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TRABAJO DE FIN DE GRADO:
Effectiveness of EU funds to sustainability in Central Eastern European Countries.

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Abbreviations:

CE: Circular Economy

CEE: Central Eastern Europe

CEP: Circular Economy Package

CSR: Corporate Social Responsibility

EGD: European Green Deal

EC: European Commission

EU: European Union

GDP: Gross Domestic Product

HPI: Happy Planet Index

MEP: Member of the European Parliament

PCC: Pearson Correlation Coefficient

SDGs: Sustainable Development Goals.

ABSTRACT

This research aims to determine the efficiency and effectiveness of the European Union funds. To do so, ten countries from Central and Eastern Europe (CEE) have been selected to study the correlation between funds given to them and some parameters, such as Happy Planet Index, wellbeing, carbon footprint, and inequality. Following the methodology done by Kranjac et al. (2017), with data from 2014, the same analysis will be done with updated data. This will allow us to compare the results from 2014 and 2019, providing a progress report on the effectiveness of EU funds. The results found for 2019 are similar to 2014, the funds given are not achieving the desired outcomes. When the amount of paid grants per capita increases, the Happy Planet Index, the main indicator of sustainable development, decreases. The same relation occurs with CO2 emissions. Instead of reducing the number of emissions of a country, the higher the grants given, the higher the CO2 emissions. It is concluded that these CEE countries cannot effectively use and absorb the grants given, and a different approach should be carried out.

Keywords: Sustainable, environment, Central European Countries, public funding, efficiency.

1. INTRODUCTION

The European Union is aiming for higher standards of living, social and economic wellbeing, and the sustainability of these practices for Europe and the whole world. Program funding is how the EU is trying to achieve its goals. By funding projects that could lead the EU to shape its future and reach its goals. However, this is not as easy as it sounds, the world is in constant change, which demands for constant reconsideration of goals and the next steps to achieve them.

Those projects subject to funding must be aligned with the global European vision and its goals. The Europe 2020 paper reflects how sustainable, smart, and inclusive growth could be achieved, and how Europe should have the capacity of achieving said growth. Sustainable, smart, and inclusive are the top three priorities of the EU and its Member States to help them decrease unemployment, intensify social cohesion and boost productivity. If those goals can be achieved, Europe would be able to have a sustainable future with a better quality of life (Kranjac et al, 2017).

The European Union creates a budget for a period that will help deliver the goals established. The idea of this budget is that pulling resources together would make Europe a stronger nation and the key to prosperity and peace, by financing projects that will make a difference in the life of European Citizens. This budget progressively changes according to the interests and needs of the period (Commission, E. 2019).

The creation of the budget has brought some advantages to Member States: more can be achieved by pooling resources at the EU level than one country could do on its own; it brings added value, which allows the EU to compete with other global players where significant levels of investment are required, as well as creating economies of scale; it is not the same as a national budget, the European one focuses on areas where it will bring added value, by boosting growth and competitiveness. These are just a few things that make the EU budget unique and an advantage for Member States (Commission, E. 2019).

Although the budget has many advantages, some issues arise. Two of those issues are going to be studied in this paper. The first issue will look at the effectiveness of funding. If the funds given to Member States are obtaining the goals set, such as reducing the amount of

waste produced or improving the country's economy while reducing the unemployment among its citizens. Focusing on the sustainable development of a nation, the second issue looks at how the standards of living have changed since the funding was received. This is another way of measuring the effectiveness of the funding.

One of the main goals of the European Union is for every Member State to be more sustainable, reduce the consumption of natural resources and find more sustainable alternatives (Johansen et al., 2020). That is the reason why part of the budget is reserved for sustainable and environmental projects, for example, to fund environmentally-friendly agricultural practices.

The following research questions will try to be answered along with this project:

- RQ 1: How is citizens' well-being affected by the funding provided?
- RQ 2: What is the effect caused by funding for sustainable development?
- RQ 3: Have the funds reduced inequalities between residents since 2014?

2. LITERATURE REVIEW

Sustainability and Circular Economy.

The term sustainability was first used in forestry, where it meant not to harvest more than the forest was able to yield (Wiersum, 1995). This term was first used with this meaning in Germany in 1713 (Wilderer, 2007). The concern for preserving finite natural resources has been a thing for a while now. Undoubtedly, in the Paleolithic era, they must have worried about their prey becoming extinct, as it was their main food source; or farmers, later on, must have considered the importance of maintaining soil fertility (Kuhlman et al., 2010).

The report of the Club of Rome supposed a milestone in history, by capturing the attention of global public policy makers on the issues faced by natural resources. The Club of Rome reported that without taking action, crucial natural resources for humanity's survival would be exhausted in a couple of generations. Therefore, the Brundtland report, a report of the UN World Commission and Environment and Development, was implemented to avoid the exhaustion of natural resources. Through this report, the concept of sustainability known today was adopted, gaining widespread recognition (Kuhlman et al., 2010).

The question raised by Brundtland was: how can the goals for achieving a better life and prosperity of a nation be met with the limitation of resources and the environmental degradation issues? The answer obtained was sustainable development, which is described by the World Commission as: “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987).

Two concerns are discussed in the Brundtland report: development and environment. The first can be interpreted as needs, or as the short term. And the second one as resources or the long term. However, the United Nations, in its Agenda for Development, defines sustainability in three dimensions: social, economic, and environmental (Strange et al., 2008). They have defined development as a multidimensional undertaking whose purpose is to achieve higher standards of living. Economic, social development, and environmental protection are interdependent and basic components of sustainable development (United Nations, 1997).

