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CARBON FOOTPRINT CALCULATION IN DIFFERENT AREAS OF ACTIVITY

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Abstract: *Today there are no mandatory European Union rules for calculating the carbon footprint. Anyway, the European Commission has proposed to achieve until 2030 the goal of lowering the net greenhouse gas emissions by minimum 55% in comparison to the year 1990. Lately, there have been intense concerns from the EU institutions and bodies in environmental issues, many of them joining environmental initiatives. This paper aims to present a simplified way of calculating the carbon footprint in different fields or situations, taking into account that depending on the activity carried out, various fuels and sources are used, with distinct emission factors associated, following the impact they have on the environment. Attention is also drawn to the need for increasing the level of population awareness in a current subject whose approach cannot be delayed.*

Key words: *carbon footprint, greenhouse gases (GHG), emission factor, environmental management, fuels.*

1. INTRODUCTION

The entire quantity of CO_2 and other greenhouse gas emissions that are both directly and indirectly produced by a product, activity, or the operations of a person or an organization are referred to as a person's or an organization's "carbon footprint.". The population, economic production capacity, industrial institutions, intensity, and structure of energy use are the main determinants of carbon emissions. The European Union objectives can be fully accomplished if all these emissions are included in the calculation.

As there are no strict regulations for calculating the carbon footprint, it is up to every organization to take responsibility for reporting their carbon footprint correctly and taking steps to reduce it.

This paper has the purpose of showing an easy way for calculating the carbon footprint and how each greenhouse gas (GHG) emission must be converted into CO_{2eq} to find out the total carbon footprint. Thus any organization can calculate its own carbon footprint and thus become aware of the impact of its activity on the environment. Also, some results will be presented for the carbon footprint in different fields of activity obtained according to the described model. In the last chapter, main consequences of climate change on Europe are presented and the progress made at the European level regarding climate action.

2. CONTEXT

The European Green Deal [1] represent the strategy on long-term growth of Euurope that aims to make Europe climate neutral by 2050. The European Climate Law [2], signed in 2021, states that the EU is legally bound to create, by 2050, a balance between greenhouse gas emissions and their elimination, and then to reach negative emissions. The said law also includes an ambitious climate goal for 2030: to reduce the net GHG emissions by 55% minimum, compared to 1990 levels.

In these concerns, until strict regulations regarding the calculation of the carbon footprint are imposed, there remains a voluntary global responsibility assumed for the realization of these efforts. In this sense, many organizations choose to implement environmental management tools or join European Union initiatives in order to improve their environmental performance in terms of GHG emissions and more.

3. CARBON FOOTPRINT CALCULATION

The advantages of calculating the carbon footprint is the fact that it can be an input element for determining the risks and opportunities regarding the environment and the climate impact. Organizations around the world measure and report their carbon footprint to interested parties and use the results to communicate their sustainability actions [3]. However, what encourages organizations to calculate their carbon footprint?

- Pursue continuous improvement of environmental performance: identifying the critical points of emissions and their reduction measures, measuring the evolution of emissions over time by ensuring permanent and efficient control, keeping emissions within the imposed limits and establishing emission reduction objectives on the journey to net zero.
- Reporting to stakeholders: reporting to the authorized bodies, improving prestige but also responsibility, meeting the requirements and expectations of relevant interested parties.
- Understanding risks and opportunities: assuming and complying with the regulations regarding Greenhouse Gases, increasing opportunities and visibility on the market, contributing to investment and procurement decisions.

3.1 The Scopes 1, 2 and 3 of Carbon Emissions

First, the GHG (Greenhouse Gas) emissions are split into two groups: direct and indirect.
The Greenhouse Gas Protocol [4] also categorizes emissions into three groups called Scopes (Figure 1).

These Scopes help organizations to identify the place where the activity that generates emissions started and produces effects.

- <u>Scope 1 emissions</u>: the direct emissions linked to the organization’s activities (combustion that occurs both fixed and mobilely, fugitive emissions, and emissions that are generated during processes);
- <u>Scope 2 emissions</u>: the indirect emissions related to the organization's purchased energy's production. These include emissions from the use of cooling, steam, heat, and purchased energy. Most of the time, Scope 2 solely addresses the company's electricity consumption.;
- <u>Scope 3 emissions</u>: indirect emissions associated with the organization's operations that fall outside of Scope 2 and include upstream and downstream emissions.

