TECHNISCHE UNIVERSITÄT WIEN
Vienna University of Technology

RRMMMAA
Initiative for research of environmentally compatible and sustainable resource management
Resource Management Agency

The Future Energy and Resource Consumption is Determined in the Cities

The population growth in Vienna, with a forecast population of 2 million inhabitants for 2035, will also lead to an increase in traffic. For Wiener Linien as the major transport provider of the city, the question arises which impact the future expansion will have on environment and resource consumption of the company, now and in 20 years.

Ecological Footprint, CO_2 Emissions and Resource Consumption of Wiener Linien and their Forecast till 2035

The project goal is the determination of the Ecological Footprint and the CO_2 emissions of the Wiener Linien for 2012. Based on three options for different expansion scenarios (1: unchanged status quo, 2: expansion of the underground, 3: expansion of the tramway), the Ecological Footprint (EF), the CO_2 emissions and the additional resources required by the Wiener Linien are projected till 2035.

CO_2 emissions	Ecological Footprint	Resource Consumption
• knowledge about direct emissions • comparability of results • benchmarking as a basis for optimization	• taking into account the "ecological backpack" • indicator to monitor the environmental effects • well suited for public relations	• Life cycle in construction • Urban Mining • basic data for the development of circular economy • cost efficiency

Methodological Approach

Adapted to the data structure of the Wiener Linien, the following categories are distinguished: buildings, movable and immovable equipment, vehicles, energy and fuel, consumables and waste. The energy is subdivided into energy for transportation (traction energy) and for power current. When available, cost centre-related data are used. The representation of the results is matched to the data structure of the company. As an indicator of the use of resources, inert materials (concrete), metals (steel, aluminum, copper) and plastics in the vehicles are used. For the determination of the emissions, the ecoinvent database has been used, and the footprint has been calculated using the software SimaPro.

Executed in cooperation with

Vienna University of Technology (TU-Wien)
Resource Management Agency (RMA)

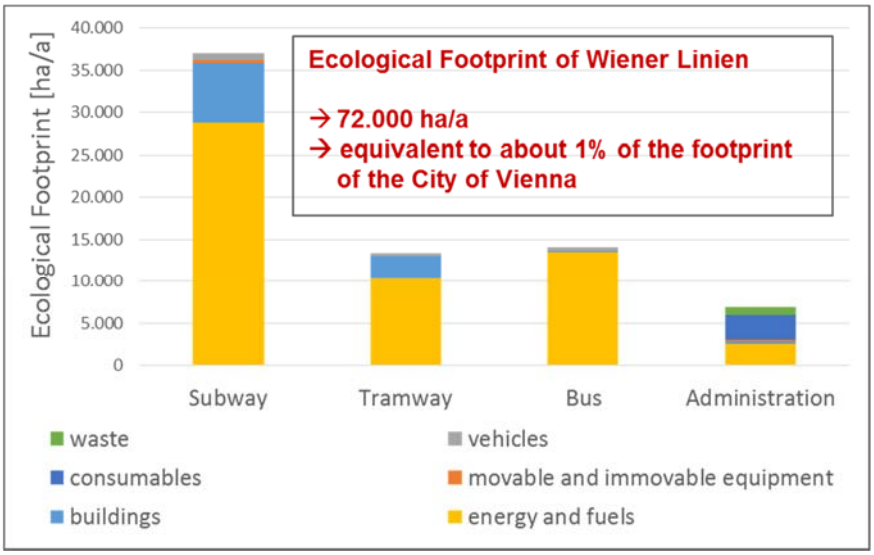
Conducted on behalf of the

Wiener Linien GmbH & Co KG

WIENER LINIEN

Results

The Ecological Footprint of the Wiener Linien for 2012 corresponds to approx. 72,000 ha. Within the comparison of the three transportation means, the portion of the underground dominates with approx. 50 %, followed by those of the bus and the tramway with each approx. 20 %. Per seat-km the EF amounts in the average to 0.04 m²/year. Per seat-km, the EF of the buses is twice as high (~ 0,08 m²/a) compared to the one of the underground and the tramway (each ~ 0,04 m²/a.) Depending on the expansion scenario, Wiener Linien will need 1.1 to 4.6 Mio. t additional resources by 2035. The construction of the underground consumes three times more resources in comparison to the tramway extension.

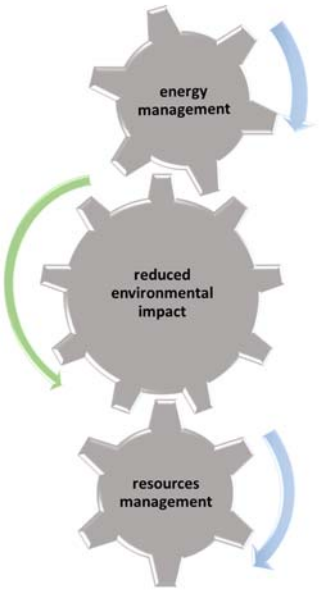


Conclusions

Ecological Footprint: With about 75 %, the energy consumption dominates the Ecological Footprint of the Wiener Linien. The Ecological Footprint is particularly dependent on the energy mix of the electricity. Compared to an Ecological Footprint with UTCE electricity, the Ecological Footprint of Wiener Linien is about 40 % lower. The Ecological Footprint of the mobile and immobile assets and consumer goods can be significantly reduced by increasing the energy efficiency and by reducing consumer goods.

Resource consumption: Although most of the resources are used in the underground construction, the focus should be laid on the resource management of structures along the underground tunnels, as these structures are renovated in a frequent rhythm and are thus available a source of secondary resources.

Future scenarios: The Ecological Footprint of the Wiener Linien for 2035 does not significantly differ among the three scenarios (<12 %).



Recommendations for Action

Conversion of the purchased electricity into electricity from renewable energy.

Increase of the energy efficiency in the vehicles. Regarding the thermal conditioning, recent studies show large saving potentials.

Promotion of green procurement and implementation of life cycle cost calculations for consumer goods, movable and immovable assets.

Implementation of resource management in the area of construction (closing of material cycles, Building Material Information System).

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