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ENHANCING NATIONAL DEFENSE CAPABILITIES THROUGH COLLABORATIVE PROGRAMS: INSIGHTS AND POLICY RECOMMENDATIONS FOR INDONESIA*

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Abstract. This study analyzes the program planning in the Indonesian defense sector with a focus on the impact of defense spending on economic growth. Through a combination of quantitative analysis of Indonesian defense spending data and qualitative discussions with Indonesian defense economists, the study investigates the effectiveness of productive programs such as collaboration, dual-use capabilities, and empowerment. The findings reveal a positive association between Indonesia's defense spending and economic growth, emphasizing the significance of well-designed collaborative programs. However, ensuring budget certainty for these programs to yield practical benefits is crucial. The study emphasizes the need for the defense budget policy to be clearly stated in the national defense law, ensuring its effective implementation. Furthermore, the study explores potential new collaborative programs and defense and security initiatives that can enhance national defense capabilities. It underscores the importance of fostering collaboration between military and civilian organizations to accelerate innovation in science and technology, proposing the establishment of a defense science and technology park as a platform for such collaboration. The research has implications for policy development and decision-making in the defense sector. By emphasizing the significance of collaborative programs, the study provides insights for policymakers to enhance the effectiveness and practicality of defense initiatives. It also highlights the importance of ensuring budget certainty and incorporating defense budget policy into the national defense law.

Keywords: defense spending; collaborative programs; economic growth; national defense law; defense science and technology park

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1. Introduction

Many studies have shown the importance of collaborative programs, including in the national security and defense fields. Although collaboration is not a new method, and Indonesia has collaborated significantly with other communities owing to the availability of communication technology, there has recently been a strong push for cooperation programs in the field of national defense. Collaboration has been suggested for accelerating innovation, reducing uncertainty, and receiving mutual assistance when implementing a program. For example, science and technology parks (STP) in the scope of defense and security are a proposed form of collaborative organization to increase the productivity of defense R&D (Vásquez-Urriago et al., 2014). Collaborative programs are also productive activities that need government policy support for the planned provision of people, costs, and infrastructure. Within this context, we focus this study on the relationship between defense spending and productivity, highlighting Indonesia's related defense spending policy. Do they include a straightforward cooperation program? Is there sufficient evidence that Indonesia's collaborative defense spending is productive? What are the obstacles to their implementation? This study also discusses innovative ideas for finding solutions and ensuring that programs characterized by collaboration, dual-use, and empowerment are effective. To ensure that acceleration is essential for such a context, we conduct self-convincing data analysis and propose recommendations to policymakers.

Many experts agree that international collaboration can promote closer relations between countries. Intergovernmental collaboration agreements promote close cooperation in science. One of the significant driving contexts for such promotions is the exchange of research experiences and the implementation of technology, education, and cultural policies. However, the collaborative approach is not only in research and technological collaboration but has already been developed in crucial areas, such as overcoming hunger, infectious diseases, and natural disasters.

The discourse on the theme of this collaboration perfectly fits with Indonesia's current and future conditions. Indonesia is a maritime country with various cultural, political, and ecological realities on thousands of islands at the equator. The territory is rich in biodiversity but vulnerable to natural disasters (Timperio et al., 2020). Geopolitically, Indonesia views the importance of global interaction as a new paradigm – how the international community responds to political instability, climate change, and disasters in a region, which in the end, the international view as a widespread problem. The phenomenon of global change transcends national boundaries, and effective risk mitigation requires local and global responses. Such interactions require policy responses to adapt and mitigate risks such as Covid-19. This case demonstrates the application of the new paradigm. Such participants in collaborative organizations voluntarily find effective ways to mitigate Covid-19 risks (Rho et al., 2021). The collaboration lessons related to Covid-19 have reaffirmed the importance of local and globally collaborative activities, now and in the future, especially when urgent decision-making is needed (Ehlers et al., 2021).

