

Sustainability in the service of science

Abstract: Researchers have been predicting the occurrence, increase in number, and intensification of environmental disasters caused by global warming for years. The leaders of individual countries are gradually becoming aware of this reality. Others have already set out on a path that will transform their countries into more environmentally friendly modes of operation. In order to achieve these goals, target values have been set at both the global and national levels, which, if met, will allow us to avoid or at least slow down the adverse changes predicted by researchers.

One of the main causes of global warming is the continuous increase in the carbon dioxide content of the air, for which road transport, and in particular the use of passenger cars, is largely responsible. Transportation using electric vehicles, i.e., electromobility, is one possible solution for replacing vehicles that run on fossil fuels. The popularity of these vehicles has been growing in recent years. The number of electric cars on the world's roads rose from nearly 1 million in 2016 to nearly 14 million by the end of 2023. The popularity of electric cars can be attributed to global reasons as well as economic ones. Electric cars are also becoming increasingly popular in Hungary, with the number of green license plate cars steadily rising, but there are still few purely electric vehicles on Hungarian roads, as the population is not yet willing to take the risks associated with electric cars. The primary objective of the study is to outline, based on perceptions of electric cars, how the population's awareness could be increased, taking into account various possibilities.

Keywords: Electromobility; electric car; raising awareness.

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Global warming and electromobility

The burning of fossil fuels, deforestation, and animal husbandry are having an increasing impact on the climate and the Earth's average temperature. Human activity significantly increases the amount of greenhouse gases occurring in nature, thereby intensifying the greenhouse effect and accelerating global warming. (European Union)

Transport is responsible for approximately 23% of global carbon dioxide emissions, with approximately 75% of these emissions coming from road vehicles that use fossil fuels [1].

Many countries have passed laws to reduce long-term emissions from passenger cars [2]. The European Union has set a target of becoming carbon neutral by 2050 [3] and reducing its carbon dioxide emissions by 55% compared to 1990 levels by 2030. (European Parliament) To achieve these goals, passenger cars, which currently account for approximately 12% of EU CO₂ emissions, must quickly become carbon-free [4, 5].

In the automotive industry, this effort is primarily manifested in pressure to reduce fuel consumption and carbon dioxide emissions. Stricter limits are forcing car manufacturers to introduce new, expensive technologies that reduce these harmful emissions. The solution to these challenges may lie in the expansion of electric vehicles, commonly referred to as electromobility. Electromobility can create opportunities for sustainable transport [6; 7; 8].

The rise of electric mobility has been striking in recent years. Growth has been particularly noticeable in the passenger car sector, and based on this change, it is undeniable that governments, society, and consumers alike see electric mobility as playing a major role in the future [9; 10; 3].

Factors influencing the spread of electric mobility

Several studies have been published on the topic of electromobility [3; 8; 11]. In their 2017 study, Kolz and Schwarz examined the key factors influencing the spread of electromobility and the areas of impact of these factors. According to the authors, when examining the electromobility industry, a distinction must be made between the global environment, which can be influenced to a limited extent, and the local environment, which can be influenced to a greater extent, and their key areas of influence must be identified. [12; 13], [14] used PEST analysis to identify global areas. They identified 55 influencing factors, of which 29 were global and 26 were local.

One area of influence was politics, for which the authors identified six points related to the examination of its objectives:

- government funding,
- regulation,
- taxes and fees,
- laws,
- energy and climate policy, and
- standardization [15].

Each of the factors identified influences electromobility to a different extent for all parties involved. Furthermore, each of the decision-makers (manufacturers, buyers, states, cities) also has decision-making processes related to the identified areas.

The role of government in the spread of electromobility

It is essential that the leaders of a country, region, or municipality are interested in making the current transport system more sustainable and environmentally friendly, improving the air quality and quality of life of the population, and creating healthier conditions for meeting transport needs.

Policies aimed at expanding electromobility, such as programs that favor the use and purchase of electric vehicles, as well as the formulation and adoption of an appropriate legal framework for incentives, are the first step in increasing consumers' willingness to purchase and use vehicles equipped with new technologies.