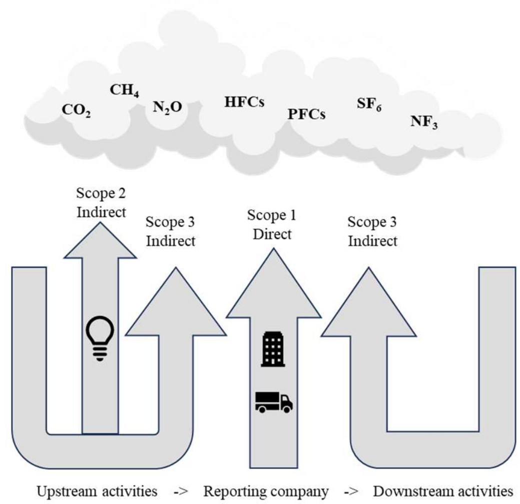

Fig.1. The 3 Scopes emissions

According to [5] there are 15 types of emissions generating activities that are included in this category. For an accurate calculation of the total carbon footprint, it is important to take into consideration all the three scopes, if applicable. The Scope 1 and Scope 2 are imperative when it comes for reporting, but for the Scope 3 there is only a recommendation for reportx, as it is often difficult to quantify it. The calculation itself is the last step in the reporting process because it is conducted based on very important information.

First, the organization must identify the audience, meaning that the report might be for internal use, like employees, external use, like clients or suppliers, or for a certification organization as it is International Organization for Standardization (ISO).

Once the audience is determined, the organization needs to set the boundaries as the facilities that will be included in the report, the operations, the level of ownership, the level of reporting (if it is only for facilities, for the products, the processes or all of them), the reporting period, the baseline and which sources will be taken into account (Scope 1, 2 and 3).

After this stage, it comes to collecting all the information needed in order to succeed the most important step: calculation.

3.2 Key elements used in carbon footprint calculation

In the carbon footprint calculation there are key elements and also metrics that need to be well understood in order to fulfil this task:

- *Emission factor.* This is the emission intensity of an operation or activity. There are different public or private sources from which the appropriate emission factors can be extracted for the activity in question. All the emission factors used in this paper are retrieved from official bodies that publish regularly this type of data.
- *Activity data.* It represents the quantitative information about the operations carried out like: energy consumption, vehicle use, leakages, etc. Most often, one activity is responsible of more than one type of emission.
- *Source.* It stands for an action that has an effect on the organization's operations and causes GHG emission. House or office heating, water use, power use, business travel, fuel use by the vehicles of the organization for commuting and delegations, air conditioning, garbage disposed of, etc. are some examples of sources.
- *Categories of Greenhouse Gases*. There are seven categories identified of GHG under Kyoto Protocol [6]: Carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Sulphur Hexafluoride (SF_6), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Nitrogen trifluoride (NF_3).
- *Global Warming Potentials*. They are ratios that show how much a GHG contributes to global warming when compared to the same amount of carbon dioxide.

3.3 The basic concept of calculation

Although the origin and intensity of activities that generate emissions are distinct, the calculation generally will have the same pattern as follow [7]:

$$Emissions = Activity\ data\ \times Emission\ factor \quad (1)$$

$$Carbon\ footprint\ =\ Scope\ 1\ emissions + Scope\ 2\ emissions + Scope\ 3\ emissions \quad (2)$$

3.4 Mathematical representation

In order to obtain a result for the carbon footprint, it is necessary that all types of emissions are converted into a common unit by applying a 100-year Global Warming Potentials and all the quantities are converted into Carbon Dioxide Equivalent and they can be subsequently cumulated. For burning of natural gas, three types of emissions are generated: Carbon dioxide, Methane and Nitrous Oxide. According to the International Energy Agency, the emission factors for these three gases per 1 cubic meter of natural gas are: 1.9 kg CO_2/m^3, 0.037 g CH_4/m^3, 0.033 g N_2O/m^3.