Collaboration is a constant feature of modern society (Patel et al., 2012). Although there are still obstacles to implementing interdisciplinary collaboration, the collaborative research approach has received significant attention from many groups (Smolka, 2020). Additionally, the national defense program is a multidisciplinary field. The difficulty often faced in implementing programs that require a prominent level of multidisciplinary care is the limited number of personnel and scientific competence. This forces officers to outsource human resources and collaborate with universities, industries, and NGOs. Defense spending policy documents usually do not hold an explicit "collaboration" program; therefore, implementing units may not execute the program collaboratively. Another problem that often arises when implementing a collaborative approach is the civil-military cultural gap, characterized by the system's non-technical nature and weak interaction between technical and social components to translate defense strategies into work system applications (Liwång, 2022). For example, in this context, the strategic vision of national defense is often challenging to understand by universities and the industrial

community because it is structured in many documents and has a military-specific style, so it is not entirely clear how the vision should be translated into systems design, including the lack of methodological support for the transition from strategy to work system (Hannay & Gjørven, 2021). Despite discussing such difficulties, as many have suggested in the literature, the defense R&D community believes that collaboration between researchers in defense R&D, industry, academia, and NGOs will significantly benefit and have multiple impacts. By continuing to conduct collaborative methods, in the end, there will be a diffusion of understanding of the "work culture" among the civil-military (Patel et al., 2012). Of course, the problem must be addressed is how such an initiative can be sustainably set up and explicitly stated in the defense spending planning policy. Referring to the literature on collaboration, we assumed that defense spending in specific fields with a collaborative approach would positively affect national security and welfare. This study proposes the following hypotheses: (1) defense research and technology have a positive effect on welfare, and (2) research and technology collaboration has a positive effect on welfare.

We conducted a case study to prove both hypotheses using a defense spending dataset and related variables available at the Ministry of Defense, TNI Headquarters, Statistics Indonesia (BPS), Bank Indonesia, and the World Bank.

2. Literature Review and Methods

Collaborative Approach

A collaborative approach between the government, community organizations, universities, and industry has long been proclaimed as an effective working model to solve problems related to defense (Akbar et al., 2021), allowing technology diffusion (Annosi et al., 2021; Endri, 2020) and empowerment (Jackson et al., 2019). The fields are varied, but the most popular are collaborations to solve environmental problems (Yeganeh et al., 2020), energy supply (Kim, 2021), health (Jit et al., 2021), and education (Caniglia et al., 2017). Given that the field of national defense is multidisciplinary, many experts have reviewed the defense aspect's collaborative approach and stated many benefits (Liwång, 2022; McGuire, 2007). Collaboration in national defense and security in Indonesia is implicit in the doctrine of the total defense system, which is contained in many official documents. In addition, to various events, the Indonesian Defense Minister stated the importance of collaboration (Setiadji, 2020). However, cooperation programs are not explicitly stated in Indonesia's defense spending policy documents. Thus, there is no sign in the document of whether an initiative or program will be implemented collaboratively. Even if such collaborative programs exist, documents are usually shown separately (another obstacle).

The Nexus of Defense Spending and Welfare

The defense spending plan has received the most attention, specifically concerning its effect on welfare; for research, proxy data for welfare can be found in economic growth. In Indonesia, defense spending is judged to have a negative or positive effect depending on the regressor variable and the analytical technique used. The positive effects of defense spending on economic growth include job creation (Wing, 1991), security stability (Saputro et al., 2020), and productive investment in human capital (Chairil et al., 2013). A comparison of the effect of defense spending on economic growth between Indonesia and Turkey is interesting; in Indonesia, this effect is positive, while in Turkey, it is negative. If an allocation is unsuitable for the target, economic growth will harm economic growth. Given the importance of a collaborative approach in executing a program, the idea of explicitly spelling it out in a defense spending policy document is fascinating. Not only will it be a guide for program execution, but the collaborative program will also show the effect of defense spending, as shown in the research above. To reinforce the idea of a collaborative program in future defense spending planning documents, we need to update the research described above by adding the latest data to better understand the possible changes in the outcome.