Another definition of sustainability is maintaining well-being for an indefinite period. Even though this definition covers the environmental part of the three dimensions adding up to sustainability, it is important to clarify that environment and sustainability are not interchangeable, in order words, they are not synonymous (Kuhlman et al., 2010).

We should distinguish between natural and man-made resources, as well as renewable or non-renewable resources. What economists denominate as capital is equivalent to renewable man-made resources.

Unluckily, we cannot disregard the use of non-renewable resources, as Robert Solow has explained (Solow, 1992). But not being able to avoid using them does not mean that they need to be exhausted. Solow proposed that natural resources, either renewable or non-renewable, can be substituted for capital. This capital can take the form of either new materials, such as plastic or steel, or smaller quantities of natural resources to produce the end product, such as energy efficiency. An example of the substitution proposed by Solow is using coke for charcoal instead of wood in the iron industry as this last one started to scarce. Another example is the transition from hunting and gathering to other agricultural practices more appropriate to the increase in population density, such as agriculture in tandem. It can

be seen that as natural resources decrease and become more scarce, capital increases (Daly, 1997).

An issue that arises is that it cannot be known if technology will continue solving the problem of the decreasing amount of resources, and some natural resources should not be lost, such as the Amazon forest or the blue whale. This issue raises the question of how much natural resources can be sacrificed. To be more concrete, two questions should be proposed: what resources should be preserved at all costs? And those interchangeable with capital, what quantity of capital should be produced to compensate for the loss of natural resources? (Kuhlman et al., 2010)

The answer to the first question does not depend on an economist's view, but rather on the opinion of society about what natural resources are essential. An economic analysis will help estimate the cost of lost well-being, to help during the decision-making process about what resources are essential.

On the other hand, the second question was first discussed and answered by Harold Hotelling in 1937. He reckoned that the exhaustion of natural resources might have been too slow as well as too fast. This means that probably the current generation would not have been better off if previous generations had only extracted 10% of the total amount of coal used, and the manufacturing process would have been much slower. Even with the amount used by previous generations, coal won't be exhausted for a couple of centuries yet.

What needs to be considered is that there is an optimum exhaustion rate, this is when the social cost of losing the natural resources is outweighed by the social benefit it yields. The social benefit is usually expressed as rent. In economic theory, rent represents the difference between the cost of production factor and how much it costs to keep it operating. An example of rent, in an ideal situation where the resource is freely accessible, would be the excess of the resource price over the cost of obtaining it (Hotelling, 1931).

Solow took Hotelling's theory and proposed that those rents that Hotelling talked about should be invested in productive capital, as it could be a way to compensate for the loss of natural resources to future generations (Solow, 1992).

We can now loosely define Sustainability as a state of affairs where man-made and natural resources remain constant for the foreseeable future, in order to maintain their well-being or

at least, not worsen it. Sustainable development includes the assessment of policies or projects and their potential impact, so they lead to higher well-being and a positive impact on the state of resources (Kuhlman et al., 2010).

Linked to sustainability is Circular Economy (CE), an environmental change as a response to the global need for a sustainable and ecological economy, where economic activities follow the three Rs principles: Reduce, Reuse and Recycle.

Circular Economy must replace the current linear model, where a resource is used to make a product, then it is used and lastly thrown away, creating waste. The principle of CE is closing loops, this implies reusing again materials instead of taking new raw materials to produce a product or component. Whenever possible, reuse and remanufacture are used instead of recycling as the original added value remains with the product.

A circular business model should be designed to create, capture and retain value while reducing the number of resources used, while achieving a complete cycle of the materials used. As mentioned above, closing loops. Consequentially, the goal of this business model is to make profits through the flow of resources and products over time, which includes reusing and recycling goods, instead of the traditional model where it makes profits through the sale of goods. The reasoning behind this circular model are the possibilities companies have to reduce the negative impact of their practices on the environment (Lahti et al., 2018).

Governments such as The European Union or the Chinese Government have been introducing laws to stimulate a transition towards a circular economy instead of a linear model. For example, the European Parliament approved a Circular Economy Packaged in 2018, in which a wide range of policy measures and actions to reduce waste are included (Creech, 2018).

The relationship between Circular Economy and Sustainability is not clear. Geissdoerfer et al. (2017) studied how these two concepts are related.

It is clear that both concepts are essentially the same in their nature, as they share concerns about technology, industrial production, and consumption. Also, they show how important is to better integrate environmental and social aspects of the economic progress. Both of them emphasize the issues future generations will face as a result of the environmental hazards, and manifest the importance of improving agency and pubic deliberation for development.

They have essentially the same global perspective, about emphasizing problems worldwide, which would lead to shared responsibilities and the need to coordinate multiple agents to solve them.

Aside from the mentioned similarities, each concept is used for a different purpose, in different contexts. Sustainability focuses on sustainable development, and is more open-ended, as opposed to CE. They also have a few differences, such as different origins, goals, motivators, timeframes, or system prioritizations. The main difference can be seen in the goals. CE aims for close loops, by eliminating waste, use of new raw materials, and emission leakages; while sustainability is open-ended, it considers multiple goals, that shift depending on the policy makers and their interests (Geissdoerfer et al., 2017).

One of the issues of circularity is that even though it has a positive influence on sustainability, it forgets about some dimensions, such as the social one (Murray et al., 2015). It usually emphasizes economic benefits and provides a simplified environmental perspective, making the concept more attractive to policy makers and businesses, but because it excludes the social dimension, it diverts the attention and hence, resources, from other comprehensive and holistic approaches.

Geissdoerfer et al. (2017) found through their analysis that CE is seen as a condition for sustainability. This relation would address the before mentioned issue, as sustainability does focus on the social dimension. Circularity being a condition for sustainability would allow diversity, higher adaptation to different situations, and combining both concepts to strategies to tackle issues.

