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LOW-CARBON INNOVATION POLICY WITH THE USE OF BIORENEWABLES IN THE TRANSPORT SECTOR UNTIL 2030

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Abstract: *The topic of the present study deals with the changes and future trends of the European Union's climate policy. In addition, it studies the manner in which Hungary's transport sector contributes to the success of the above. The general opinion of Hungarian climate policy is that the country has no need of any substantial climate policy measures, since it will be able to reach its emission reduction targets anyway. This is mostly true, because the basis year for the long term goals is around the middle/end of the 1980's, when Hungary's pollution indices were entirely different than today due to former large-scale industrial production. With the termination of these inefficient energy systems, Hungary has basically been "performing well" since the change in political system without taking any specific steps in the interest of doing so. The analysis of the commitments for the 2020-2030 climate policy planning period, which defined emissions commitments compared to 2005 GHG emissions levels, has also garnered similar political reactions in recent years. Thus, it is not the issue of decreasing GHG emissions but the degree to which possible emissions can be increased stemming from the conditions and characteristics of economic growth that is important from the aspect of economic policy. In 2005, the Hungarian transport sector's emissions amounted to 11 million tons, which is equal to 1.2% of total EU emissions, meaning it does not significantly influence total transport emissions. However, the stakes are still high for developing a low GHG emission transport system, since that will decide whether Hungary can avoid those negative development tendencies that have plagued the majority of Western European transport systems. Can Budapest avoid the scourge of perpetual smog and traffic jams? Can it avert the immeasurable accumulation of externalities on the capital city's public bypass roads caused by having road transport conduct goods shipping?*

Keywords: *low-carbon transport, green transport, GHG emission reduction, effort sharing, renewable energy*
(JEL classification: Q58)

Introduction

The purpose of the present study is to assess the long term possibilities for developing the Hungarian transport system, which would allow the sector to change its previous negative tendencies (it fails to follow the leading trends of the EU's transitional countries) and finally be able to donate to performing the climate policy targets set by Hungary and the EU. In addition to identifying the correct future directions, the study also aims to provide recommendations that can be used in practice and that could be useful for the European Union's political decision makers for the 2021-2030 program period.

Hungarian trends in transport development follows those Western European changes that amount to approximately 30% of the ESD (Effort Sharing Decision, emissions not included in the EU Emissions Trading System). In Hungary, this value is presently 20%, which assumes strong growth in the near future. Therefore, Hungary's primary goal could be to implement the necessary growth through low-carbon developments (with the use of systems requiring low energy and resource inputs). It is also important to stress that if the present potentials for development are left unutilized, the result will be a so-called "lock-in effect"[1] which results in serious social disadvantages and can lead to contradictions in development over the long term.

Regarding transport, the greatest challenge we have to

1 It also means the omission of possibilities for development that are presently easily accessible (for example, with the use of tendering funds) but do not pose a fundamental need in the social environment of the given country or economic environment. However, failing to implement developments that extend beyond social needs can increase the economic disparities between developed and developing countries, inducing serious contradictions in development levels.

face is the increasing number of vehicles and the increasing need of the population to travel. Even despite of the 2008 economic recession, the sector has shown continuous growth since the 1990's in the number of kilometers travelled; at the same time, an increasing tendency proportionate to the change in GDP was also apparent. Luckily, the sector was able to break free of this effect (which is referred to by literature as "decoupling"), but no significant GDP-independent decreases were attained (Forster et al. 2012; Šelih et al., 2010).

If indices are also taken into account, another typical figure shows that the transport sector is responsible for close to 20% of the European Union's GHG (greenhouse gas) emissions; public road transport makes up 90% of this figure (Nemry, 2011). In relation to the above, the greatest issue is that although low emissions and electric modes of transport are increasingly common in public transport (for example, electric trains, subways, and trams), public roads are still mainly used by outdated vehicles burning fossil fuels. The spreading of modern electric and CNG technologies in Hungary and most Central and Eastern European countries is not expected for a long period of time due to their high cost (Fiorello et al., 2009).

