Electric Bus Emissions Assessment Tool

TUMI E-Bus Mission Users' Quick Guide

Introduction

The TUMI E-Bus Mission, which is funded by the German Ministry for Economic Cooperation and Development (BMZ), and supported by various organisations such as C40 Cities, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), The International Council on Clean Transportation (ICCT), The Institute for Transportation and Development Policy (ITDP), ICLEI – Local Governments for Sustainability, The International Association of Public Transport (UITP) and World Resource Institute (WRI), is working towards accelerating the transition to electric buses in the Global South. The TUMI E-Bus Mission deep dive and mentee cities are setting targets and designing roadmaps to adopt electric buses. It is expected that by 2025, 500 cities will be inspired, and these actions will lead to the procurement of more than 100,000 e-buses, reducing more than fifteen megatons of CO2 emissions.

For monitoring the impact of the TUMI E-Bus Mission, it is important to have a consistent methodology and data framework on the potential GHG mitigation reductions that can be forecasted based on the cities' commitments. The TUMI E-Bus Mission coalition partners support the deep dive cities in setting targets and implementing e-bus adoption. The GIZ has engaged the Wuppertal Institute to assist in assessing the said GHG (and associated air pollutants) impacts of the e-bus targets put forth by the deep dive cities of the TUMI E-Bus network. In collaboration with the EU-funded SOLUTIONSplus e-mobility project, an emissions impact assessment calculator – E-Bus Emissions Assessment Tool (E-BEAT) – has been developed to aid the measurement and monitoring of the said impacts.

For the purposes of estimating and monitoring the emissions impacts of the actual e-buses procured under the TUMI E-Bus Mission, a bespoke version of the E-BEAT Tool has been created.

Sheet Colours Explained

The E-BEAT tool tabs are coloured blue, green, and grey. The green tabs represent the sheets which have specific relevance to the end users under the TUMI E-Bus mission.

Tab Color	Description
Blue	Informational/introductory sheets
Grey	Calculation sheets ; for basic usage of the tool, there is no need to revise any particular values in these sheets.
Green	User input and output sheets.

Cell Colours Explained

For the end users, only the green-coloured cells (in the green-coloured tabs) are of primary importance. These represent the bare minimum inputs that are needed from the users, to be able to estimate the impacts of the additional e-buses in the fleet.

	2022	2023	2024	2025	2026
Minibus					
Midibus					
Standard	8	16	24	274	524
Articulated					
Double decker					

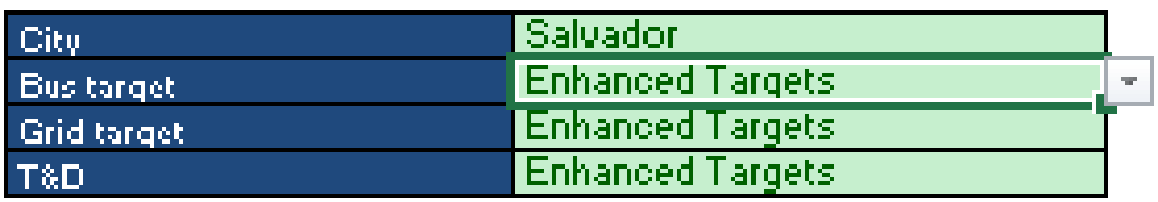
There are only two sheets that contain green cells that the end users need to interact with (at a minimum), in order to generate results:

1. "Results" Sheet
2. "Monitored" Sheet

STEPS

I.Go to the "Results" Sheet

The results sheet essentially provides the results of the calculations. There are four green cells that the users need to select choices on.
Please change the city name. The other 3 choices you can change, if you want to inspect current scenario results.