Sustainability and the EU.

As previously mentioned, sustainability would allow an economy to use its resources more effectively, as well as preserve them for future generations. And a Circular Economy implies reducing waste to a minimum by re-using, remanufacturing, and recycling already manufactured materials and products. This is why the European Union hopes that by introducing a circular approach to its economy, the pressure on the environment will be reduced, it will enhance the security of raw materials, there will be an increase in competitiveness, innovation, and growth, and these outcomes will lead to the creation of jobs.

In 2018, the European Parliament gave its approval to the EU's Landmark Circular Economy Package (CEP) after there were formally approved a few targets, such as higher recycling targets, new approaches to reduce waste across all countries in Europe, and making all plastic packaging recyclable by 2030.

Through the CEP, EU member states have some obligations: they will need to reach a 55% recycling rate by 2025, 60% by 2030, and 65% by 2035; they have until the first of January 2025 to establish a textile and hazardous waste collection from households, until the thirty-first of December 2023 to guarantee a separate collection system for bio-waste or for it to be recycled at source, such as home composting. The next target that the package contemplates is landfill reduction. It establishes that all waste suitable for recycling or other forms of recovery will not be accepted in landfills as of 2030. Furthermore, by 2035, municipal waste sent to landfills shall be reduced to less than 10% of the amount of waste generated (Creech, 2018).

"With this package, Europe is firmly committed to sustainable economic and social development, which will, at last, integrate industrial policies and environmental protection", said lead MEP Simona Bonafè. "The Circular Economy is not only a waste management policy, but is a way to recover raw materials and not to overstretch the already scarce resource of our planet, also by profoundly innovating our production system".

"This package also contains important measures on waste management, but at the same time goes further, by defining rules taking into account the entire life cycle of a product and aims to change the behavior of businesses and consumers. For the first time, member states will be obliged to follow a single shared legislative framework" (Creech, 2018).

In 2019, the European Commission introduced the European Green Deal (EGD), a generation's defining project for the European Union, with the intention of making its economy and society carbon neutral by 2050. The European Commission president has defined the challenge as 'Europe's man on the moon moment' (Bongardt, 2022).

To be able to achieve the goals set for the EGD, it is required, primarily, to cut emissions, invest in greener technologies, and protect the environment. The EGD was set up following up on previous EU agendas to become more sustainable by transforming and reducing threats, such as climate and environmental challenges, into economic opportunities, as it is

sustainable growth. What differentiates the EGD from previous policies is that EGD tries to introduce a global sustainability lens to society, its economy, and all policies involved; it introduces climate neutrality.

By prioritizing climate neutrality, the EU strengthens, not only environmental and economic sustainability, but also political sustainability. It will achieve this by providing a coherent narrative on climate, sustainability, and policy areas, a topic previously unrelated. Now, when discussing economic development, environmental protection is included. Therefore, the EGD has helped redirect the macroeconomic coordination process of the EU from growth to sustainability (Bloomfield et al., 2020; Wolf et al., 2021).

In 2015, the previous European Commission presented the path to a climate-neutral economy through the 2030 Agenda for Sustainable Development (EC, 2018; EC, 2019), an agenda including 17 goals (Sustainable Development Goals, SDGs) to provide for the economic, social, and environmental sustainability of humanity. The Council of the EU reiterated the need of striving for climate neutrality and requested a faster implementation strategy that reflected the 2030 Agenda, including its 17 SDGs, into policies. Environmental integration is a crucial principle since the Amsterdam Treaty. The EU has always been an important actor on the global stage, particularly in the climate field. Some examples include the Paris Climate Accord or the Kyoto Agreement (Bongardt et al., 2022).

The European Green Deal has the potential to be a building block for the European economic model, instead of just a sum of its parts. As climate and sustainability are the fundamental basis of the deal, the rest of the policies need to be in accordance with the sustainability objective and carbon emission targets. International commitments, such as the 2015 Paris Climate Accord, add external constraints that may help align climate policies with other policy areas.

Lastly, the Green Deal has more potential beyond contributing to environmental sustainability, it can also aid the sustainable European integration process as such. It slows down negative outcomes and promotes synergies to an extent, then the EGD uses the qualitative changes made by the single market and the Economic and Monetary Union (EMU) to the economic model to contribute to and complement the economic and political sustainability (EC, 2021).

The Covid-19 pandemic crisis has contributed in some ways to consolidating the case for the EGD. The pandemic tested the sustainability of the economic model in place and as a consequence, the European process of integration. The health and socio-economic implications of this crisis drifted the attention from environmental and climate-related issues, such as forest fires, broken records of highest temperature in oceans and lands, and extreme weather events.

This crisis, Covid-19, is part of the consequences of human-made environmental degradation of the planet. It is what is known as a zoonotic disease, which means it has been crossed over from animals to humans. And it is not the first one to take place in this millennium (The Lancet, 2021). Scientists state that the arising of zoonotic diseases is directly linked to the destruction and loss of habitats and biodiversity, which is facilitated by unsustainable practices, such as mass farming and globalization. The issue with these practices is that they enable rapid and wide spreading while not factoring in the damages they create. From an economic point of view, they are a couple of reasons why markets fail: firstly, when there is not a market for a good; and secondly, when environmental damages are not properly accounted for, taking into account the difficulties of direct regulation or setting prices on natural resources and their use present in practice. For that reason, and for efficiency considerations, it is needed to integrate climate and biodiversity into economics and decision-making (Stern, 2007; Dasgupta, 2021).