For a gas bill of 12,385 m^3 (eg.) of natural gas:

1. Emissions calculation (applying equation 1)

12,385 m^3 x 1.9 kg CO_2/m^3 = 23,531.5 kg CO_2
12,385 m^3 x 0.037 g CH_4/m^3 = 458.25 g CH_4
12,385 m^3 x 0.033 g N_2O/m^3 = 408.705 g N_2O

2. Applying Global Warming Potentials (100-year time horizon according Assessment Report 6 [8])

GWP for CO_2 – 1, for CH_4 – 27.9, for N_2O – 273.
Previous data – 23,531.5 kg CO_2 – approx. 23.5 t CO_2, 458.25 g CH_4 – approx. 0.00046 t CH_4, 408.705 g N_2O – approx. 0.00041 t N_2O.
CO_2 emissions = 23.5 t CO_2 x 1 = 23.5 t CO_{2eq}
CH_4 emissions = 0.00046 t CH_4 x 27.9 = 0.0128t $CO_{2\ eq}$
N_2O emissions = 0.00041 t N_2O x 273 = 0.1119t $CO_{2\ eq}$

The quantity of CO_{2eq} was obtained by multiplying the quantity of each emission by the GWP extracted from the official sources.

3. Totalling emissions

To obtain the total amount of GHG generated by burning the natural gas for the period covered, it is necessary to sum up all the emissions quantities which is possible as now they are expressed in a common unit (t CO_{2eq}).
Total emissions = 23.5 t CO_{2eq} + 0.0128 t CO_{2eq} + 0.1119 t CO_{2eq} = 23.625 t CO_{2eq} (Total

emission of CO_{2eq} from heating activity over the period of time covered).

In the case of a source included in Scope 3, the calculation type could differ depending on the indirect upstream or downstream activities implying more emission factors for one activity data.

4. Totalling the emissions categories

Reporting the carbon footprint is a recurrent activity which is made once per year usually. To calculate the carbon footprint it is necessary to pursue the steps presented for each activity included in the report, depending on which facilities, operations, sources are considered. One organization might simply include Scope 1 and Scope 2, whereas another might include the first 2, plus some activities from Scope 3. Table 1 is an example of totaling emissions by sources (Scopes).

Table 1

Example of obtaining carbon footprint

Activity/Scope	Emissions (t Co_{2eq})
Natural gas heating	425
Transportation (by organization vehicles)	300
Air conditioning	10
Total Scope 1	735
Electricity	340
Total Scope 2	340
Landfill waste	80
Employee commuting	3
Total Scope 3	83
Carbon footprint	1158

Thus, the results for carbon footprint highly depend on the activities carried out by the organization, the number of employees, the sources that the organization choose to be included in the report and many other variables. That is why, a concise general applicable method is not imposed at the moment [1].

4. CARBON FOOTPRINT CALCULATION IN DIFFERENT AREAS OF ACTIVITY

4.1 Carbon footprint calculation for individuals

Today, it is very easy to calculate the individual carbon footprint due to many online available tools that proceed this type of calculation (Figure 2). After proceeding all steps, there is the possibility to compare the individual carbon footprint to the country average, world average, or to the world average target (0) [9].

Generally, the software is programmed to take into account data regarding the household, travel (flights, cars, motorbike, bus and rail) and also secondary activities by introducing the amount of money spent on them. This is an easy way to realize how much only one person can contribute to the negative impacts on the environment and climate change. There are tools that calculate the carbon footprint for organizations too including a lot of variables, managing to obtain quite precise results through a much easier process. Of course, when it comes to official reports, the use of websites or online calculators is not indicated.