The data reviewed as the focus of the analysis in this study are GDP, defense spending, population, labor force participation, national R&D budget, number of soldiers per thousand population, manufacturing (value-added), number of university graduates per ten thousand population, and soldiers' welfare index. Indonesia's defense spending in the ASEAN region is classified as low based on its ratio to GDP according to the average World Bank data from 1990 to 2020. Based on the average over the past decade, Indonesia's defense expenditure is significantly high, ranking just below Singapore's. Despite defense spending, there is an agreement that expenditure must supply security and increase welfare. This study focuses on understanding defense spending that can increase productivity, economic growth, and welfare. In this context, the literature shows that productivity is related to human resource technology and working capital development. Thus, we presumed that some defense spending would be for working capital and the other would ensure security and protection.

Productivity growth depends on innovation and increased physical and human capital (Gordon, 2018). There are indications that productivity growth is also related to the standard of living costs (Jones & Klenow, 2016) and purchasing power (Ge & Tang, 2020). In Indonesia, the average labor force participation was more than 60%, which at the end of 2005 showed 64%, and in 2020 showed 67.4%. This percentage shows the potential for available labor (productive human resources). To understand the effect of capital, we refer to manufacturing value-added data associated with labor force participation and college graduates. Meanwhile, the welfare level of soldiers with proxies of the per-capita-defense-spending ratio data and the consumer price index will provide an overview of soldiers' standard of living costs, denoted by the soldier's welfare index.

The Model of Defense Spending and Welfare

In the statistical analysis, GDP was the dependent variable, and the others were the independent variables. Inferential statistical analysis was used, which involves various tests commonly applied in econometrics. We conducted twice Focus Group Discussion (FGD) to confirm the findings involving defense economists, NGOs, academics, and representatives of institutions related to the national economy, such as Bank Indonesia, the Ministry of Finance, the Ministry of Education, and TNI Headquarters.

The framework used in this study adopts several neoclassical production function models that have been described in several related studies (Ben Zeev & Pappa, 2015; Edquist & Henrekson, 2017; Herrera & Gentilucci, 2013) in which the formula of the gross output production function is

$$d(Y)=Y(t-1)+m+ m(t-1)+\log(s)+\log(g+n+d)$$

where Y is log(GDP), m is log(defense spending), s is gross domestic fixed capital formation, g is technology value-added in manufacturing, n is the labor force participation index and undergraduates, and d is the GDP deflator. In addition to using the Solow model, the relationship between these variables using the vector autoregressive (VAR) and autoregressive distributed lag (ARDL) approaches is used to understand the shock and the long-term effect of the independent variable on the dependent variable.

The findings of the quantitative analysis were further confirmed through qualitative analysis by discussing the quantitative findings in two focus group discussions (FGDs). The FGDs involved economists from the National Development Planning Agency, Bank Indonesia, Ministry of Finance, University of Indonesia, Indonesian Defense University, National Development University, Presidential Staff, and national economic observer organizations (NGOs) experts. In addition to the FGDs, in-depth interviews were conducted with three Indonesian Defense economists, including a former Minister of Defense, a former Secretary General of Defense, and a Presidential Staff member, focusing on specific themes related to collaboration.

3. Results and Discussion

Productive Program of Defense Spending for Economic Growth

In theory and practice, national security is a priority in every country, but large military expenditures can burden the government considerably and harm people's welfare. Therefore, an effective military budget plan is necessary. How much military spending is “adequate” is always debatable, given that any money spent affects other public expenditures (Benoit, 1978). In a theoretical economy with only two goods, a cliché comes into play: guns vs. butter (Bove et al., 2017). The results of earlier studies generally lead to positive relationships with productivity (Alptekin & Levine, 2012; Chen et al., 2014; Wang et al., 2012). Table 1 shows the relationship between defense spending (M) and economic growth (Y), where M has a significant positive effect on economic growth, which is 11%. However, the lag in defense spending, M(-1), had a significant negative impact of 13% and a total negative effect of -1.86%. This finding is consistent with the results of previous studies (Fatah & Salihoglu, 2016; Revika & Yeniwati, 2019; Wing, 1991). Thus, we conjecture that the nexus of defense spending with economic growth is a short-term effect. Therefore, it is necessary to analyze other dynamic models.