Ever since the start of the ESD system the transport sector is highly connected to the buildings and the agriculture regarding climate policy goals. Furthermore, the link between these branches goes far beyond this mechanism considering that agriculture would be able to provide biofuel to transportation ensuring a more environmentally friendly operation (Kiss, 2013). Even though there are more innovative and efficient technologies in the field of sustainable vehicle development already, the early predictions rule out these options from the near future of Central and Eastern Europe. So as long as we must rely on traditional fuels, the biofuel provision from the side of agriculture remains a top priority (Fonseca et al., 2010). Therefore the role of this sector is going to appear in the analysis from the aspect of renewable energy use and energy efficiency improvement within the Hungarian transportation.

This is important to stress because the present research program primarily deals with the load on public roads and attempts to include the tendencies characteristic of those into specific studies. In summary, it can be declared that of the sectors governed by the European Union's climate policy, the development of the transport sector is the most disputed and the most urgent, as the sector has the greatest effect on our environment due to the growth of needs that have become apparent in this area and the low rate of utilization of the technological novelties that can be applied in this area (Coussy et al., 2014).

Materials and Methods

The study used the TREMOVE model developed by Transport & Mobility Leuven to assess transport and put the basic data in order; this model is a methodology that has undergone close to 20 years of development in studying the situation of the European Union's transport sector. The basis for calculating the trends valid until 2030 is the public Tremove 3.4 database, which includes country-specific data.

Due to the chronological nature and variability of the available data, the benchmarking study method was selected to conduct the basic assessments. Benchmarking is fundamentally a level comparison method that is suitable for comparing the condition of a given time and place by concentrating on a predefined system of conditions (Fogarassy, Bakosne 2014; Camp, 1992).

In essence, it ranks, then qualifies future states based on characteristics available in the present and on the indicators that make up those characteristics. Benchmarking analyses can be specified and ranked in accordance with the purpose of the study; they are also suitable for identifying deviations from a state of balance or from best practices. In the present study, the methodology was specified by making the processes taking place in Hungarian transport scenarios quantifiable according to the cornerstones of the European Climate Policy. These were the following aspects for study:

- the ratio of renewable energy sources in the sector,
- the rate of energy efficiency, and
- aspects of decreasing CO_2 emissions.

The studies analyzed the *technological, environmental, and financial* dimensions of the building sector along the lines of the above three main dimensions, assigning 3 indicators to each of the above dimensions. Tables 1, 2, and 3 illustrate the study framework developed by the study.

Table 1. Indicator group 1 of the transport sector benchmarking analysis

Dimensions	Code	Status indicators	Code	Performance indicators (defining the method of development)
ASPECTS OF THE RATIO OF RENEWABLE ENERGY				
Technological	RS1	A specific study and the general characteristics of the applied energy mix	RP1	Changes in the use of expendable resources (in the present case: fuel): the increase or decrease in the ratio of fossil energy source usage in the examined sector between 2020 and 2030.
	RS2	The general standard and improvability of technical equipment	RP2	The state of the technical standard and the ratio of environmentally friendly technologies
	RS3	The ratio and characteristics of renewable energy source utilization	RP3	The possibilities for increasing the utilization and percentage of renewable energy sources (in the present case: biofuels) in the sector
Environmental	RS4	The characteristics of participation in a waste energy reuse system	RP4	Renewable energy system support, classified according to roles
	RS5	Results/relations between emissions/imissions benchmarks	RP5	Ratio of the potential for decreasing emissions levels as compared to the other ESD sectors
	RS6	The rate/level of corporate environmental management and the general sectoral attributes of environmental management systems	RP6	The role of social responsibility programs in attaining GHG reduction targets

Dimensions	Code	Status indicators	Code	Performance indicators (defining the method of development)
Financial	RS7	To what extent does the ratio of the sector within the ESD influence the country's position on the quota market (AEA)	RP7	Evaluation of activity (characteristics of carbon financing)
	RS8	The intensity/activity of environmental policy and climate policy regulation	RP8	The effects of regulation on emissions
	RS9	Resource efficiency complexity: labor market effects and effects on employment	RP9	Study of job creation effects and the description of its significance