The only good impacts caused by the Covid-19 crisis were that when it slowed down economic activity, it reduced associated pressures on the natural environment for a period of time, and as a consequence, CO2 emissions were reduced significantly. Now that we have gone back to life as usual and economic activity as before this crisis, to be able to achieve sustainable development, we should try to continue with low CO2 emissions, and not let them bounce back to their previous levels (International Energy Agency, 2020; International Monetary Fund, 2020; World Meteorological Organization, 2020).

This pandemic had an impact on many areas, not only on the economic one. It also came with some social and environmental lessons. It has proven the need for a sustainability-oriented reform in the European Union and the potential it would have, by showing the weaknesses the current system has. This was seen in the vulnerability and shortcoming of

global supply chains, transport systems, agricultural practices, cities, and the digital sector (Bongardt, et al., 2022).

In the spring of 2021, a special Eurobarometer was conducted (Eurobarometer 513), it is on climate change, where, for the first time, European Citizens have singled out climate change as the most serious issue facing the world. It has confirmed that the vast majority of EU citizens "agree" or "tend to agree" that in order to improve public health, addressing environmental issues and climate change should be a priority. From their point of view, even though the cost of investment needed to transition to a greener economy is high, it has a much higher cost to deal with damages created by climate change (Bongardt, et al., 2022).

In conclusion, the pandemic has allowed to establish links between short-term and long-term policies and objectives. It has worked towards reinforcing the European Green Deal, as it plays its economic rationale and policy priorities, as the building block in the economic model. The environmental and social lessons that arose with Covid-19, have contributed to the willingness to change unsustainable patterns of consumption and manufacturing, which fall in line with the EGD and its long-standing priorities, which is a digital, fair, and sustainable economy.

Barriers to Circular Economy and Sustainability.

As previously discussed, Circular Economy and Sustainability have been receiving more attention and becoming more popular in recent years, but the concept and core ideas of CE have been around since 1960, and it has been further discussed throughout the 1970s and beyond (e.g. Boulding, 1966; Stahel, 1981; Blomsma et al., 2017).

The reason behind the current enthusiasm around CE is due to its alleged outcomes for sustainable development. For instance, the benefits for the European Union applying CE would be: CO2 emissions could be reduced by 48%, it would generate a net economic benefit of around 1.8 trillion euros, and create many additional job positions (Ellen MacArthur Foundation, 2015; European Commission, 2014).

The implementation of the Circular Economy is still in the early stages, in spite of the support many business and policy circles have proclaimed (Lacy et al., 2016; Ghisellini et al., 2016; Stahel, 2016). China may be the only exception, as it adopted its "Circular Economy

Promotion Law of the People's Republic of China" in 2009, although it is still far away from achieving what has been denominated as "full circularity" (Geng et al., 2013; Dijksma et al., 2016).

Scholars have identified the limited progress in the implementation of CE to a variety of barriers, which can be distinguished into four broad categories: cultural, regulatory, market, and technological barriers. Depending on the literature examined, there are more or less sub-barriers identified inside each category. Usually, this varies depending on how they chose to classify said sub-barriers. For example, "circularity is not effectively integrated into innovation policies" and "governmental incentives support the linear economy", can be two different sub-barriers or can be grouped into "obstructing laws and regulations" (Van Eijk, 2015; Kirchherr et al.,2018).

1. Cultural Barriers:

This category includes, particularly, barriers with regards to consumers and company culture. The literature discusses that "limited consumer acceptance" is the main reason the implementation of CE has been very limited so far (Vanner et al., 2014), or how CE practices have not been integrated into the strategy, mission, vision, and goals of a company. This shows how companies have not generalized the concept of circularity yet (Pheifer, 2017). Other scholars believe this barrier to be the least relevant, with only 20% of studies examined raising this category (de Jesus et al., 2018).

Kirchherr et al. (2018) carried out a research based on surveys and interviews with experts. In their findings, they identified that three sub-barriers of this category were selected as some of the most pressing barriers. The sub-barriers are "Lacking consumer interest and awareness", "Hesitant company culture" and "Operating in a linear system".

"Lacking consumer interest" was one of the most mentioned barriers as interviewees complained that "consumers change their mind too quickly", which jeopardizes a business model that focuses on durable products, that will last longer than the fashion trend happening at the moment.

The next most mentioned barrier was "Hesitant company culture". This finding clashes with the assertion that companies are widely embracing CE. Instead, it seems like discussing CE may be restricted to environmental or corporate social responsibility (CSR) departments,

rather than including other influential departments such as operations or finance in the discussion. Moreover, this barrier may be the result of the first one discussed, "lacking customer interest", as companies are usually conditioned to respond to customers' concerns (Kirchher et al.,2018).

Lastly, "Operating within a linear business model" appears as a barrier because of the lack of knowledge about CE, and a very conservative supply chain. As it was said before, this finding shows how CE has not reached the mainstream yet. Companies need to keep in mind that even if they have chosen to implement a CE approach, it does not mean their supply chains are willing to do it as well. In order to achieve full circularity, both a company and its supply chain must be on the same terms, and commit to CE (Witjes et al., 2016; Dijksma, et al., 2016).

2. Market Barriers:

Some of the issues that would be categorized as market barriers are: the low price of raw materials is preventing CE products to surpass their linear equivalent (Mont et al., 2017); or how the recycling of materials is not the norm as it is more economical the production of raw materials (Preston, 2012). Bio-based plastics are much more expensive than fossil-fuel-based plastics, which are undermining circular products and limiting their implementation and use. These market barriers, especially "low raw material prices", could be the root cause of the previously mentioned cultural barriers. Both types of barriers are linked, as if there were raw materials at a higher price, there would be more affordable substitute products made through circular processes. If this was the case, it could catch consumers' interest, since they are usually very cost-conscious during the decision process of a purchase. In return, this would incentivize companies to move toward a more circular approach, reducing the barrier of "operating in a linear system" (Kirchherr et al., 2018).

