Environmental impact of the coronavirus

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Abstract: *The current crisis caused by the coronavirus is having a strong impact on the world both economically and socially. In this challenging situation, individual values, behaviour, attitude have a great impact, either it can influence the further development of the crisis in a positive or even negative direction. During the virus, the main focus is on economic and social issues emphasis, however, in our view, it is also worth considering environmental impacts. The main aim of this study is to examine the positive and negative effects of the coronavirus on our environment sustainability with the help of secondary and primary research methods. In the frame of the primary data collection quantitative standardised questionnaire has been occurred. Based on the results the study covers the decrease and increase of environmental pollution at the personal, household, corporate and institutional level in the period affected by the coronavirus.*

Keywords: *Sustanability, CO^2 emission, coronavirus, carbon reduction*

1 Introduction

1.1 Sustainability and sustainable development

The concept of sustainable development has been a long contested issue, its exact definition was first encountered in 1987 in the report of the United Nations, World Commission on Environment and Development (Brundtland Commission) entitled 'Our Common Future'. The purpose of the report was to set out the requirements and principles by which the Earth can be saved for future generations. So "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". [1] There are three pillars of sustainable development that need to be considered in

a complex way, taking into account their interactions: environmental, social and economic sustainability.

Agenda 30

In 2015, 193 United Nation member states adopted the new integrated framework for sustainable development, which includes much more detailed and structured goals than before. The main advantage and characteristic of this framework is that, it sets goals and tasks for each country and region. The Agenda 30 framework (officially Transforming our world: The 2030 Agenda for Sustainable Development) contains a total of 17 goals, 169 sub-goals and nearly 230 indicators that attempt to assess and analyze aspects of sustainable development by 2030. [3]

1.2 Impacts of coronavirus

The coronavirus epidemic is a global health crisis of our time. The virus has spread to all continents except Antarctica. The number of cases is growing rapidly around the world, countries are competing with the spread of the virus, slowing it down is a global priority. Past global economic crises and epidemics have also had an impact on the environment, this impact can be measured with the intensity of carbon emissions.

The "Carbon Brief" summary examined estimates and reports from the world's largest carbon emitters. The summary examines the overall economic changes in China and America, the European Union's carbon emissions, the Indian energy sector and the global oil sector. According to the carbon analysis of data from ICIS and the International Energy Agency, these five areas account for the vast majority of annual global CO2 emissions, around 76% in 2018.

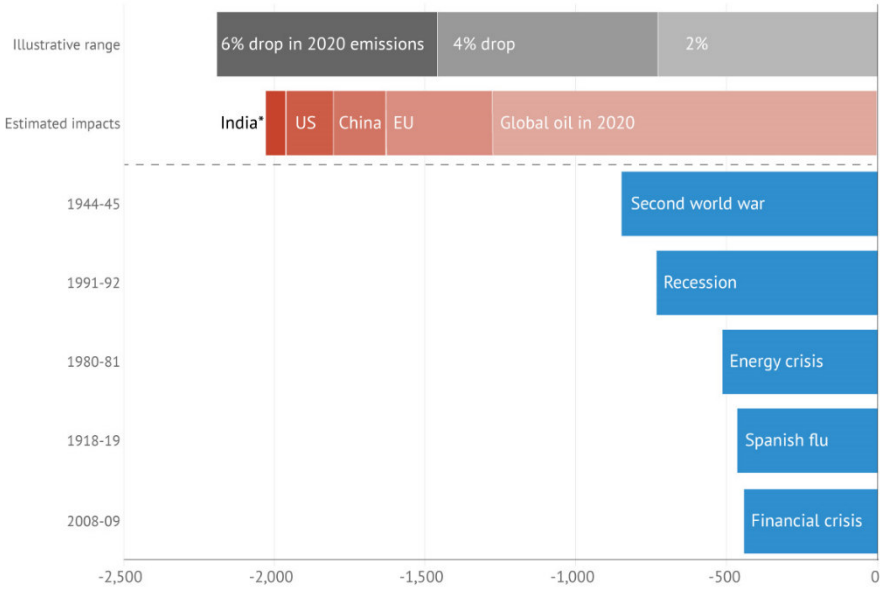
Highly infected countries in Europe have put in place strict quarantine regulations to reduce the spread of the virus. As a result, energy demand has been greatly reduced. In Italy and France, energy demand fell by 3% in the first week of quarantine and by 10% in the second week of quarantine. In England and Germany, demand is 10% and 5% lower than the average for the last 4 years. The quarantine also affected the airlines, with only 5% of the originally scheduled April flights operating, according to a Lufthansa Group report. The analysis assumes a total reduction of 388.8 million tonnes of carbon dioxide equivalent in the European Union. [4]