Abbreviations: 'RS1 - 9:' status indicators of the ratio of renewable energy, according to dimensions; 'RP1 - 9:' performance indicators of the ratio of renewable energy, according to dimensions

As apparent by Table 1, each indicator has two aspects: a *Status Indicator* and a *Performance Indicator Group*. Of these, the former provides a basis, the characteristics of which have to be known in order to have a picture of the examined system (which in the present case is the transport sector). The latter is a similarly parameterized indicator that enables the direction and rate of the changes to be quantifiably measured (Fogarassy et al., 2014). An important factor of the studies is that the state of affairs in 2020 has to be defined in order to be able to define the changes that take place between 2020 and 2030. In order to determine this static state interpreted amongst dynamic changes, a point of reference must first be set. The evaluation of the indicators set for 2020 were individually set with the help of a professional program, with the help of which a provisional picture was obtained on the 2010-2020 period. The study compared the expert estimations for 2020 with European models (Tremove, Primes, National Transport Infrastructure Development Strategy 2014), after which the 2020 indicators were finalized.

Table 2. Indicator group 2 of the transport sector benchmarking analysis

Dimensions	Code	Status indicators	Code	Performance indicators (defining the method of development)
ASPECTS FOR INCREASING ENERGY EFFICIENCY				
Technological	ES1	The ratio of electrical energy use in total energy use	EP1	The evaluation of the type of energy utilization, with proportionality
	ES2	The possibility and degree of connections that can be created with ETS sectors	EP2	Connections with ETS sectors and the resulting production surplus created therein
	ES3	The degree/rate of possible clean tech applications	EP3	The possibility of introducing low-carbon technological solutions
Environmental	ES4	The intensity of input utilization within the sector	EP4	Transport sector energy use
	ES5	Optimization level of vehicle lifecycles	EP5	The ratio of vehicles not older than 5 years compared to the total number of vehicles
	ES6	Level of energy loss	EP6	Degree of avoiding losses
Financial	ES7	Cost effectiveness parameters of increasing energy efficiency	EP7	Ratio of cost effective potential for reduction
	ES8	Typical costs of increases in eco-efficiency	EP8	Changes in the ratio of urban to rural public road transport
	ES9	The significance of regulatory elements in production processes	EP9	The effects of regulation on improvements to technological levels

Abbreviations: 'ES 1 - 9:' status indicators of the energy efficiency aspect, according to dimensions; 'EP 1 - 9:' performance indicators of the energy efficiency aspect, according to dimensions

Table 3. Indicator group 3 of the transport sector benchmarking analysis

Dimensions	Code	Status indicators	Code	Performance indicators (defining the method of development)
THE ASPECTS OF CO_2 REDUCTION LEVELS				
Technological	CS1	The intensity of GHG emissions in light of the given technology	CP1	GHG emissions based on the evaluation of the available technical variants
	CS2	The possibility of introducing low-carbon technologies to the sector	CP2	Changes in the ratio of public transport to road transport
	CS3	Composition/volume index of characteristic GHGs	CP3	The potential for reducing the ratio of CO_2 compared to total GHG emissions
Environmental	CS4	Environmental characteristics of GHG emissions	CP4	Description of GHG environmental characteristics and their evaluation from the aspect of the expected measures
	CS5	Environmental regulations/norms, thresholds/consistency	CP5	Do regulations support or hinder the meeting of environmental policy targets
	CS6	The level of environmental risks in emissions	CP6	The characteristics and nature of adaptation measures
Financial	CS7	The characteristics/level of participation in the GHG market	CP7	The ratio of total GHG emissions in all sectors subject to the regulation
	CS8	Typical costs of GHG reduction per unit of CO_{2e}	CP8	CO_2e reduction cost index in the examined sector
	CS9	The nature of the contribution to the meeting of GHG climate policy targets	CP9	Volume and efficiency calculations

Abbreviations: 'CS 1 - 9:' status indicators of the aspect of reducing CO_2 emissions, according to dimensions; 'CP 1 - 9:' performance indicators of the aspect of reducing CO_2 emissions, according to dimensions

The indicators included in the tables are required in order to define the amount of externalities (influencing factors without market value) accumulated in the sector.