The next market barrier is "High upfront investment costs". Implementing a new CE business model in a firm cost a lot of money, especially when there is still a need for learning about it. There is a need for learning curves for CE business models, which means that whoever invests money first in learning, will most likely lose money and only make it easier for the next person. As a result, most businesses are waiting on someone else to make the first move (Kirchher et al., 2018).

3. Regulatory Barriers:

Many studies are identifying a lack of "smart regulation" that would help the transition towards circularity, a lack of "supportive policy framework", and are warning about how regulation is preventing the exchange of materials across international borders (Preston, 2012; Rizos et al., 2015; Pheifer, 2017).

What Pheifer (2017) meant, and what Kirchher et al. (2018) also found during their research, on how regulation prevents the exchange of materials across international borders is that sometimes there are materials that cannot be recycled in a country, but in another one is possible, the regulation doesn't allow to transport said material from one country to another to be recycled. Or how it might not allow using recycled materials to create a new one, for example, not being able to use recycled materials for one of the layers of asphalt.

In the European Union, there are not many regulatory barriers, as the European Commission has claimed sustainability and CE as a policy priority since 2015. Although the EC is committed to CE, government intervention may be the reason for the market and regulatory barriers mentioned. Raw materials can have artificially low prices, creating the core market barrier previously mentioned, because they have been produced using energy at subsidized rates. These subsidies could jeopardize the diffusion of other circular materials, such as reused or recycled ones (Stahel et al., 2016). The EU may need to consider how to avoid this issue. It may choose to intervene in favor of circular products, to allow a faster transition towards circularity. An example of such a type of intervention has been provided by a German environmental party. They proposed to lower the value added tax from 19% to 7% for any reparations of products, making reparation more attractive than buying a brand new one (DPA, 2017).

The other market barrier previously discussed, "high upfront investment costs", could also be lowered through government intervention, by providing financial support. This is already a commonly used policy instrument by the EU, especially in the agricultural sector (Hodge et al., 2015). The excuse that "CE is too expensive" could not be used anymore if it would cost the same either to invest in a circular business model, or a linear one. Although it would not break the fear of failing, it would provide some additional momentum to those willing to transition towards a circular model (Kirchher et al., 2018).

4. Technological Barriers:

To be able to have a CE transition, it is necessary to have the relevant technology in place. For instance, many studies identify technological barriers as the most pressing barrier faced by the CE transition (Preston, 2012; Shahbazi et al., 2016; de Jesus et al., 2018).

However, in the research carried out by Kirchher et al. (2018), technological barriers were not identified as core barriers. From their interviews, they discovered that the necessary technology is in place and that businesses have the "ability to deliver high quality remanufactured products". Some literature has emphasized that the design of products is the main impediment to a CE transition, rather than the technology (Shahbazi et al., 2016; Pheifer, 2017).

5. Implications of the barriers:

Identifying core barriers to CE and its negative outcomes, bears a few implications. First implication, CE is a difficult-to-implement concept, otherwise many companies would have already transitioned to a circular approach, searching for higher profits. At this stage, only the sustainable development community seems to have enthusiasm for circularity, but it is believed that what makes it difficult to implement the CE concept, may be overcome eventually.

Second implication, current strategies regarding CE carried out by government intervention, may not work. What was discovered by the study carried out by Kirchher et al. (2018) is that neither the engineering aspects nor the technological barriers are what is stopping the transition towards CE. This leads to the last implication found.

Third implication, new intervention strategies are necessary to allow a transition towards circularity. The government is seen as a key player to accelerate the transition. Its role would be to tackle the core market barriers, such as "Low raw material prices" and "high upfront investment costs". Once these barriers have been handled, via reducing subsidies for fossil fuels or by introducing incentives for circular investments, the government should be able to substitute the current chain reaction that leads to failure, with another one oriented to a successful transition (Kirchher et al., 2018).

3. METHODOLOGY

This project aims to determine the efficiency and effectiveness of funds given by the European Union for countries to be more environmentally friendly and sustainable. Furthermore, the comparison between said funds and how the studied parameters have evolved during the period 2014-2019.

First of all, following the research carried out by Kranjac et al. (2017), the same ten countries have been selected, which allows for comparing results from different years. Said countries were selected as the main purpose of the funds given to them is to address the countries' socio-economic challenges, which aim is to reduce the differences with other EU countries. The period chosen for study is 2019, as in 2020 the Covid-19 pandemic hit, and the funds have been reallocated to help fight and overcome the sanitary emergency created by the pandemic.

The main indicator to study the efficiency of the funding is the Happy Planet Index (HPI), as it measures how residents of a country use the environmental resources in order to live happier and longer lives. The objective of the HPI is to analyze and measure the possibility of having good lives without abusing the natural resources and environment too much. To calculate it, four factors are needed: life expectancy, experienced wellbeing, inequality of outcomes, and ecological footprint.

HPI is calculated through the following formula [1]: *(Note: this is an approximate formula, which leaves out the statistical adjustment)*

$$HPI \cong \frac{(Life\ expectancy\ x\ Experienced\ wellbeing) x\ Inequality\ of\ outcomes}{Ecological\ footprint} \quad [1]$$

The elements composing the HPI formula are the following:

- Life expectancy: used as an indicator of the overall standard of health in a country. It is the average life expectancy of a country's residents. (Veenhoven, 1996).
- Experienced well-being: is an indicator of satisfaction of a country's residents. How satisfied they say they are with life on a scale from 0 to 10. The same question is asked to a population, for example: "If your life is represented by the steps on a ladder, being the tenth step the best life you could have, and the bottom of that ladder

the worst one. On which step would you be right now?" (Naderi et al, 2015). After the whole sample is collected, the average is calculated and the well-being of a population is obtained.