Table 1. Effect of Defense Spending on GDP without Collaborative Programs

Dependent Variable: Y; Method: Least Squares; Sample: 1975-2021; Included observations: 47				
Variable	Coefficient	Std. Error	t-Statistic	p-value
Y(-1)	0.815425	0.049763	16.38626	0.0000
M	0.111354	0.041544	2.680376	0.0105
M(-1)	-0.129981	0.042172	-3.082151	0.0036
S	0.157876	0.043788	3.605476	0.0008
C	0.782037	0.300961	2.598463	0.0129
R-squared	0.997079	Mean dependent var		15.60847
Adjusted R-squared	0.996801	S.D. dependent var		0.313440
S.E. of regression	0.017729	Akaike info criterion		-5.126937
Sum squared resid	0.013201	Schwarz criterion		-4.930113
Log-likelihood	125.4830	Hannan-Quinn criterion		-5.052871
F-statistic	3583.981	Durbin-Watson stat		1.364862
Prob(F-statistic)	0.000000			

Source: raw data from MoD Indonesia, BPS, Bank Indonesia, and World Bank

Meanwhile, technology and participation (X) cause defense spending to affect growth positively. This effect is apparent when Tables 1 and 2 are compared. When we add X (participation and involvement of academia, R&D programs, and dual-use programs in education) into the model (Table 2), the total effect of defense spending becomes positive at 3.8%. Moreover, the constant term (C) significantly increased from 0.78 to 2.41. We interpret this as a strong influence of technology and participation (X) not only on the effect of defense spending but also on other growth factors. Thus, we interpreted the participation and involvement of academia in the program as essential. Another interpretation is that the program in defense spending must exist in the context of encouragement, which is in line with the opinion of most experts that defense spending will encourage the formation of human capital and technological mastery, provide a spin-off, and create productivity. However, some experts believe the net effect is harmful because it still passes through many impact chains (Grobar & Porter, 1989). This opinion can be annulled if defense spending is deliberately directed to encourage growth through collaboration, dual-use, and empowerment programs.

Table 2. Effect of Defense Spending on GDP with Collaborative Programs

Dependent Variable: Y; Method: Least Squares; Sample: 1975-2021; Included observations: 47

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Y(-1)	0.579901	0.085381	6.791921	0.0000
M	0.117078	0.047278	2.476385	0.0176
M(-1)	-0.079009	0.040918	-1.930928	0.0606
S	0.167438	0.039638	4.224161	0.0001
X	0.018489	0.047852	0.386375	0.7013
C	2.408866	0.603751	3.989834	0.0003
R-squared	0.997733	Mean dependent var		15.60847
Adjusted R-squared	0.997393	S.D. dependent var		0.313440
S.E. of regression	0.016004	Akaike info criterion		-5.295394
Sum squared resid	0.010245	Schwarz criterion		-5.019840
Log-likelihood	131.4418	Hannan-Quinn criterion		-5.191701
F-statistic	2934.210	Durbin-Watson stat		1.244477
Prob(F-statistic)	0.000000			

Source: raw data from MoD Indonesia, BPS, Bank Indonesia, and World Bank

The inference from Table 3 shows that evidence. It shows that defense spending will improve its effect on economic growth if it involves regressors of effective programs such as R&D, education, and job creation - at least productive factors will reduce the adverse effects or increase the positive effects. Meanwhile, the opinion that the positive effect of defense spending is only possible in developed countries is refuted by research that finds a direct impact of security stability on growth, where security stability is claimed to be a condition for the emergence of economic growth (Chairil et al., 2013).