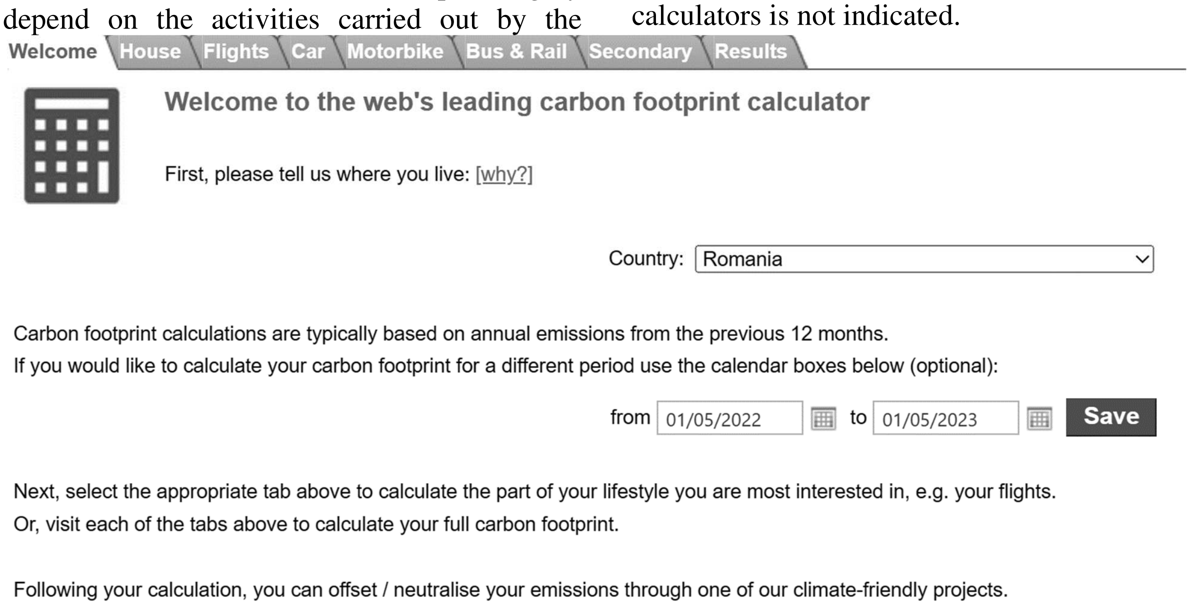

Fig. 2. Carbon footprint calculator for individuals [9]

4.2 Carbon footprint calculation in transport

There are industries where the CO_{2eq} emissions are online available, not being necessary anymore to convert all types of emissions to this common unit, reducing a lot more the calculation time. The transport industry has the highest rate of GHG emissions, being responsible for over 28% of total GHG emissions [10].

In transport, the carbon footprint can be calculated depending on the travelled distance (passenger km or tons km), or depending on the amount of fuel consumed, in a period of time.

<u>*Example:*</u> A road passenger transport company has 3 buses with which it transports passengers daily from and to the airport. They make 2 round trips per day with an average number of 28 passengers over a distance of 500 km (1 round trip). The company operates only 20 days a month, totalling 240 days in a year. To calculate the carbon footprint in a year by the company's direct activity, the follow methods [11] can be used:

- <u>*Distance based*</u>

3 (buses) x 2 (round trips) x 500 km x 240 days/year = 720,000 km/year

720,000km/year x 28 passengers = 20,160,000 passenger-km/year

20,160,000 passenger km/year x 25g CO_{2eq}/passenger-km = 504 t CO_{2eq}/year

- <u>*Fuel consumption based*</u>, by applying the emission factor for diesel and obtain:

720,000km/year x 2.6l/10 km x 2.7 kg CO_{2eq}/l= 504 t CO_{2eq}/year

4.3 Carbon footprint comparisons in a power plant

Burning fossil fuels results in the production of carbon dioxide. Natural gas, oil and coal are a few examples, along with other fuels like wood. When deciding what fuel is the most efficient in terms of quantity of CO_2 generated while producing energy, there is the possibility to compare the amount of CO_2 emissions during the production for the same amount of energy. Information regarding molar masses, specific energy, proportion of carbon in different fuels are retrieved from chemistry.

<u>*Example:*</u> A power plant produces 4.3 x 10^{10} kj of energy per day (24 hours). The question will be: Which fuel is more efficient in terms of CO_2 emissions between bituminous coal and wood, to be used in the production of this amount of energy? The comparison and calculation is made only for CO_2 emissions, the combustion process of this fuels also including NO_x, SO_x, CO and other emissions but in lower quantities.

- <u>*Bituminous coal combustion*</u>

<u>Input data</u>: the amount of energy proposed is 4.3 x 10^{10} kj, specific energy for bituminous coal is 33 kj g^{-1} and suppose that bituminous coal is 85% carbon. The calculation would follow the next model:

$$m_{b.c.} = \frac{E}{e_{b.c.}} \quad (3)$$

where $m_{b.c.}$ is total mass of bituminous coal, E is the proposed amount of energy and $e_{b.c.}$ is the specific energy for bituminous coal;

$$m_C = x\%C_{b.c.} \times m_{b.c.} \quad (4)$$

where m_C is the total mass of carbon and $x\%C_{b.c.}$ is the proportion of carbon in the bituminous coal;

$$m_{CO2} = \frac{m_C \times M_{CO2}}{M_C} \quad (5)$$

where m_{CO2} is the total mass of CO_2, M_{CO2} represents the carbon dioxide molar mass and M_C represents the carbon molar mass.