- Inequality of outcomes: measurement of inequality in a country. The inequality can be measured in terms of how happy the residents of a country feel and how long they live. It is based on the distribution of life expectancy and well-being data in each country. It is expressed as a percentage.
- Ecological footprint: the average land needed, per capita, to sustain the consumption patterns of a country. This measure includes the total land required to provide renewable resources, such as wood materials and food, used by the residents; the area used for infrastructures; and lastly, the land needed to absorb CO2 emissions. It is expressed as global hectare per person, the standardized unit of ecological footprint. (Kranjac et al. 2017)

The HPI is used to provide a guide to nations on how to live a good life without costing the Earth and its resources.

Opposite to western countries with wealthy residents, nations such as the Asian Pacific region and Latin America have poorer countries with high life expectancy and well-being, as they try to protect their natural resources. As a result, their ecological footprint is much smaller than in wealthier countries (Galli et al, 2014).

As Happy Planet Index is established as a measure of satisfaction and efficient use of environmental resources by residents, the Pearson correlation coefficient is used to find a correlation between paid EU grants and HPI for Central Eastern European Countries. Through the correlation coefficient, the influence of paid EU funds on the well-being of CEE citizens and the sustainable development of those same countries is going to be tested.

With the correlation calculated in ***Table 2***, the research questions will be answered. It will provide an answer to whether the well-being is positively influenced by funding; if the funds are improving the environmental issues faced by the studied countries, or if they do not seem to achieve the goals they were given for; and lastly, if they are able to reduce inequalities. On the table, the Xi variables are the data for paid grants for the budgeted period 2014-2020; Yi variables are for data such as well-being or Happy Planet Index.

Pearson correlation coefficient (PCC) calculates the statistical relationship between two random variables (Statistics how to, 2016). The following equation [2] will be used to measure the sample correlation between two sets of data, where *n* represents the number of countries in the sample:

$$PCC = rxy = \frac{\sum xiyi - n\overline{xy}}{(n-1)SxSy} = \frac{n\sum xiyi - \sum xi \sum yi}{\sqrt{n\sum xi^2 - (\sum xi)^2}\sqrt{n\sum yi^2 - (\sum yi)^2}} \quad [2]$$

Where:

- Xi and Yi: sample of values.
- Sx and Sy: the sample standard deviation of X and Y.

Once the results have been obtained and studied, conclusions will be drawn about the effectiveness of paid grants to Central and Eastern European Countries.

4. ANALYSIS AND RESULTS

Throughout the methodology explained, a few tables and calculations have been done to study the correlation between the variables and to answer the research questions.

The first table, ***Table 1***, presents basic information about the selected CEE countries, such as GDP, population, GDP per capita, paid grants, and payment ratio. This last variable measures what percentage of the budget for 2014-2020 is paid in the studied period.

Table 1: Basic and EU funds data

Countries	Annual GDP (EUR million)	Population (Million)	GDP per capita (1000 EUR)	Paid grants (EUR billion)	Payment ratio (%)
Romania	223,16	19,41	9,12	3,89	17%
Poland	533,6	37,92	13,02	12,831	17%
Bulgaria	61,56	7	6,63	1,248	17%
Czech R,	225,57	10,65	18,46	3,418	16%
Slovakia	94,05	5,45	15,89	2,296	17%
Latvia	30,65	1,92	12,53	0,741	17%
Hungary	146,11	9,77	13,27	3,479	16%
Lithuania	48,86	2,79	14,05	1,118	17%
Estonia	27,73	1,32	15,51	0,579	17%
Slovenia	48,4	2,08	20,72	0,499	15%

Source: Eurostat data, 2019; European Commission, 2019

It can be seen that the payment ratio is almost the same percentage of the budget for each country.

Poland has the highest allocated budget, as it is the most populated CEE country. However, in terms of per capita ratio (seen in Table 2), there are a few countries with higher ratios than Poland, being the highest ones Lithuania and Estonia.

The next table, ***Table 2***, shows the parameters studied to obtain the correlation between them and paid grants. These are the Happy Planet Index, Wellbeing, Ecological Footprint, and Inequality. The Pearson Correlation Coefficients (PCC) will prove if there is a dependence between variables. The PCC defined interval is: -0,50 to 1,0

Table 2: Correlation between grants and parameters studied.

Countries	Paid grants per capita (xi) in 1000 EUR	HPI (Yi)	Wellbeing (Yi)	Footprint (Yi)	Inequality (Yi)
Romania	0,20	10,91	7,3	3,58	7,08
Poland	0,34	5,6	7,8	4,75	4,37
Bulgaria	0,18	8,91	5,3	3,62	8,1
Czech R,	0,32	3,43	7,4	5,72	3,34
Slovakia	0,42	3,79	6,9	4,73	3,34
Latvia	0,39	5,17	6,7	6,41	6,54
Hungary	0,36	5,35	6,4	3,87	4,23
Lithuania	0,40	5,17	6,3	6	6,44
Estonia	0,44	3,51	7	8,01	5,08
Slovenia	0,24	3,76	7,3	5,37	3,39
PCC		-0,7070	0,1702	0,6680	-0,3850

Source: Eurostat data, 2019 and author

Results of PCC:

Paid grants per capita and HPI: -0,71. This result indicates a high negative correlation, which means that as paid grants increase, HPI decreases. Simplified, as the funding received increases, the sustainable development of that country worsens. This is the opposite outcome of what is desired. The ideal outcome would be to obtain a higher Happy Planet Index as the grants increase, as a bigger score on the index means a better ranking in the country.