Table 3. Summary of the Impact of Collaboration and Empowerment on the Defense Spending Relationship and Indonesia's Economic Growth 1975-2021

Year	Non-collaborative Spending				Collaborative Spending			
	M	M-1	Total	Sig.	M	M-1	Total	Sig.
1975-2000	13.29%	-19.69%	-6.40%	<0.05	10.51%	-14.25%	-3.74%	<0.05
2001-2010	-0.24%	2.66%	2.42%	<0.05	4.04%	2.62%	6.66%	<0.05
2011-2021	1.61%	-3.71%	-2.10%	>0.05	1.03%	-2.29%	-1.26%	>0.05
1975-2021	11.14%	-13.00%	-1.86%	<0.1	11.71%	-7.90%	3.81%	<0.05

Source: raw data from MoD Indonesia, BPS, Bank Indonesia, and World Bank

Subsequently, we used the vector autoregressive (VAR) approach to analyze the long-term effects and shocks on economic growth that may occur when the elements of productivity, dual-use, and participation are involved. We find that the defense spending response caused a shock to economic growth in the third year, although there was a slight downward effect in the fourth year, as shown in Figure 1. In advance, we replaced capital with Foreign Direct Investment (FDI), and it shows that the growth response becomes negative (<-1%), and we interpreted that it does not cause a shock.

Academic participation is essential in another simple simulation using ordinary least squares (OLS). As Table 4 shows, defense spending positively affects economic growth by 12%. Meanwhile, when we excluded X, the model was unfit (worse, by looking at the Durbin-Watson statistic < 1.00), so we could not interpret it further.

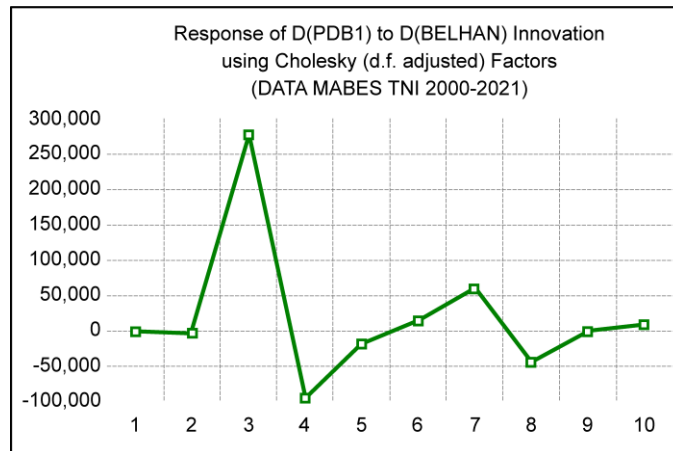


Fig. 1. Response of Economic Growth (PDB1) to Defense Spending (BELHAN) with technology, skill labor, and capital formation
Source: raw data from MoD Indonesia, BPS, Bank Indonesia, and World Bank

Table 4. Simple Simulation Results

Dependent Variable: Y; Method: Least Squares; Sample: 2000-2019; Included observations: 22				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
M	0.117969	0.032344	3.647283	0.0020
S	0.518610	0.128422	4.038315	0.0009
X	1.344836	0.143667	9.360808	0.0000
DEF	-0.999091	0.120123	-8.317196	0.0000
C	0.585944	0.700801	0.836107	0.4147
R-squared	0.997486	Mean dependent var		15.87625
Adjusted R-squared	0.996895	S.D. dependent var		0.188782
S.E. of regression	0.010520	Akaike info criterion		-6.074389
Sum squared resid	0.001881	Schwarz criterion		-5.826425
Log-likelihood	71.81828	Hannan-Quinn criterion		-6.015976
F-statistic	1686.432	Durbin-Watson stat		1.919685
Prob(F-statistic)	0.000000			

Source: raw data from MoD Indonesia, BPS, Bank Indonesia, and World Bank

Tangible and Intangible Effect of Defense Spending on Economic Growth

We held the Focus Group Discussion (FGD) on June 29, 2022. The FGD was attended by experts in the defense economy in Indonesia with four main speakers, including Prof. Purnomo Yusgiantoro, former Minister of Defense of the Republic of Indonesia, and Prof. Jaleswari (Presidential Expert Staff). The FGD discussed perfecting the effect of defense expenditure on economic growth. From the FGD, we noted several criticisms of the use of the model, such as 1) the model only involves tangible data, while the defense spending effect should also refer to the intangible effect; and 2) the model uses macro data, while a plainer effect will be seen in microdata.