4.3 x 1010 kj / 33 kj g^{-1} = 1.3 x 109 g = 1.3 x 106 kg

85/100 x 1.3 x 106 kg = 1.1 x 106 kg C

1.1 x 106 kg x 44.01/12.01 = 4 x 106 kg CO_2

- <u>*Wood combustion*</u>

<u>Input data</u>: the amount of energy proposed is 4.3 x 10^{10} kj, specific energy for wood is 22 kj g^{-1} and suppose that wood is 50% carbon. The calculation for wood will follow the same formulae as for bituminous coal:

4.3 x 1010 kj / 22 kj g^{-1} = 1.95 x 109 g = 1.95 x 106 kg

50/100 x 1.95 x 106 kg = 0.97 x 106 kg C

0.97 x 106 kg x 44.01/12.01 = 3.55 x 106 kg CO_2

- <u>*Comparison*</u>

Total CO_2 emissions in bituminous coal combustion is 4 x 10^6 kg and total CO_2 emissions in wood combustion is 3.55 x 10^6 kg:

4 x 10^6 kg > 3.55 x 10^6 kg => the wise choice would be using the wood for energy production even if it is needed a larger amount of wood than coal (1.95 x 10^6 kg wood > 1.30 x 10^6 kg coal).

The difference doesn't look to be so big, but this results are only for a 24 hour day. For a reporting year (for instance, for 320 days the plant produced energy) the calculation results would be:

4×10^6 kg x 320 = 1,280 x 10^6 kg CO_2 (for bituminous coal)

3.55 x 10^6 kg x 320 = 1,136 x 10^6 kg CO_2 (for wood)

The difference is 144 kt (kilotons) of CO_2 emissions per year, so the wood in this simple example has the lowest carbon footprint.

4.4 Carbon footprint comparisons between transport modes

To compare the reliability between modes of transport in terms of CO_2 emissions, will question which mode of transport is more efficient between inland water transport and road freight transport considering the following *example:* There is a transport of 7,000 net tons of cargo over a distance of 143 km between the Port of Rotterdam and the Port of Duisburg. To transport this cargo, it is assumed that a pushed convoy with 4 barges will be needed. For the same amount of goods, for road transport by trucks, a number of 280 trucks carrying 25 net tons of cargo will be considered necessary and the calculation will be made for the same distance (Figure 3 [12]) (although for road transport the distance between these 2 ports is approximately 200 km).

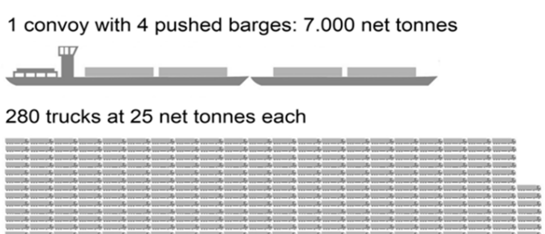

Fig. 3. Capacity needed on inland waters/road for the same amount of cargo

Input data: 7,000 net tons of cargo, distance 143 km, transport on inland waters, road transport. To obtain the total emissions for these 2 situations the following data are multiplied: the number of vehicles required, the distance in km, the cargo mass in tons and the specific emission factor.

- For the pushed convoy, the CO_2 emission factor is considered 9.7 g CO_2/t-km.

1 convoy x 143 km x 7,000 t x 9.7 g CO_2/t-km = 9.7 t CO_2

- For trucks, the emission factor is 156 g CO_2/t-km.

280 trucks x 143 km x 7,000 t x 156 g CO_2/t-km = 43.7 t CO_2

Obviously, inland water transport in this case is more reliable both in terms of costs, transport capacity, travelled time and CO_2 emissions generated.

5. REDUCING THE CARBON FOOTPRINT

5.1 How the climate change affects Europe

At European level, climate change is increasingly affecting the environment, the health of the population and also the market.

From East to West, all of Europe is affected to some extent by these changes, more or less. As positive effects, we can mention a lower demand for heating and perhaps the improvement of agriculture due to a favorable environment. But the negative effects are worrying. The impact of climate change on Europe is presented next [14].

1. Arctic area:

- More rapid temperature increases than the norm for the world;
- Less permafrost regions;
- Less ice covering Greenland and the Arctic waters;
- A few fresh possibilities for using natural resources and shipping by water;
- Increased chance of biodiversity loss;
- Risks to local residents' livelihoods.