The conclusion drawn from this negative correlation is that EU funds are failing at improving the environmental issues faced by the countries studied.

Paid grants per capital and Well-being: 0,17. It indicates a high positive correlation. The desired outcome: as funds increase, the well-being of residents is increasing as well.

Paid grants per capita and Ecological Footprint: 0,67. High positive correlation between variables. This indicates that when funds are getting bigger, the impact on the environment is increasing as well, which is quite the opposite result the European Union is looking for.

Paid grants per capita and inequality: -0.38. High negative correlation between parameters. Inequality between residents will decrease as EU grants increase. There will be fewer differences between the population of a country.

Having a higher paid grant pc does not necessarily mean that the country is going to have a higher HPI, quite the opposite. It can be seen in Table 2 how the countries with a higher HPI, Romania (HPI: 10,91) and Bulgaria (HPI: 8,91), are the ones with the lowest paid grants pc. The desired result would be to have higher HPI as possible, as it is measuring the ability of a country to live a nice life while using less natural resources.

The same conclusions can be drawn from this: The European funds do not seem to improve sustainable development in CEE countries, in fact, the HPI has been getting lower since 2014 (Kranjac et al., 2017). The data for 2014 can be found in ***Appendix II***.

During the study carried out by Kranjac et al. (2017), for 2014 data, they reached the same conclusions. Paid grants and HPI were negatively correlated; well-being and footprint were positively correlated to paid grants; inequality was also negatively correlated.

This means that neither HPI nor carbon footprint has been better off since the funds given in 2014, and by 2019, this has not been resolved either. The funds are failing to achieve their objectives since the first study was done. It should be reconsidered how the funds are distributed or the EU should investigate why these countries are not able to properly absorb the funding.

In the case of inequality, the correlation coefficient calculated for 2014 was -0.64 (Kranjac et al., 2017). By 2019, this result has been decreased by half, which still means that as the grants given increase, the inequalities between citizens are being reduced, but not as much as in 2014.

Well-being is the only variable positively affected by funds. Residents are getting a better sense of living, which is synchronized with the use of EU funds. It should continue to increase with better use of said grants. The positive correlation proves that EU grants are improving humans' feelings about better lives.

Meanwhile, the negative correlation between HPI and grants given, proves that said funds are not leading CEE countries to more sustainable development. For this study, HPI is considered as the index reflecting the sustainable development of a country, that is why the correlation can indicate if the grants are improving or not their sustainable development by using EU funds.

The last table, ***Table 3***, studies the correlation between CO2 emission per capita and paid grants per capita.

Table 3: Correlation between grants and CO2 emissions.

Countries	Population 2019 (million)	CO2 emission 2019 (in million tons of CO2 equivalents)	CO2 per capita 2019	Paid grant per capita 2019
Romania	19,41	114,33	5,9	0,20
Poland	37,92	393,67	10,4	0,34
Bulgaria	7	56,69	8,1	0,18
Czech R,	10,65	124,57	11,7	0,32
Slovakia	5,45	40,18	7,4	0,42
Latvia	1,92	11,63	6,1	0,39
Hungary	9,77	65,29	6,7	0,36
Lithuania	2,79	20,74	7,4	0,40
Estonia	1,32	14,91	11,2	0,44
Slovenia	2,08	17,14	8,2	0,24
PCC			0,2033	

Source: Eurostat data, 2019 and author

Paid grant per capita and CO2 emission per capita: 0,20. High positive correlation. This means that the emissions are increasing simultaneously with the increase in funds per capita. Once again, this is the opposite outcome intended by the European Union.

The results obtained by Kranjac et al. (2017) for 2014, are similar to these ones. The only difference is that even though paid grants and CO2 emissions have a positive relationship, this value has gone down from 0.53 in 2014, to 0.20 in 2019, which is progress. Some of the countries have been able to reduce their emissions of CO2 per capita. Estonia was the country with the highest CO2 pc in 2014, with a 16,06 level, and in 2019 was down to 11,2.

5. CONCLUSION

The European Union created the budget to promote projects and policies, such as the Cohesion Policy or Structural policy, with the purpose of reducing disparities between Member states of the EU and increasing their overall growth (Beugelsdijk et al., 2005; Fiaschi et al., 2018).

The objective of the project was to study the relationship between financing and the sustainable development of Central Eastern European Countries, using the work carried out by Kranjac et al. (2017) for 2014.

Through this study, the same conclusions as Kranjac et al. (2017) were reached. So far, the funds are not able to reach their purpose. They are not improving the sustainable development of the studied counties. However, this does not mean that the budget is completely failing its purpose. There are a few studies that have found that some of the policies are helping to increase the overall growth of Member States, and are being able to reduce inequalities between the richer countries and those that were last to join the EU (Fiaschi et al., 2018). More specifically, the structural funds have allowed poorer countries, such as Greece, to reduce their extreme differences from richer countries (Beugelsdijk et al., 2005). This means that it is having a positive impact on certain aspects, but others may need to be reconsidered.

One of the reasons why the financing is not succeeding is the absorption capacity of the country. Absorption capacity is defined as the extent to which the country can spend the financial resources allocated to them effectively and efficiently. It can have three connotations: macroeconomic absorption capacity, which is measured in terms of GDP; financial absorption capacity, which is the ability to co-finance EU's supported projects; lastly, administrative capacity, the qualification of a country's authorities to manage, monitor and fund the implementation of projects and programs.