China starts with reduced carbon emissions every year. This is due to Chinese New Year, during Chinese New Year shops close and contructions stops for a week, most industries cease production. During this time, coal-fired power generation typically falls by 50%. In 2020, the shutdown was extended due to the coronavirus epidemic, bringing coal consumption in coal-fired power plants to its lowest level in four years over the next 4 weeks. In terms of declining coal and oil consumption, China has emitted 25% less carbon dioxide than in 2019 in the first

two weeks after the New Year. This ratio is about 100 million tons of carbon dioxide. [2]

According to the International Energy Agency's April short-term energy estimates, the United States is also expected to see a large decline in electricity, which will hit the commercial sector hardest by 4.7%. Electricity consumption of the industrial sector and households will fall by 4.2% and 0.8% in 2020. As a result of the changes, total electricity generation in the U.S. is expected to decline by 3%, but renewable energy generation is expected to grow by 11%. Due to the electricity sector's need for less coal and the longer-term closure of coal mines, analysts predict 557 million tonnes less coal production, which in total 22% less than in 2019. [5]

The "Carbon Brief" outlined the likely reduction in carbon dioxide due to the coronavirus in the figure below. The blue bar shows the events that have led to the largest reductions in CO2 emissions in the world to date and the reduction in millions of tonnes. The gray bar illustrates the 2020 reduction scenarios for 2%, 4%, and 6% reductions. The red bar shows the estimated effects of the coronavirus crisis taking into account the already mentioned five sectors.



1. figure Carbon reduction estimates for 2020 Source: [2]

The summary figure shows well that the world has entered a phase that it has not experienced before in terms of carbon emissions. With 2,000 million tonnes less carbon dioxide in the Earth's atmosphere we can say this is a positive impact. However, it is important that countries strive to restore their economies with environmental sustainability in mind so that the emission decline does not reverse.

2 Methodology

The possible environmental consequences in Hungary are analyzed in the framework of primary research, the research tool is a questionnaire survey. The research collects information on altered population habits due to the coronavirus through an online questionnaire survey. The aim of the survey is to be able to draw conclusions about the effects on environmental sustainability in Hungary on the basis of quantifiable changed habits.

The target group is the population of Hungary, who are fully affected by the changes and regulations caused by the current coronavirus. The only criteria of the questionnaire survey is to be a resident of Hungary, there was no no additional criteria are given (for example, regarding gender, age). The sample size was 203 people, the sampling was arbitrary, so the results are local and not representative. Subjects were recruited using an online survey using arbitrary sampling. The questionnaire examined the respondents' experiences and behavior before and during coronavirus. This allowed conclusions to be drawn about the impact of the current coronavirus crisis on people's lives. The areas examined were as follows:

- Change in shopping habits depending on, purchase quantities, purchase frequencies, amounts to be purchased.

- Changes in vehicle usage by examining own car, taxi, public transport, etc. usage.

- Changes in the amount of experienced waste by households.

The questions in the questionnaire included both open-ended and closed-ended questions, however, during the compilation, the goal was to minimize open-ended questions in order to facilitate the evaluation of the questionnaire. Most of the closed questions were selective and scalable. During the evaluation of the questionnaire, half-completed questionnaires and questionnaires with unrealistic, irrelevant answers were removed.