2. Boreal region:

- Winter storm damage increases;
- Less snow and ice, more rain, and higher river flows;
- Faster growth of forests increases the risk of forest pests;
- More chances to utilize hydropower;
- Energy usage for heating is reduced;
- Increased crop production;

- More summer travelers.

3. Mountain areas:

- More extreme temperature increases than the European average;
- A shift in the location of plants and animals toward higher elevations;
- Increased chances of extinction of species;
- Increased threat of forest pests;
- Increased likelihood of landslides and rock falls;
- Hydroelectricity may be impacted;
- Ski tourism is down.

4. Mediterranean region:

- Increased risk of loss of biodiversity, increased risk of fires in the forests;
- More intense heat, lower river flow and rainfall, increased risk of droughts;
- Extremely exposed to the effects of climate change outside of Europe;
- Increased rivalry for water;
- Agriculture needs more water;
- Decreased crop yields;
- Less summertime tourism, but perhaps more in other seasons;
- Heat waves cause more fatalities;
- Production of livestock gets increasingly challenging;
- Energy production gets more challenging;
- requiring more energy for cooling;
- Most economically disadvantaged sectors;
- There are many places where getting bitten by an insect might make people ill.

5. Atlantic region:

- More torrential rain;
- More inclement weather;
- Increased river flow;
- A greater chance of winter storm damage;
- A greater risk of floods;
- Perhaps less energy required for heating.

6. Continental region:

- More harsh weather;
- Increased risk of river flooding;
- Increased risk of forest fires;
- Reduced summer rainfall;
- Decreased value of forests;
- Increased energy requirement for cooling.

7. *Coastal region and seas:*

- Increasingly sea surface temperatures;
- An acidifying ocean, and a northward migration of marine organisms;
- More marine dead zones;
- Community changes in the phytoplankton;
- Fisheries' risks and some opportunities;
- Increased risk of infections transmitted by water.

The implications of these effects are alarming both on short and long term perspective. That is why rapid solutions need to be approached.

5.2 European strategies on reducing the carbon footprint

European Commission has set ambitious targets to be accomplished and for that it built a strong strategy to follow [15]:

1. EU climate action has advanced.

The European Green Deal, The European Climate Law, The European Scientific Advisory Board on Climate Change are just some of the proofs that European Commission put all the efforts to achieve the climate goals. Due to the pandemic crisis, and especially now to the war, it came to a disruption in the energy market. As e response, REPowerEU Plan was the propose of EU Commission in order to increase the energy efficiency and infrastructure and investments in renewable energy. Also, the funds allocated to this sector have increased in order to support the industry decarbonization process.

2. Invest in innovation

EU industry is supported by ETS Innovation Fund to invest in new technologies to rise up renewable hydrogen innovations and similar green solutions. The budget rose more than a half after the first round, being an important step towards 2030's and 2050's objectives.

3. Increase private investment in green financing

The European Commission is making great efforts to put the revised sustainable finance strategy into practice and incorporate financial sector laws with climate ambitions. The European Commission has assumed a Reporting Directive on Corporate Sustainability, which would strengthen the rules governing the social and environmental data that businesses are expected to provide, for comparable climate-related data.

The new regulations will guarantee that stakeholders and investors have access to the data they need to evaluate the investment risks associated with climate change and other sustainability-related concerns. They will also foster a culture of openness regarding companies' effects on both population and the environment.

The new regulations will become effective for businesses in the 2024 fiscal year for reports that are posted in 2025.

Also, a proposal of differentiated approach for certain activities in the energy field was made by the Commission.

4. Enhance social fairness and economic resilience

In accordance with the European Pillar of Social Rights, the green transition to net zero emissions should be equitable and inclusive, taking care of those who meet the biggest challenge. The geopolitical environment and the rise in energy prices underline the need to quicken the transition while fostering social and economic resilience.

In view of the rising cost of energy, Member States are implementing programs to provide low-income individuals having access to electricity and transportation. Several EU finance mechanisms assist a just and social transformation.

5. Engage people

As population represents one of the main factors of influencing carbon emissions, it is very important to understand that the transition to a climate-neutral society involve all of the people. Everything from how we conduct ourselves in public, at work, and at home to how we consume, heat or cool our houses, and even the means of transportation we use to get to and from work. Every activity has an impact on the climate and contribute to the unwanted changes. The population has to be aware of the involvement of their own activities and proceed to act for the benefit of the planet when they have to make choices.