Interpreting externalities

In the course of the present study, the term externality was used not in the traditional sense, but rather as any positive or negative (environmental, financial, or social) resource factor that can affect the developments of the Hungarian transport sector but that is not included in decisions on development. The point of examining externalities is to identify market errors, contradictions in development, and hindering or impeding factor groups within the studied economic system. The main aspect of the evaluation was to determine the degree to which a given indicator aids or hinders the transport sector in attaining the targets set by climate policy. In accordance with the above, each of the 9 indicators of the three evaluation system categories were allocated a value [(-2), (-1), (0), (1), (2)], with negative numbers indicating under-performance and positive numbers indicating over-performance. Thus, when compiling the results, a score of 0 indicates the optimal level of a system (best practice), while all other numbers indicate the presence and the rate of externalities. If the accumulation of positive externalities will be characteristic of the various aspects of transport, this means there are many possibilities that are not utilized and to which sources have to be allocated after 2020. However, an overabundance of negative externalities is expected if the opposite is encountered (Fogarassy 2012). This could be a result of the fundamentally incorrect structure of one of the aspects of the sector. Investments should therefore not be made in such aspects, as that would only support disadvantageous development directions that are detrimental to both society and the economy (Fogarassy 2006).

Research results

Table 4 presents the results of the study based on the presented methodology logic. The table summarizes 3 aspects of the analysis: case *"A"* is a simple sum of the externalities

Table 4. Evaluation of the transport sector benchmarking analysis

Serial number		ASPECTS OF THE RATIO OF RENEWABLE ENERGY		ASPECTS FOR INCREASING ENERGY EFFICIENCY		THE ASPECTS OF CO_2 REDUCTION LEVELS	
		2010/2020	2020/2030	2010/2020	2020/2030	2010/2020	2020/2030
Technological	1	-2	-2	1	1	0	-1
	2	-1	-1	2	2	0	0
	3	0	0	1	2	1	-2
Environmental	4	-2	-2	-2	1	-2	1
	5	2	2	0	1	-2	1
	6	-1	-2	0	1	-2	-1
Financial	7	0	-1	-1	-1	-1	-2
	8	-2	0	1	1	-1	-1
	9	0	-1	-1	0	-2	-1
A: Net positive externalities ∑ (1;9)		**-6**	**-6**	**1**	**6**	**-9**	**-6**
B: Total externalities ABS (1;9)		**9**	**10**	**9**	**10**	**11**	**10**
C: The ratio of net positive external effects within total external effects		**0%**	**0%**	**11%**	**60%**	**0%**	**0%**

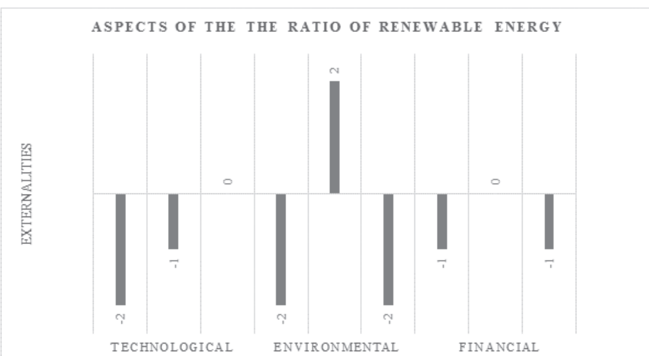
Explanation: A: Net positive externalities ∑ (1;9): the number of positive externalities within the various aspects in 2020 and 2030, respectively, if no directed climate policy developments take place outside of BAU; B: Total externalities ABS (1;9): the absolute value of the total number of externalities; C: The ratio of net positive external effects within total external effects; expressed as a percentage, it indicates the dimension of improvability in the studied area.

manifest in the sector (A: net positive externalities). Index *"B"* is the total amount of externalities calculated by adding their absolute values (B: the absolute value of total externalities). Finally, index *"C"* indicates the ratio of net positive externalities (A) within the total number of externalities (B). Naturally, if the latter is negative because disadvantageous effects have accumulated, the whole index receives a value of 0%.