The issue with absorption capacity is that countries that need financing the most are the ones facing difficulties absorbing them. The explanation for this issue is in two factors: the lack of experience or qualifications of the regional authority; and the difficulties arising from bureaucratic procedures or slowness of the decision-making process (Georgescu, 2008).

In conclusion, the European funds given to the CEE countries are not having the desired outcomes they were designed for. The reasoning behind their lack of effectiveness is most likely due to the lack of absorption capacity these countries have, leading to a non-efficient usage of the financing. It is true that since 2014, the parameter studies have been improving, but there is still a long way to go to achieve the full potential of the grants. Some specific factors that these countries should consider improving include: strengthening their administrative capacity, by preparing higher qualified personnel and avoiding employees'

fluctuations; higher transparency, by eliminating excessive bureaucracy and providing extensive information; or stabilization of the rules that provide access to funds, among others (Georgescu, 2008; Kranjac et al., 2017).

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Appendix I

$$PCC = rxy = \frac{\sum xiyi - n\overline{xy}}{(n-1)SxSy} = \frac{n\sum xiyi - \sum xi \sum yi}{\sqrt{n\sum xi^2 - (\sum xi)^2}\sqrt{n\sum yi^2 - (\sum yi)^2}}$$ [2]

n = 10

Paid Grants per capital (xi)	
$\sum xi$	3,28
$\sum xi^2$	1,15
$\sqrt{n\sum xi^2 - (\sum xi)^2}$	0,877

HPI (Yi)		**Wellbeing (Yi)**	
$\sum yi$	55,6	$\sum yi$	68,4
$\sum xiyi$	16,781	$\sum xiyi$	22,540
$\sum yi^2$	364,443	$\sum yi^2$	472,420
$n\sum xiyi - \sum xi \sum yi$	-14,589	$n\sum xiyi - \sum xi \sum yi$	1,009
$\sqrt{n\sum yi^2 - (\sum yi)^2}$	23,517	$\sqrt{n\sum yi^2 - (\sum yi)^2}$	6,756
PCC	-0,707	**PCC**	0,170

Footprint (Yi)		**Inequality (Yi)**	
$\sum yi$	52,06	$\sum yi$	51,91
$\sum xiyi$	17,857	$\sum xiyi$	16,473
$\sum yi^2$	288,637	$\sum yi^2$	296,581
$n\sum xiyi - \sum xi \sum yi$	7,779	$n\sum xiyi - \sum xi \sum yi$	-5,563
$\sqrt{n\sum yi^2 - (\sum yi)^2}$	13,271	$\sqrt{n\sum yi^2 - (\sum yi)^2}$	16,467
PCC	0,668	**PCC**	-0,385

Appendix II

Empirical data for 2014, by Kranjac et al., 2017.

Table I: Basic and EU funds absorption data for CEE countries.

Countries	AnnualGDP (EUR billion)	Population (million)	GDP per capita (1000 EUR)	Paid grants (EUR billion)	Payment ratio (%)	Contracted grants (EUR billion)	Contracted ratio (%)
Romania	150.66	19.95	7.55	10	52	20.3	106
Poland	403.08	38.48	10.48	52.5	78	68.2	102
Bulgaria	42.00	7.2	5.83	5.1	77	7.7	115
Czech R.	154.94	10.51	14.74	18.1	69	25.2	96
Slovakia	75.21	5.42	13.88	7.6	65	13.1	112
Latvia	24.06	1.99	12.09	3.9	86	4.8	105
Hungary	103.3	9.88	10.46	21.7	87	28.0	112
Lithuania	36.29	2.94	12.34	6	88	6.8	100
Estonia	19.53	1.32	14.80	3	87	3.3	98
Slovenia	37.25	2.06	18.08	3.4	83	4.3	104

Source: Eurostat data, 2014

Table II: Correlation between paid grants pc and HPI, Wellbeing, Footprint and Inequality.

Countries	Paid grants per capita (Xi) in 1000 EUR	HPI (Yi)	Wellbeing(Yi)	Footprint(Yi)	Inequality(Yi)
Romania	0.501253	28.8	2.7	2.7	19
Poland	1.364345	27.5	4.4	4.4	11
Bulgaria	0.708333	28.4	3.3	3.3	19
Czech R.	1.722169	27.3	5.2	5.2	9
Slovakia	1.402214	28.2	4.1	4.1	13
Latvia	1.959798	17.1	6.3	6.3	14
Hungary	2.196355	26.4	2.9	2.9	15
Lithuania	2.040816	21	5.8	5.8	11
Estonia	2.272727	17.9	6.9	6.9	12
Slovenia	1.650485	24.6	6.1	5.8	19
PCC		**-0.698**	**+0.645**	**0.654**	**-0.638**

Source: Eurostat data, 2014 and authors

Table III: Correlation between paid grants pc and CO2 emissions.

Countries	Population 2014 (million)	CO2 emission 2014 (in million tones of CO2 equivalents)	CO2 per capita 2014	Paid grant per capita 2014
Romania	19.95	110.4	5.53	501.25
Poland	38.48	382	9.92	1.364.34
Bulgaria	7.2	55.4	7.69	708.33
Czech R.	10.51	126.8	12.065	1.722.17
Slovakia	5.42	40.8	7.52	1.402.22
Latvia	1.99	11.6	5.83	1.959.8
Hungary	9.88	57.7	5.84	2.196.36
Lithuania	2.94	19.2	6.53	2.0408.16
Estonia	1.32	21.2	16.06	2.272.72
Slovenia	2.06	16.7	8.11	1.650.48
PCC			**+0.5294**	

Source: Total greenhouse gas emissions by countries (including international aviation and indirect CO2, excluding LULUCF), million tonnes of CO2, equivalents and Eurostat - Population and authors