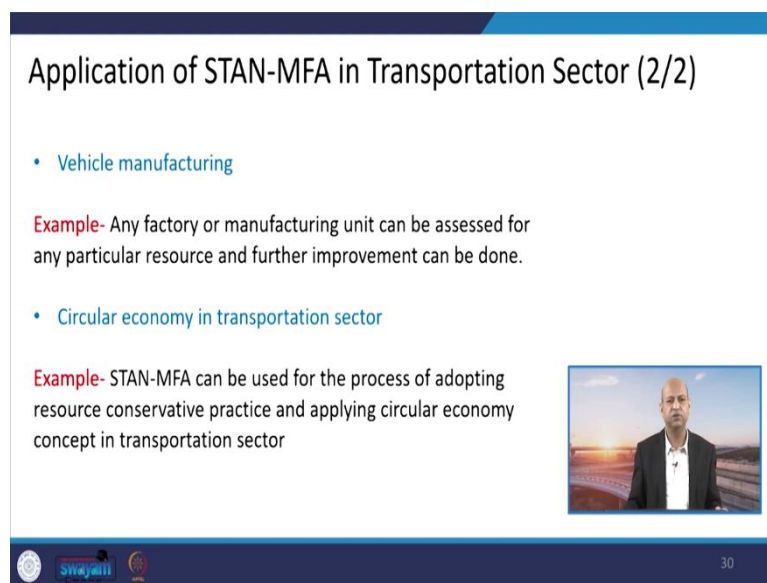
Well, when we talk about application of this particular tool STAN which is material flow analysis tool in transportation sector. So, basically it can be used for various aspects of the transportation system like calculation of resources consumption by transportation sector in terms of fuels or it can be also like stocks of the urban transportation sector scenario-based analysis.

For the city of Vienna which we have discussed in lecture 37. So, in that particular this particular tool has been used. Then is stocking of any particular pollutant in a region that can also be seen which because it is material like fuel is coming how much sulphur is there, how much sulphur dioxide will be produced those kinds of things can be done very simply although this is not the dispersion model.

So, do not get confused in that sense then stocking can be seen like what how much fuel is being used and different routes will be there of different buses. So, on which route how much fuel is being used those kinds of calculations can be done.

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Similarly, like for vehicle manufacturing also you can do at the factory level or at the unit manufacturing unit level which can be assessed in particular resource consumption of a like steel sheets or aluminium parts or those kinds of things. So, when you use these and you get to know as an output some wastage so, in a circular economy you can use that wastage as a resource for another activity. So, it can be used for adopting resource conservation practices, conservative practices, and it can apply in circular economy concept for transportation sector.

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So, in conclusion, we can say that this STAN 2 is a very good tool for material flow analysis and it can be used for transportation sector also. And this will give new insights so, that we can go for decision making to you know, reduce the consumption of different resources and utilization of waste using the circular economy concepts. So, this is all for today.

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And these are the references where you can, download this tool and please try to play with it and learn what are different features so that you can have a new skill about using this particular tool. So, thank you for your kind attention. See you again in the next lecture. Thanks again.