Evaluation of the study aspects

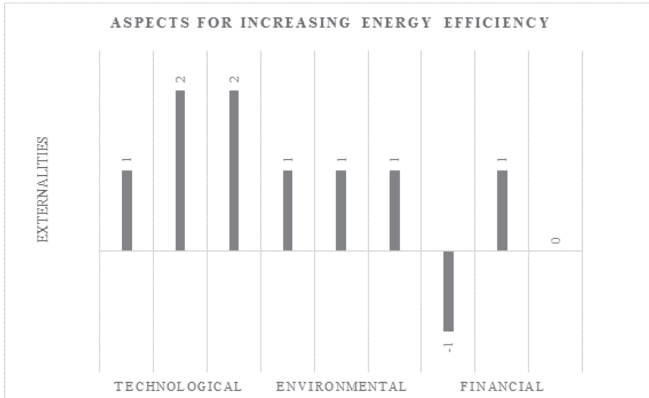
The percentage of renewable energy: the negative figures apparent until 2020 are probably not surprising, since it can be forecast even now that modern technologies within the transport sector (electricity, CNG) will have not spread at all by 2020 (Schade, Krail 2012). However, it is a sad fact that not even the popular scenarios (Tremove and Primes) include those political regulations in their calculations that alone enable these values to be increased. Another obstacle generally encountered in transport is the fact that the sphere of GHG polluters is mostly made up of private persons, who are difficult to delineate and regulate. As a result, the measures between 2020 and 2030 have to affect areas that central regulations can directly influence (Figure 1.). For example, such is the increasing of the percentage of public transport and upgrading the tools it uses. It can be observed that in the case of countries such as Poland and Romania, where CNG buses have been operating for several years, the national level of CO_2 emissions is significantly better.

Figure 1. The number of externalities within the renewable energy aspect



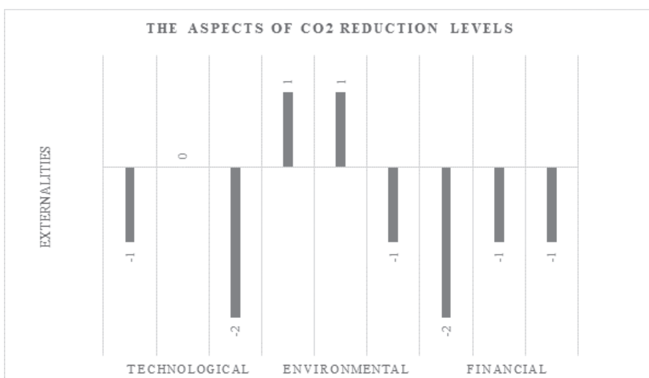
Increasing energy efficiency: this is the only category in which the Hungarian transport sector has received positive results. It can be established on the basis of the study that positive factors can be manifest by 2020 among the externalities that can pose the basis of development for the period ending with 2030. Using the previous indicator group as an example, it is clear that this will not take place with the inclusion of renewable energy sources, but can rather be based on measures that make better use of technologies presently available (for example, the optimization of toll roads, speed limits, etc.). Another important factor is continuously developing technological innovations in the case of vehicles that operate with traditional fossil fuels in order to increase their efficiency (for example, using bio-ethanol and gas in gasoline powered cars). On the other hand based on the experimental data we need to realise the negative feedback in case of financial practice, the renewable-transport finance is a pretty underdeveloped and unprofessional therefore we have few unsustainable programs from the past years. (Figure 2.).

Figure 2. The number of externalities regarding energy efficiency



The aspects of CO_2 reduction: regarding this aspect, it must be said that although a certain improvement is apparent between the two periods, this is far behind expectations. According to forecasts, carbon dioxide emissions will stagnate or, in certain cases, decrease slightly (by 1-2%) by 2020. Despite the above, a large accumulation of negative externalities takes place in the first interval, which will not substantially improve by 2030 (Figure 3.). This could end up being the determining factor for the entire sector. Regardless of whether various climate policy directions have been defined within the EU, the original Kyoto commitments pertain to the reduction of GHG emissions. Based on the study, the increasing of energy efficiency will result in only marginally decreased levels of CO_2 emissions, which can re-evaluate the importance of the sector from the aspect of climate policy and can therefore influence the factors for planning. Consequently, this is the indicator group that best presents the importance of the sector, since it shows the dangers it can have for the meeting of climate policy targets over the long term. This basically means that the increase of energy efficiency results in the increase in the number of vehicles (rebound effect), thus GHG emissions will end up not decreasing.