To follow up on the criticism, we conducted a preliminary analysis of the relationship between defense spending and growth using interpolated data on the "Indeks Bela Negara (IBN)." IBN is a measure of Indonesian citizens' intention to defend the country since 2016 by MoD Indonesia. Conceptually, the IBN represents the intangible effect of defense spending on growth. To predict the impact of defense spending on IBN, we performed a linear interpolation of IBN with the BPS criminality data regressor (2005-2019) to obtain sufficient data for the preliminary study. We find that defense spending positively affects IBN (see Table 5). Based on the results of the preliminary analysis of this study, we interpret that defense spending, including its intangible effects, has a

positive effect on welfare if it has empowerment, dual-use, and collaborative programs (see Table 6). Of course, we need the actual measurement results of the IBN to obtain sufficient information about the intangible effects of defense spending on economic growth. Therefore, we encourage researchers to do so when the amount of IBN data is sufficient or when there is another regressor with proper data.

Table 5. The Effect of Changes in Defense Spending on IBN

Dependent Variable: IBN; Method: Least Squares; Sample: 2002-2018; Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M)	1.707846	0.571669	2.987473	0.0097
X	12.05109	0.451303	26.70289	0.0000
C	-126.1588	7.214093	-17.48782	0.0000
R-squared	0.980755	Mean dependent var		66.48843
Adjusted R-squared	0.978006	S.D. dependent var		3.191143
S.E. of regression	0.473258	Akaike info criterion		1.500433
Sum squared resid	3.135623	Schwarz criterion		1.647470
Log-likelihood	-9.753678	Hannan-Quinn criterion		1.515049
F-statistic	356.7364	Durbin-Watson stat		2.465953
Prob(F-statistic)	0.000000			

Source: The raw data are from MoD Indonesia, BPS, Bank Indonesia, and World Bank

Table 6. The Effect of IBN and Defense Spending on Economic Growth

Dependent Variable: D(Y); Method: Least Squares; Sample: 2002-2018; Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(M)	0.158533	0.042733	3.709837	0.0007
D(IBN)	0.002493	0.001048	2.379563	0.0226
C	0.022517	0.002970	7.581949	0.0000
R-squared	0.364167	Mean dependent var		0.024510
Adjusted R-squared	0.329797	S.D. dependent var		0.022680
S.E. of regression	0.018567	Akaike info criterion		-5.062783
Sum squared resid	0.012756	Schwarz criterion		-4.936117
Log-likelihood	104.2557	Hannan-Quinn criterion		-5.016984
F-statistic	10.59567	Durbin-Watson stat		1.709918
Prob(F-statistic)	0.000230			

Source: The raw data are from MoD Indonesia, BPS, Bank Indonesia, and World Bank

Table 7. The Thematic Maps of the Defense R&D Collaboration Program Resulting from FGDs and Expert Interviews

Collaborative Programs of R&D	Scope	Perceived Impact	Participants in Programs
KFX/IFX	Indonesia-ROK-Italy-US	High	Universities, R&D agencies, defense industries
MEF	Multilateral	Low	Military R&D and defense industries
UAV	Indonesia-Turkey	Mid	Universities, R&D agencies, defense industries
Munition	Domestic	Low	R&D Agency (MoD) and Dahana (Defense Industry)
Humanities/Social (e.g., Pandemic Threats)	Domestic	Low	Universities, R&D agencies, NGO
Other Tech & Innovation	Multilateral	Low	Universities, R&D agencies, defense industries
Other special military programs	Military - Multilateral	Very low	Military R&D agencies, defense industries