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It is the responsibility of the authorities and the state to develop a private and publicly accessible charging infrastructure, which is a priority measure in the spread of electric vehicles [16], given that the charging network allows electric vehicle users to move around easily and conveniently both within and outside the city without causing anxiety and frustration about where to charge their cars.

The researchers classified government considerations into five groups, the precise elaboration and implementation of which could promote the development of electromobility.

Table 1. Government considerations for promoting development

Government considerations	Definition
Legislation	Existing legal frameworks and policies that favor the use and purchase of electric vehicles.
Enforcement	Enforcement of regulatory changes, laws, directives, and standards promoting electromobility, as well as increasing the proportion of electric vehicles and alternative fuels in the vehicle fleet.
Education	Informing students about the benefits of electromobility and alternative fuels. Incorporating electromobility classes and courses at relevant universities.
Incentives	Incentives provided by the state and authorities to the private and public sectors.
Campaigns	Campaigns organized by authorities, regions, and municipalities to raise public awareness of electromobility and alternative fuels.

Forrás: [17].

In order to effectively develop electromobility, the measures listed in the table, as well as the effective development and modernization of infrastructure, require closer cooperation between the government and the business community, and also support entrepreneurial decisions related to e-mobility [17; 18; 19; 20].

The potential role of universities and university lecturers in raising awareness about the use of electric vehicles

One of the goals of the University of Dunaújváros is to support the government's efforts related to sustainability and green transformation [21]. In order to achieve these goals, the University of Dunaújváros has taken several steps to disseminate knowledge about sustainability to as many stakeholders as possible.

The following is a summary of the steps taken by the Institute of Social Sciences at the University of Dunaújváros to inform students and the general public:

- *Revising our curricula* to place greater emphasis on sustainability-related knowledge, thereby providing the students concerned with an overview of current legislation and the current situation:
 - *Launching a specialization in Sustainable Finance* for students majoring in Economics and Management BA.
 - *Green logistics specialization* for students majoring in Technical Management BSC.
- *Dissemination of knowledge related to environmental protection and sustainability*: at university lectures, during the Science Week program series,
- *Presentation of knowledge related to sustainability and electromobility* in the form of short, informative lectures as part of the Everyone's University program series
- *Presentation of knowledge related to sustainability and electromobility* in the form of short, informative lectures within the Everyone's University program series – Electromobility – research: Research on the population's awareness of the topic, the results of which are shared with stakeholders in lectures, articles, and studies, and published in study volumes.
- *Participation in innovative work with local governments*, during which the local population can be informed.

The role of universities and educational institutions is invaluable in the promotion process, because convincing and shaping the attitudes of the young, growing generation is the first step in transforming the most active consumer group of the coming years into conscious buyers [24; 8]. This is also supported by the results of our students' attitude survey [25].

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Summary

Global warming has become the most pressing problem of the last century. Reducing greenhouse gas emissions, which are responsible for global warming, is the responsibility of every country. In order to achieve their climate goals, countries have developed their own climate plans, specifying the steps they believe will help reduce CO₂ emissions. One possible means of achieving these goals – given that road transport is one of the largest producers of CO₂ – is to increase the use of electric vehicles instead of traditional fuel-powered vehicles.

Interest in electric vehicles is growing steadily abroad, but there has also been a significant increase in the number of cars sold in Hungary.

Demand for electric cars is growing, but government incentive programs are needed to encourage more buyers to choose more environmentally friendly, but more expensive, vehicles.

Based on the low number of domestic purchases, it could be assumed that consumers are not aware of the advantages of buying electric cars or the possibilities of financial and non-financial incentives. This assumption can be confirmed by the questionnaire survey, as even the majority of respondents with higher education felt that they did not have sufficient information on the subject. They expect information primarily from the government, but they also welcome any information from car manufacturers and dealers, as well as scientific institutions.

In its Climate Strategy, the Hungarian government emphasizes the role of partnership with the corporate, civil, and nonprofit sectors in order to achieve climate goals by the set deadline. Higher education institutions therefore, have a great responsibility, especially because they have a key role to play in informing and convincing the generation that will soon be buying electric cars.