Figure 3. The number of externalities regarding CO_2 reduction levels



The main development cornerstones of the Hungarian transport sector based on benchmarking studies

The strength of the Hungarian transport sector lies in its inherent cost effective GHG reduction potential. It is well known that the European Union's transport sector main problem is not a lack of possibilities for reduction, but the cost of doing so. It is also well known that it is much cheaper to implement the developments in other areas than in transport. According to international forecasts, the sector will continue to show a large degree of dependency on fossil fuels (gasoline and diesel) by 2030. In consequence, despite the improvement in energy efficiency, long term GHG reductions can only be achieved with the use of renewable energy sources (Hill et al., 2012 Borkent et al. 2012). This is also confirmed by the results of our benchmarking analysis (Table 4), which indicates that the low level of negative externality content in energy efficiency in itself is not sufficient for moving the level of CO_2 emission reductions in a positive direction. The inclusion of renewable energy sources in the transport system is clearly required to achieve this result. Within the aspect that deals with renewable energy sources, it is shown that the values of the technological and environmental indicators remain unchanged, meaning they do not provide the possibilities that would enable developments. Contrary to the above, the complex results table of the financial dimension presents quite a contradicting picture. It leads to the conclusion that the present financing/support system requires the implementation of changes (for example, fuel tax discounts, parking fees, etc.) that are suitable for substantially restructuring the transport sector's fuel use and the mix of fuels it uses.

Another perspective for development is the responsible regulation of urban transport. It is well known that due to its concentrated form, urban transport poses a much greater burden on the environment than suburban transport (Selih et al. 2010; Leduc, Blomen 2009). Regarding this point, the disorganization and imprudence of economic policy decisions poses a significant disadvantage, as a result of which contradicting regulations are often legislated. For example, such is the congestion charge, which is known to be a suitable tool for limiting traffic but is politically quite unpopular. Among climate policy developments, imposing congestion charges on large cities has been a recurring recommendation for years now; it entertains the logic that people who want to participate in urban traffic have to pay the price (Strong-Chhun 2014). Contrary to this notion, the county based toll system was introduced in Hungary, which forces traffic into cities instead of around them in several points, as bypass roads have also been included in the toll system. In Hungary, it is sad that from the perspective of the GHG emissions of urban and extra-urban transport that the new county toll road system introduced in the interest of increasing budgetary revenue is delaying the introduction of the congestion charge in Budapest. The study results illustrated in Table 4 show that the greatest positive results regarding the aspect of CO_2 reduction between the two periods were achieved in the environmental dimension. This means that the system of environmental protection regulations (for example, emissions restrictions, periodical traffic limitations. etc.) has to be amended in the interest of utilizing development possibilities, as that can motivate the development of the system in the direction of reducing GHG emissions.

Based on the benchmarking analysis, the value indicative of the percentages of public transport and road transport proved to be one of the most important indicators. On the one hand, public transport can be much more effective regarding the number of passengers, and in large part it also uses technologies that have low GHG emissions (for example, electric trains, subways, and trams) (Stanley et al. 2011). Regardless of this fact, the models evaluated by the present study show that public transport will show a 5% decrease between 2010 and 2030, its rate thus falling below 20% in comparison with road transport. The retention of present public transport levels and the introduction of regulations that can shift users to this form of transport thus has to be one of the main priorities of transport development. This can take place through the improvement of system efficacy or with protectionist measures that grant greater benefits to people who use public transport. In the case of the public road-based format of personal transport, there are other tools besides the expensive technical development of existing tools. A good example can be the development of the vehicle stock structure by increasing the number of electric mopeds. This simple yet practical mode of transport is much cheaper than vehicles that use similar technological solutions but are nevertheless significantly more expensive. At the same time, it would be a solution akin to reducing emissions and congestions.