Source: Authors

Table 7 provides a valuable thematic map derived from the Focus Group Discussion (FGD) and expert interviews, shedding light on the Defense Research and Development Collaborative Program (R&D) which further explains the quantitative results. We mapped out the themes of the FGD results and interviews about the perspectives of experts and FGD participants (qualitative approach). Table 7 is a summary of examples of collaborative programs

discussed. The table allows us to examine the scope of these programs, their perceived impact, and the diverse range of participants involved. This insightful information, sourced from a study conducted in 2022, reveals that not all Defense R&D collaboration programs are regarded as having a significant impact on production capacity and independence. In fact, most programs are perceived to have a low effect. These findings critically examine the results of the quantitative approach. Even though collaboration is known to have a positive effect quantitatively, the correction is given by the results of an expert perspective which stimulates further discussion. Several proposals for new strategies to increase their impact were in the discussions. One potential approach is establishing a Science and Technology Park and encouraging start-up technology innovation. By engaging promising and emerging researchers, these initiatives can facilitate the development of their skills and capacities, thereby contributing to the effectiveness and productivity of collaborative programs. As such, the analysis provided has underlined the importance of continuous evaluation and exploration of innovative steps to augment the impact of the Defense R&D collaboration program. By utilizing new approaches and involving various stakeholders, the defense sector can strive for greater efficiency and effectiveness in research and development efforts, increasing the capability and independence of national defense.

The following section discusses the quantitative results combined with the interviews and FGDs (qualitative approach) results.

Lessons from Pandemic Era: Collaborative Programs

Although the research results between defense R&D and universities in Medan and Padang in 2019 have demonstrated the hypothesis of a biological attack and found weaknesses in the national organization for handling pandemics, these results have received little response from relevant agencies. In 2020, there was a Covid pandemic, proving their findings that the organization for handling the national Covid pandemic was not ready for various reasons and obstacles. This fact shows that research results related to national defense in social threats have not received sufficient attention - indicating a low effect on influencing stakeholders.

Moreover, the FGD discussed collaboration programs during the Covid pandemic, which showed that collaboration was necessary. The experts taking part in the FGD indicated that the problems that arose could no longer be overseen on a sectoral basis because of limited human resources, infrastructure, and unavailable technology. This problem will continue in the future, considering the increasingly diverse sources of threats, such as climate change and environmental damage, limited energy sources, and political instability in several regions of the world. In the context of learning from the covid pandemic, resources, such as public and private hospitals and other facilities, are limited. In this context, TNI health facilities throughout Indonesia have been transformed, and their ability has increased to minimize the pandemic risk. Likewise, the budget for doctors, nurses, pharmacists, and even military defense has been diverted to deal with the pandemic on a large scale. What has been done in Indonesia has also been done in many countries.

Nevertheless, the pandemic has taken a heavy toll and shows there are still shortcomings in handling it, and perhaps Indonesia is too ego sectoral. However, the pandemic has strengthened Indonesia's belief that there are common problems that will occur that must be discussed and addressed together at the national, regional, and global levels. Therefore, a strategic community should evaluate alternative procedures to prepare for adjustments. Many scholars have voiced such ideas, for example, the hope for evaluation of defense policies under new scenarios (Hoffman, 2021), the need to develop a massive global collaborative framework for virus research, and the need for collaboration between stakeholders during and after the pandemic (Lepore et al., 2021). In line with the encouragement of these experts, the Indonesian Vice Minister of Defense conveyed the importance of collaboration in implementing 2022 work programs. Finally, this paper also underlines the importance of the work program in the policy document of the national defense spending plan marked "collaborative program."

The context of the collaboration program has recently become warmer with the COVID-19 pandemic. Most government expenditures, including some defense programs, have been suspended and reallocated. All health infrastructure and military medical personnel, including nonmedical soldiers, were deployed to overcome the pandemic and enforce health protocols. Under such conditions, collaboration occurs simultaneously, and previously unthinkable problems arise, such as influential interagency roles and the need for planned collaborative programs.

Lessons from the Minimum Essential Force (MEF) policy: a More Definite Defense Spending Plan

In addition to the type of cooperation program, the next effort discussed in the FGD was strengthening the science and technology community and its organization in the context of the policy to fulfill weapons capacity, known as the MEF policy. The main program in the MEF policy has been realized at 63% and should be completed by 2024. However, owing to various obstacles, especially the annual defense budget uncertainty, the MEF program may be delayed until 2030. Based on the MEF obstacle experience, the FGD experts highlighted the need to optimize defense spending by highlighting the efficiency of operating costs, maintenance, spare parts fulfillment, and reducing depreciation rates, all of which will appear in the cooperation program. They also emphasized the importance of SciTech acceleration programs for human capacity building, such as research and education, and the preparation of infrastructures, such as laboratories, places of education, and places of practice.