3 Results

3.1 Demographic characteristics of the sample

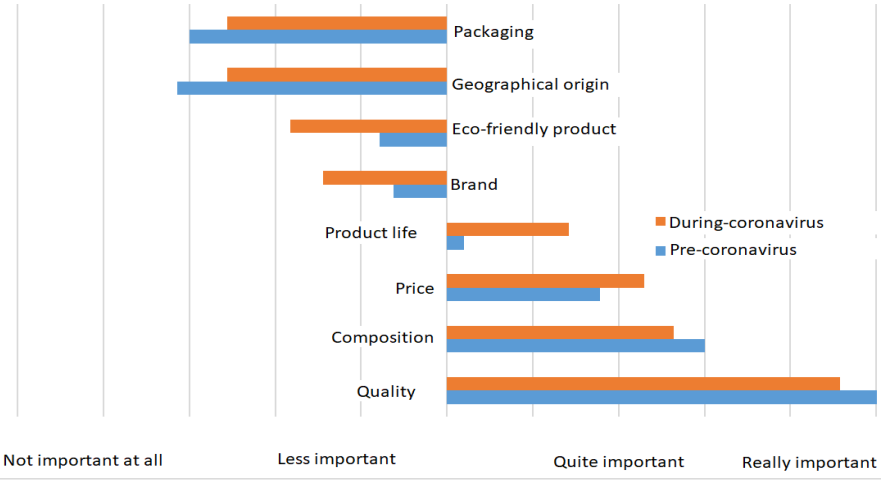
114 of the respondents are between the ages of 21 and 30, which is 56% of the respondents. Other larger age groups are between 31 and 40, with 35, and between 41 and 50, with 32. 90.69% of the fillings are given to those under 50 years of age. The youngest respondent is 20 years old, while the oldest respondent is 74 years old. The proportion of respondents to the questionnaire by gender: 59% are male and 41% are female, and 61% of the respondents are from Budapest. Budapest accounts for ~ 50% of all diseases in the country.

3.2 Importance of purchasing considerations

The following figure shows the importance assessment of pre-coronavirus and during-coronavirus purchase considerations. The x-axis of the figure shows how important the fillers considered the aspects on the y-axis. The x-axis shows the ratings in ascending order of importance from left to right, so the aspects on the left were considered less or not at all important by the fillers, while moving to the right increases the importance of the aspects.

Fillers purchased mostly in terms of quality, composition, and price before the coronavirus. These three most important criteria are followed by product life with a much lower level of importance. Then the brand and the eco-friendly product, aspects fall into the less important category, and finally the geographical origin and packaging are the least important aspects.

During the coronavirus crisis, the importance of the product life aspect has strengthened, fillers considering it almost 14 times more important than before the coronavirus, presumably the fillers were prepared for a longer-term crisis situation. This change was most detrimental to the environmentally friendly product aspect, which decreased by about 133% on the importance scale (relative frequency of mentions). Of those who considered the eco-friendly product criterion very important before the coronavirus, 29% changed their minds about it during the crisis.

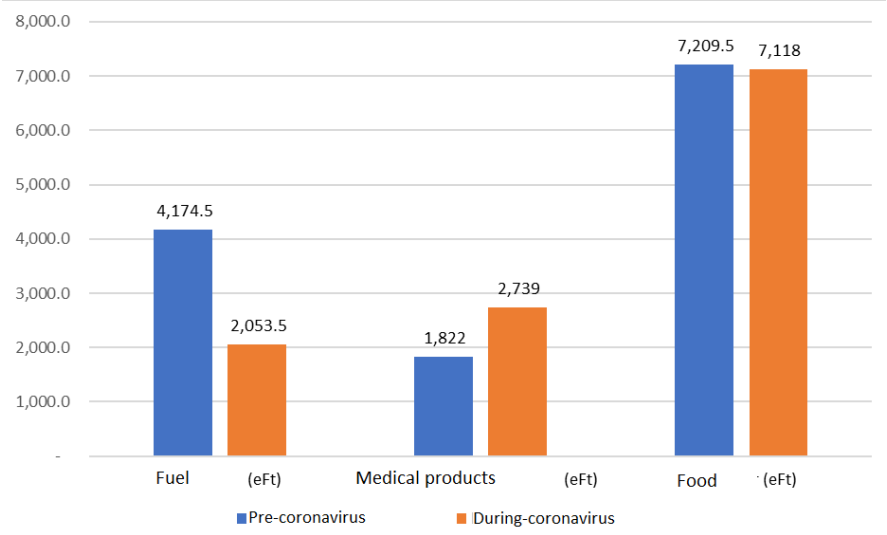


2. figure Importance of purchasing considerations Source: Own study, 2020 N=203

3.3 The amount spent on product groups

In the following, the respondents examined the monthly amounts of HUF for medicinal products, food and fuel. This allows conclusions to be drawn about how much less or more fillers will spend during the coronavirus crisis. The figure

below shows how much the fillers spent in total for each product category, based on the average of the amount groups. It can be seen that the amount spent on medicinal products increased by 33% due to the coronavirus crisis, while the amount spent on food did not change much. However, fuel costs have halved as a result of the crisis. Overall, the respondents spent ~ HUF 1.3 million less on the three product groups in one month during the coronavirus crisis compared to the pre-coronavirus period, driven by a decrease in fuel allocations.