1. City: The user needs to select the city of interest. A drop-down menu will appear containing 22 cities that had been part of the initial analysis.
2. Bus target: The user needs to select the "bus target" scenario which would be applied to the calculations.
    a. Base targets: Stated number of additional buses as provided by the TUMI E-bus mission secretariat;
    b. Enhanced targets: In essence, the enhanced targets for the e-buses represent 100% electrification of the projected bus stock by 2050;
    c. Monitored: This represents a scenario based on what had actually been added. This will be explained more in the next section.
3. Grid target: This primarily refers to scenarios pertaining to the grid generation mix. Essentially, the base numbers are projected based on existing policies/ targets that had been committed. The enhanced targets are based on a scenario wherein the grids would at least be 75% renewable by 2050. Selecting the "monitored" option would pull data from the "monitored" sheet, essentially incorporating historical data.
4. T&D: Transmission and distribution losses (T&D) targets. The tool also accounts for T&D losses. The base scenario is based on a crude assumption that the latest historical data on T&D losses would continue into the future. The enhanced scenario assumes a 50% reduction by 2050. The "monitored" option would rely on the data to be provided by the user.

While you can combine different sub-scenarios (e.g. base for bus target; enhanced for grid; monitored for T&D), it is recommended that a single choice be applied to all (e.g. base, base base). You may find all the assumptions for the "base" and "enhanced" scenarios in the "TUMI_data" sheet, if you wish to investigate such.
Once the selections have been chosen, the summary tables, and the graphs in the Results sheet would automatically update.
Once you had inspected the scenarios, **go and update the "Monitored" sheet**.

II. Go to the "Monitored" Sheet

The user can essentially think of this sheet as a user-defined sheet (and thus can be used to do user-defined scenarios). However, it is intended that the monitored data be inputted here. Users are asked to input annual data (and averages – the calculation of which are external to the tool). Users can also do their own projections, if they wish, based on the updated historical data. For example, in 2025, the user would have updated the values up to 2024, and s/he can play around with the values from 2025 onwards, to see differences if targets are changed, etc.

PLEASE NOTE THAT THE DEFAULT DATA IN THE "MONITORED" SHEET IS DUMMY DATA.

1.1. Please fill in the inputs cells in the sheet.

Input	Description
Total e-bus stock	This refers to the total number of e-buses in the fleet that is covered by the analysis. The numbers need to be inputted based on the categories included in the sheet (minibus; midibus; standard; articulated; double decker).
Total additional e-buses	This refers to the number of e-buses that had been added (per year).
Distribution of the new e-buses in a scenario that they are not electric	This basically captures the scenario wherein the electric buses were not electric (e.g. they would have been diesel, CNG, etc…). This essentially defines the baseline scenario by which the electric buses are compared to.
Average VKM/year by Type of E-bus	Average VKM/year values based on monitored data (by type of e-bus)
Average Occupancy by Type of E-bus	Average (number of passengers or PKM/VKM) values based on monitored data (by type of e-bus).
Average Energy Efficiency by Type of E-bus (kWh/VKM)	Average kWh consumption/VKM based on monitored data (by Type of e-bus). This can externally be calculated by dividing the kWh consumption by the distances (by e-bus type). There might be a chance that results would vary significantly from the other scenarios (base and target), as the monitoring sheet does not provide for changing the baseline (e.g. diesel, etc…) energy efficiencies. If this is the case, try using the base values from the "TUMI_data" sheet and contact the developer.
Grid (%) Generation	% distribution of energy generation of the electricity supply grid by energy type. If official data is available, it is recommended that such are used.
Transmission and Distribution Losses (%)	% transmission and distribution losses within the electricity supply grid (historical) by year, if available.

The user can also check the values in the "TUMI_data" sheet for counterchecking or comparing the historical values that are inputted into the "Monitored" sheet, as well as for borrowing default values for future years.
It is up to the user if s/he wants only to input data up to the most recent year, and leave future years blank. In doing so, the results will reflect the totality of impacts pertaining to the e-buses that had already been added. If s/he wishes to complete an updated scenario, s/he can fill in the input data leading up to 2050.

III. Check the "Results" Sheet

You can now go back to the results sheet, and check the results, particularly for the "monitored" scenario. You will find the updated summary tables, and the graphs (scroll down).

Thank you to our TUMI E-Bus Mission Partners: