

25. Cost of crew

Overview

Target

This view is intended to establish a cost per vkm regarding the crew on vehicles engaged in transporting passengers or goods. The cost of crew is one of the three components that set the total cost of driving per vkm. In particular, it is relevant in case of public passenger transport, air passenger transport and freight transport.

Structure

Figure 25.1 Cost of crew: general appearance of the Vensim sketch

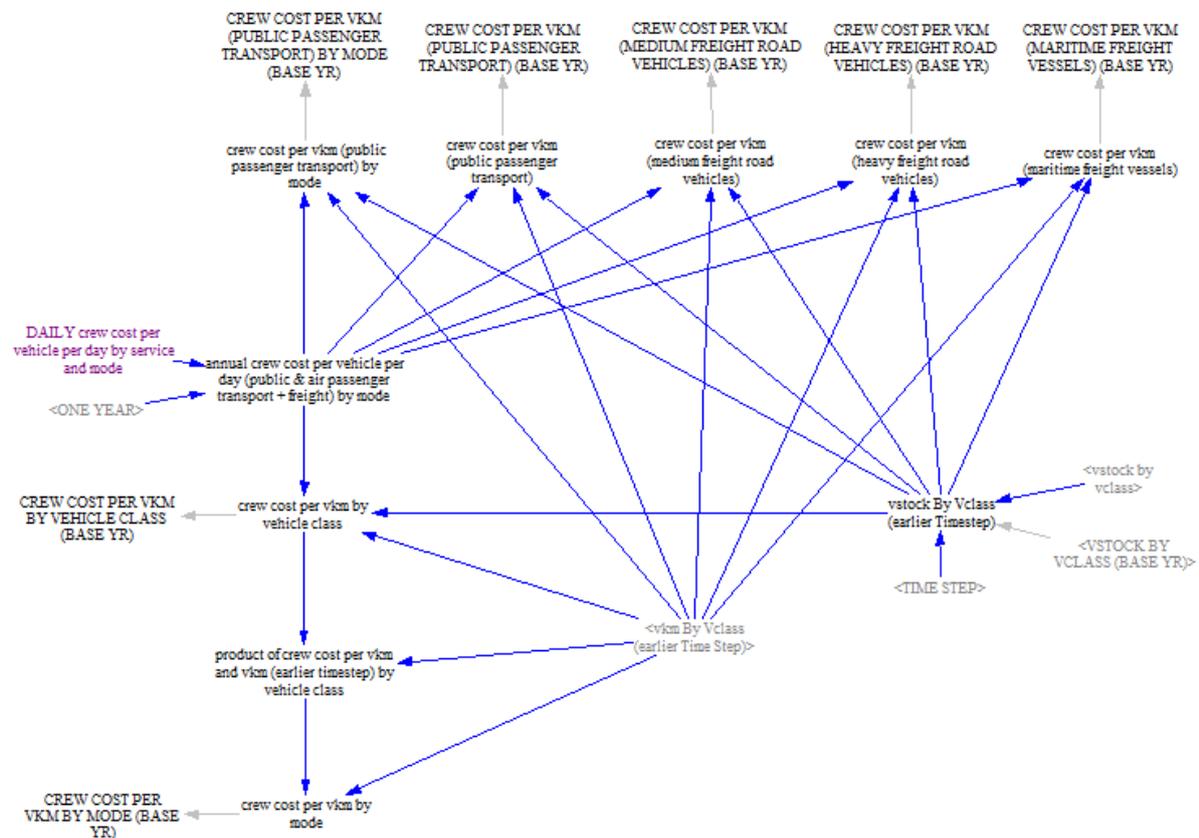


Figure 25.1 shows the appearance of the view. Inputs on the daily cost of crew (left of the view) correspond to values entered in the ForFITS Excel file. This is converted into an annual cost, multiplied by the relevant number of vehicles and divided by the relevant vkm per year to get costs per vkm over time (top of the view).

Detailed description of the view

Inputs

The user introduces information on daily crew cost per vehicle per day by service and mode ("Other costs" tab, as well as "OTHER INPUTS", "Crew costs" and "Crew cost per day (over time)" headings in the "Table of contents" sheet). The default data existing in the excel file are based on estimations concerning vehicle operation time, staff per vehicle and their salary. This exogenous input should cover the daily cost related to all the people on a vehicle engaged to be in charge of driving or taking care of the passenger/goods on board.

In order to convert the user input (USD/vehicle*day) into crew cost per vkm, inputs on vehicle stock and vkm (entering this view as shadow variables) are necessary. The vkm by vehicle class are calculated in the transport activity module (view "activity, load and stock aggregates"), while the vehicle stock by vehicle class is calculated over time in the view "vehicles by age". Since the cost of driving is a parameter affecting the transport demand generation that determines the transport activity, the vehicle stock and vkm used for the calculations of this view are those evaluated in the earlier time step.

Calculations and outputs

The user inputs on the average daily crew cost per vehicle are introduced by service and mode. The cost is assumed to be the same in all the relevant vehicle classes (indicated in Table 25.1) within a particular service and mode.