3. figure: The amount spent on product groups

Source: Own study, 2020 N=203

The following table shows the change in the amounts spent on the different product groups on average per capita. Fillers spent on average HUF 10,197 less on fuel per month and HUF 440 on food and HUF 4,409 more on medicinal products.

1. table: Average amount changes per capita due to coronavirus

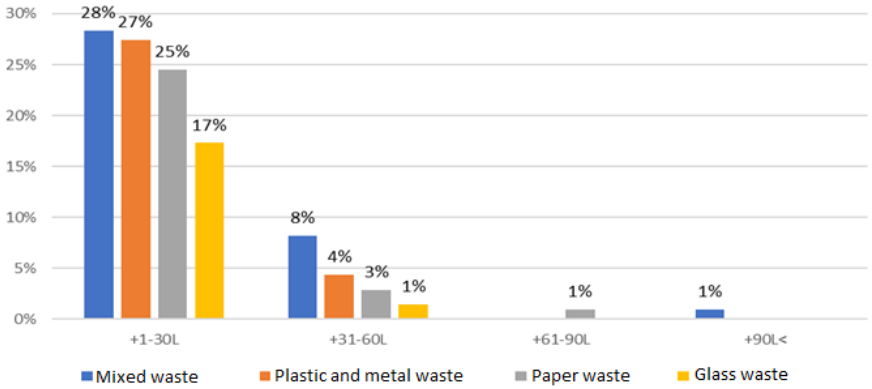
Product group	Average change
Fuel	-10.197 HUF
Medical products	+4.409 HUF
Food	- 440 HUF

Source: Own stuy, 2020 N=203

3.4 Increase in household waste

In the following, the questionnaire measured the weekly increase in household waste experienced by the respondents. The question was whether the fillers perceived a change in the amount of waste (be it mixed or plastic waste) and how

much waste has been experienced by respondents who do not collect waste selectively. Of the respondents, 80% collect waste selectively and only 20% do not. 52% of non-selective waste collectors did not experience any increase in waste in their household, while 30% observed an average of 15 liters, 13% an average of 45 liters, and 5% an average of 75 liters of mixed waste growth per week during the coronavirus. The figure below shows the changes in the amount of waste from the fillers who collect waste selectively. It can be seen that nearly 30% of selective waste collectors experienced an average increase of 15 liters of mixed and metal-plastic waste. Experiencing an average of 45 liters of waste growth, only 8% of selective waste collectors observed from mixed waste, 4% from plastic and metal waste, 3% from paper waste and 1% from glass waste.



4. figure: Increase in household waste
Source: Own study, 2020 N=203

Based on the analysis, the respondents observed an increase in household waste, the average increase in waste per capita is shown in the table below.

2.table Average household waste increase per capita

Waste type	Average increase
Mixed waste	12.15 litre
Plastic and metal waste	8.12 litre
Paper waste	8.04 litre
Glass waste	5.07 litre

Source: Own study, 2020 N=203

Conclusions

The above primary research used an online questionnaire to assess changes in the population of Hungary during the coronavirus. The research examines the impact of these changes on the environmental sustainability dimension. As a result of the primary research, the fillers, during the coronavirus crisis, considered

environmentally friendly products less important from a purchasing point of view. Instead of this, presumably, in order to prepare for the crisis, the product life of the products has become more important. Based on this, the goal of environmental sustainability is violated, as fewer people buy an environmentally friendly product.

The amount of household waste also increased on average, based on the responses to the questionnaire. This violates the indicator of the environmental sustainability development goal for responsible consumption. In contrast, the frequency of purchases was reduced by 41% of respondents, also curbing CO2 emissions from transport. The amount spent on fuel during the coronavirus crisis was much less than before the crisis, thus increasing the assumption of declining carbon emissions..

Based on international secondary research, it is estimated that due to strict social, transportation regulations and economic slowdowns, global carbon emissions could reach 2,000 million tons of carbon dioxide reductions during the coronavirus crisis.

Based on these, the conclusion of the research is that both in Hungary and in the world, the coronavirus had a positive effect on environmental sustainability in the first quarter of 2020. However, this change will be only a short-term change if nations do not take into account the objectives of Agenda 30 while restarting economies.

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