

comfortable level. Government aim is not only to strictly match levels of the EU legislation but also to improve living environment for the society and to implement polluter pay principle (PPP) in practice.

Therefore, information about LEZs is available to everyone and is easy to understand. Funds collected with selling environmental badges and fines will further enhance and enable development of greener cities and development of LEZs (or also designated as green zones) in other cities and geographical areas. Progress can already be seen. Since many cities in Germany turned greener, vehicles that belong to the emission class 3 or lower are not permitted anymore and will therefore be substituted with newer and environmentally friendlier vehicles (environmentally friendlier in the use phase). There is still a dilemma whether this transition is environmentally friendly because old cars really do cause more environmental impacts in the use phase, but are already produced and do not need new materials and energy for their production like new ones. On the other hand, new cars cause less environmental impacts in the use phase but have higher environmental impact as an inevitable consequence of their production. Therefore, we can assume that in some cases life cycle assessment of all environmental impacts of a certain vehicle might actually favor the use of existing ones instead of new ones.

4.3 Comparison of green zones within the EU member states

Restrictions on urban areas transportation can be implemented through access limitations in the form of environmental zones, city tolls, congestion charging, etc. This measures spread rapidly in the recent years throughout the whole EU. Main objective is to establish "green zones" with reduced carbon, noise and light pollution.

However, the EU directives, national legislation and local regulations can differ widely. We have witnessed that local regulations can sometimes be very successful and should be taken into account also when preparing general EU directives on the field of sustainable urban transport planning. The European Commission [6] therefore expressed concerns with respect to an increasingly complex situation in Europe with traffic restrictions through environmental zones in the Green Paper 'Towards a new culture for urban mobility'. It has acknowledged the environmental objectives of these actions. In the Green Paper consultations many stakeholders called for guidance and for development of harmonized and unique rules for green zones within the EU. Standardization of green zones would be appreciated in order to enable a wide use of such measures without creating disproportionate barriers to mobility for citizens and goods especially when coming from another city or a EU member state with different regulation.

Better known green zones in the EU and their restrictions are presented in Tab. 1.

Table 1 Comparison of well-known green zones / low emission zones in the EU [10, 11, 12]

Vehicle Type	LEZ	Current Emissions standard (data for 2014)	Future Emissions standard
Lorries only	Netherlands	Euro 4	-
	Austria (Motorway A12)	Euro 2/3	-
	Austria (Steiermark & Graz)	Euro 3	-
	France/Italy (Mont Blanc Tunnel)	Euro 3	-
	Czech Republic (Prague)	Euro 2	-
	Hungary (Budapest)	Differential parking charges	-
Heavy duty vehicles	United Kingdom (London)	Euro 4 (PM)	-
	Denmark	Fit Filter if less than Euro 4	-
	Sweden	8 years old / Euro 3	-
Vehicles with 4+ wheels	Germany	Euro 3-4 (PM) & Euro 1 Petrol	Euro 4 (PM) & Euro 1 Petrol
	Portugal (Lisbon)	Euro 1 or Euro 2	Planned: Euro 3 all (date not specified)
	Greece (Athens) Netherlands	Euro 1/Euro 4	Utrecht from 1/1/2015. Must be first registered after 1/1/2001
All vehicles	Italy	Euro 1-4 / no 2-stroke motorcycles	Euro 2-4 / no 2-stroke motorcycles
	Slovenia (Maribor)	Euro 0 and Euro 1	Continuing with LEZ if the test phase is successful
Local buses under agreements	United Kingdom (Norwich)	Euro 3 (NOx)	-
	United Kingdom (Oxford and Brighton)	Euro 5	-
Vans	United Kingdom (London)	Euro 3(PM)	-
	Germany	Euro 2-4 (PM) & Euro 1 Petrol	Euro 3-4 (PM) & Euro 1 Petrol
	Italy	Euro 1-4 / no 2-stroke motorcycles	Euro 2-4 / no 2-stroke motorcycle
	Netherlands	-	Utrecht from 1/1/2015. Must be first registered after 1/1/2001

As presented in Tab. 1, different cities across the EU have established different green zones for different types of vehicles. Some of them already have developed long term strategy for further improvement of green zone standards. These future restrictions and standards will become more and more important and will have significant impact also on vehicle demand. It is predicted that green zones will also have positive effect on purchasing electric vehicles, hybrids and other vehicles powered by alternative environmentally friendlier fuels, since conventional vehicles will not be able to enter future green zones. However, it can be tricky that different green zones have different restrictions which are not customer friendly for people traveling between different cities. Therefore, the EU should consider standardized green zone policy framework and unique environmental tag for vehicles.

5 CONCLUSION

Green cities, neighborhoods and zones are being rapidly developed and implemented in many cities across Europe as well as in other continents. Since environmental awareness and energy prices are increasing, demand for green, efficient and rational transportation has increased in last decade. Green cities and green zones within them are becoming essential part of sustainable urban development with great potential for the future.

Further development of green zone research has also been identified. One idea is the monitoring of green zone development within the cities in the EU with regard to their environmental performance. This could represent a tool for improvements on lowering GHG emissions and other environmental impacts caused by unsustainable transport within the cities and would be useful as a model for the development of a larger number of standardized green zones inside the studied area. Tool or index could be primarily developed for the EU but could (with certain modifications) be generally applicable also to other geographical areas. Furthermore, such index would also allow monitoring of progress of a certain city on the field of environmental policy and their benchmarking. This could also be seen as a potential improvement for the monitoring of the efficiency of the EU environmental policies.

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