Table 25.1 Vehicle classes in which the cost of crew is taken into account

<i>Service: Passenger</i>		<i>Service: Freight</i>	
<i>Modes</i>	<i>Relevant vehicle classes in which cost of crew is considered</i>	<i>Modes</i>	<i>Relevant vehicle classes in which cost of crew is considered</i>
NMT	E and F	NMT	Not applicable
TWO WHEELERS	E and F	TWO WHEELERS	A to F
THREE WHEELERS	E and F	THREE WHEELERS	A to F
LDVS	E and F	LDVS	A to F
VESSELS	E and F	VESSELS	A to F
LARGE ROAD	A to F	LARGE ROAD	A to F
RAIL	A to F	RAIL	A to F
AIR	A to F	AIR	A to F
PIPELINES	Not applicable	PIPELINES	Not applicable

The annual crew cost per vehicle is obtained multiplying the exogenous input by 365 days.

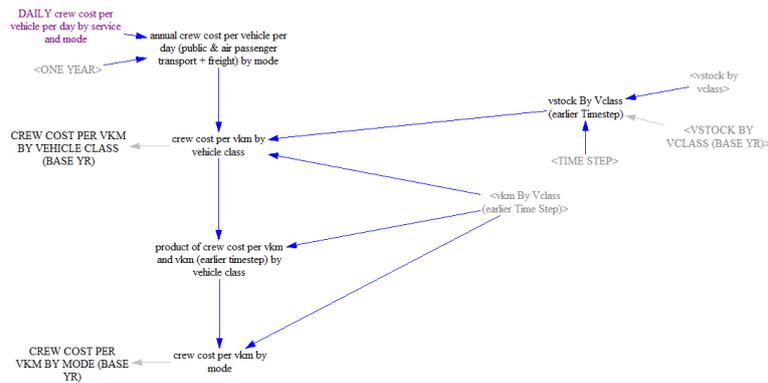
The product between the annual crew cost per vehicle and the number of vehicles in the stock gives the total annual crew cost by vehicle class. The latter is divided by the annual vkm to estimate the crew cost per vkm by vehicle class:

$$\text{Crew cost per vkm} \left(\frac{\text{USD}}{\text{vkm}} \right) \text{ by vehicle class} = \frac{\text{Annual crew cost per vehicle by vehicle class} \left(\frac{\text{USD}}{\text{vehicle} * \text{year}} \right) \times \text{stock by vehicle class (vehicles)}}{\text{Annual vehicle travel by vehicle class} \left(\frac{\text{vkm}}{\text{year}} \right)}$$

The crew cost per vkm by mode (Figure 25.2) is calculated as an average across the vehicle classes weighting by the vkm. The average includes all the vehicle classes, also those not subjected to a crew and therefore with a crew cost of zero:

$$\text{Crew cost per vkm by mode} = \frac{\sum_{\text{vehicle classes}} \text{Crew cost per vkm}_{vclass i} \times \text{vkm}_{vclass i}}{\sum_{\text{vehicle classes}} \text{vkm}_{vclass i}}$$

Figure 25.2 Calculation of the crew cost per vkm by mode



The same methodology has been applied to compute the crew cost per vkm in the particular cases at the top of the view.

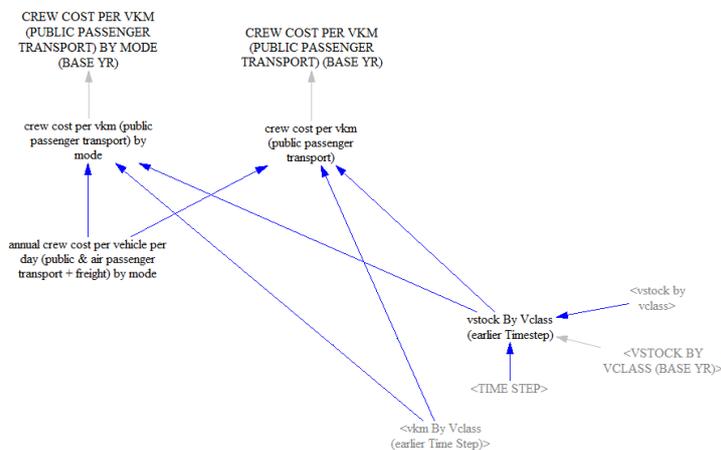
In the example given below (concerning public transport), the calculations aggregate across the corresponding modes and vehicle classes belonging to public transport:

The output is provided as an aggregate and also split by mode:

$$\begin{aligned} \text{Crew cost per vkm in a specific public transport mode} &= \\ &= \frac{\text{Annual crew cost per vehicle in the mode} \times \sum_{\text{public transport vehicle classes}} \text{stock}_{vclass i}}{\sum_{\text{public transport vehicle classes}} \text{Annual vehicle travel}_{vclass i}} \end{aligned}$$

$$\begin{aligned} \text{Crew cost per vkm in public transport} &= \\ &= \frac{\sum_{\text{public modes}} \sum_{\text{public vehicle classes}} \text{Annual crew cost per vehicle}_{mode i} \times \text{stock}_{mode i, vclass j}}{\sum_{\text{public modes}} \sum_{\text{public vehicle classes}} \text{Annual vehicle travel}_{mode i, vclass j}} \end{aligned}$$

Figure 25.3 Calculation of the crew cost per vkm in public transport



This view evaluates the crew cost per vkm at different aggregate levels: by vehicle class, by mode, as well as by a number of other aggregations that require sub-modal aggregations of vehicle classes (public transport, medium freight road vehicles, heavy freight road vehicles, maritime freight vessels).

The output variables, along with their specific value at the base year (stored in a separate variable), are used as one of the components determine the total cost of driving per vkm ("cost of driving" view).