In this concerns, the European Climate Pact represents a great occasion for everyone to learn, develop and implement solutions regarding the climate chance, a community where people can share knowledge about this topic. By seeing real cases, this movement is an inspiration for people to act towards net zero.

6. Mobilize cities

In order to mobilize the cities towards the European objectives, Commission within *The Mission on Climate Neutral and Smart cities* has created the NetZeroCities Platform where a number of 100 cities from Europe got selected to become climate neutral by 2030, benefiting from all the necessary support to complete this process.

6. RESULTS AND DISCUSSION

6.1 Results

The paper presents the carbon footprint calculation model in a simplistic way, using an example based on a gas bill. Also, some examples of carbon footprint calculation in different situations were made. In the case of people who want to make an estimate of their own carbon footprint, they have the opportunity to do it using online calculators or manually, applying formulae.

An example in transport field is presented using 2 methods of obtaining the carbon footprint for the same inputs. One method is based on the distance travelled and the emission factor for passenger-km is used. The other method is based on the fuel consumption so the total fuel consumption had to be multiplied by diesel emission factor. It comes out that the results for the carbon footprint are the same.

The second example is made to compare the emissions generated for the production of the same amount of energy using basic elements from chemistry, easy to apply by anyone such as molar masses, specific energy. It comes out that the wood is better to be used in energy production in terms of CO_2 emissions than the bituminous coal, even if for the production of the same amount of energy, a bigger quantity of wood would be needed because the specific energy of wood is lower than the one of the bituminous coal.

The third example was aimed to compare the efficiency of 2 modes of transport for shipping a certain amount of goods. The specific factors for the pushed convoys and for trucks were used. The results were as expected that the inland water transport is more efficient than the road transport regarding CO_2 emissions but not only.

In the fifth chapter, there are presented the effects that climate change has on Europe, negative effects being infinitely higher than the positive ones. Also, the strategies of European Union on reducing the carbon footprint are discussed.

6.2 Discussion

The examples presented are not exclusively informative, but are intended to draw attention to the fact that, taking into account a few individual situations, the results are extremely disappointing, with very high levels of greenhouse gas emissions, even more so at the local, national, worldwide level.

The journey to net zero requires a lot of involvement. By 2050, the European Union wants to have no emissions at all. This is only possible if the entire population contributes to its realization starting from daily activities at home, at work, in the community.

Net zero concerns everyone, and once you are aware of the consequences of your own actions, you can no longer stay indifferent, whether it is talking about individuals or organizations.

7. CONCLUSION

The paper presents the main reasons why organizations choose to calculate their carbon footprint.

It facilitates the simple understanding of how to calculate the carbon footprint, especially for organizations that are starting their efforts towards net zero. Thus, the paper indirectly contributes in facilitating the achievement of European Union objectives, especially towards the transition to net zero, it offers a vision of the domains that have a greater impact in terms of emissions, being able to make comparisons.

Reducing the carbon footprint should be a permanent objective of everyone. The energy supply and transport are the first two and main sectors for greenhouse gas emissions in European Union and obviously the hardest to align to the European objectives on climate change. Rapid measures are needed in the energy production process and the replacement of fossil fuels with renewable energies.

The paper has an indirect role to raise the awareness of the population, organizations and industry, encouraging the earliest possible start of the journey towards net zero.

8. ACKNOWLEDGEMENTS

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Calculul amprentei de carbon în diferite domenii de activitate

***Rezumat**: În prezent, nu există norme UE obligatorii pentru calcularea amprentei de carbon. Comisia Europeană şi-a propus până în 2030 atingerea obiectivului de reducere a emisiilor nete de gaze cu efect de seră cu minim 55% comparativ cu anul 1990. În ultimul timp, au existat preocupări intense din partea instituțiilor și organismelor UE în problemele de mediu, multe din acestea aderând la inițiative de mediu. Prezenta lucrare îşi propune să prezinte modul de calcul simplificat al amprentei de carbon în diferite tipuri de organizații luând în considerare că în funcție de activitatea desfăşurată sunt utilizați diferiți combustibili, aceştia având asociați factori de emisie distincți, în urma impactului pe care îl au asupra mediului. De asemenea, se atrage atenția asupra necesității creşterii nivelului de conştientizare al populației într-un subiect actual a cărui abordare nu suportă amânare.*

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