In addition to public transport, goods transport is the other sector in which the easily delineable sphere of GHG polluters can aid development interventions (Dobers et al. 2013). In this industry, companies document their trips, making it possible to accurately track the amount of the pollution they produce. In addition, business sector players are naturally easier to regulate than the behavior of individual persons in individual transport. The easiest solution from the aspect of environmental protection would be to have shipped goods transported mainly by low-environmental burden electric trains or with heavy goods vehicles (over 16 tons) that are more efficient in CO_2 emissions per kilometer (Pan et al. 2013). Contrary to the above, the business sector does not prefer railway transport at all, since it is not as flexible as road transport. However, central regulations ban heavy tractor trailers from certain roads in the interest of replacing them with smaller vehicles. This leaves two possibilities for intervention, the first being the gradual replacement of smaller capacity transport vehicles with vehicles that use electric or CNG technology, which obviously requires companies to make large investments. The other choice is to ensure that the shipping routes of goods transported by heavy tractor trailers is short, moving utilization away from smaller capacities towards the direction of electric trains. Both of these directions are basically aimed at using low GHG emitting technologies to provide for the sector's traffic. This was also a trend in personal transportation, where recommendations were either to use electric modes of public transportation or electric cars and mopeds that can be used on public roads. This comes as no surprise, since of the results summarized in Table 4, the technical dimension of the CO_2 reduction aspect shows the larger changes. According to our forecasts, a significant amount of externalities are expected to accumulate in the 2020-2030 period unless the percentage of public transportation and the number of developments in rational private transport (i.e. mopeds) increase. These negative external effects will become apparent in the form of congested roads and the fast amortization of public roads starting in the first half of the 2020's.

Conclusions

Up until recently, Hungarian climate policy generally felt that Hungary did not have to implement any special measures in order to achieve its targets, as those would be met with the modern technological advancements anyway. For example, such is the spread of new heat insulation in the built environment sector, which appear in practice as a result of a need on behalf of society and also end up automatically decreasing the amount of GHG emissions. Developments in the transport sector are contradictory to this trend, as the use of fossil fuels (gasoline, diesel) is still significant and, although energy efficiency will improve as the amount of cars in Hungary increases, the total amount of GHG emissions will continue to grow due to the greater number of vehicles. Studies show that the use of electric cars and environmentally friendly fuels is not trendy and is significantly less economical than in Western European countries. Still, Hungarian agriculture has a good potential to provide bioethanol which puts the country among the top producers in the European Union. The problem occurs with the fact that most of this capacity goes to countries like Germany just as it happens with other biological products from the sector. Therefore the use of this material falls far behind the amount that would be expected considering the size of production.

Based on the present study, it also becomes apparent that it is difficult to effectively implement regulations in a sector where private transport is so prevalent (80%). The authors therefore attempted to identify the areas of development through which the amount of GHG emissions can be easily measures and thus controlled. The results of the benchmarking analysis performed as part of the present study helped define two main points of intervention. The next step would be to perform specific economic studies in regard to these. The first point of intervention is the increase in the percentage and size of public transport (or at least maintaining present levels: around 20%), since this form of transportation poses a significantly smaller environmental burden than private transport. The second area that could hold significant possibilities for development is the sector of goods transport, where the utilization of environmentally friendly modes of transport in shipping is essential. The primary way to achieve a significant increase is by developments aimed at electric or CNG use.

In the interest of successfully applying the results of the study, the authors also recommend performing a cost-benefit analysis (CBA) for the sectors mentioned above; the results of these CBAs would indicate the amount of GHG decrease that a unit of investment would create. In addition, it must also be clear how the applied resources (i.e. EU support) would provide a return over the long term, thus what values the cost efficiency indices would have. In the case of climate prevention developments, it often happens that the actual returns on the investments are only realized after the lifecycles of the developments; this however cannot be an option in any of the aspects in question. Only those developments should be granted central or EU support that are sure to provide a return before the end of their lifecycles and where the cost efficiency of the GHG decrease remains less than the EU ETS quota price forecasts. If the development principles fail to adhere to this target system, externalities (primarily negative externalities) will end up accumulating in the sectors, which will make cross-sectoral low carbon developments fundamentally impossible.

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