In contrast, others highlight the stability of the annual defense budget so that the execution of its programs can be directed consistently to provide positive support for economic growth. Therefore, the uncertainty of MEF budgeting has inspired FGD participants to propose a more definite defense spending plan. Their idea is to include a percentage of the defense budget in the amendments to the National Defense Law, 2002 (Act No. 3/2002), based on a GDP of 1% or an APBN of 10%.

Defense Science and Technology Park (DSTP): a Collaboration Model for Accelerating Innovation

One idea to accelerate the collaborative initiative is to set up a defense STP. For example, this idea involves the development of a defense equipment maintenance depot using the STP model. The new idea of uniting military equipment maintenance depots by adopting the Science and Technology Park (STP) model (Balle et al., 2019) is interesting for further elaboration. The STP model is considered suitable for accelerating the increase in the capacity of defense technology and innovation (Vásquez-Urriago et al., 2016), which is generally an advanced and relatively updated technology (not obsolete technology). This model is also considered suitable for providing facilities for the SciTech community because it will be dual-use and can empower small industries (start-ups) to the defense industry, which is already solid. The government of Indonesia declared the STP. They included the STP in the 2015 National Development Plan. The Government of Indonesia announced one hundred STPs in 2019, though only 22 STPs are currently being developed. The STP is intended to cultivate science and technology in Indonesia and is expected to be the motor of collaborative programs in a regional context. Therefore, building an equipment maintenance depot for the military with the STP model has a double effect: as a military facility, as well as serving the community's needs. It will accelerate the dissemination of military technology to the public, academia, and industry and serve as a platform for the SciTech Community. Finally, it is essential to emphasize that effective programs characterized by collaboration, dual-use, and empowerment must be included in planning policy documents to implement them according to their targets. This study highlights the context of collaboration, dual-use, and empowerment for effective spending programs in Indonesia's future defense spending to support national economic growth.

Conclusion

The results demonstrate the positive impact of defense spending on economic growth in Indonesia, mainly when defense initiatives and programs prioritize productivity, dual-use capabilities, and empowerment through collaboration. However, it is important to acknowledge that the lag in defense spending has a significant negative effect, indicating a short-term influence on economic growth.

Regarding the practical implications of these findings, fostering collaboration between military and civilian organizations to expedite innovation in science and technology is crucial. Establishing a defense science and technology park (DSTP) in Indonesia could serve as a viable solution to facilitate such collaboration. The DSTP can have a dual effect by providing maintenance facilities for both military and civilian equipment, facilitating the dissemination of military technology knowledge to the public, academia, and industry, and acting as a platform for the Science and Technology (SciTech) Community to generate ideas and foster interaction among its members. Furthermore, ensuring the certainty of the annual defense budget will facilitate effective planning and ensure its successful implementation. Therefore, we recommend further research focusing on the inclusion of the specific defense budget amount in the amendments to the National Defense Law.

This study contributes to scientific novelty by highlighting the importance of collaboration, dual-use capabilities, and productivity in defense spending programs for stimulating economic growth. Additionally, the proposal of a defense science and technology park as a platform for collaboration and innovation represents a novel approach to enhancing the effectiveness and practicality of defense initiatives.

It is important to acknowledge the limitations of this research. Firstly, the study relied on available data and may not capture all relevant variables that could impact the relationship between defense spending and economic growth. Secondly, the analysis was conducted within a specific time frame and may not account for long-term effects or changing dynamics in defense and economic policies. Further research should consider these limitations and explore additional factors that may influence the relationship between defense spending and economic growth in Indonesia.

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THE ROLE OF VALUE-BASED LEADERSHIP ON LOCAL ECONOMIC DEVELOPMENT: A CASE STUDY OF NYANDENI LOCAL MUNICIPALITY*

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Abstract. This study aims to analyse how value-based leadership can lead to local economic development, especially in the current COVID-19 pandemic. The study traces how the vision of value-based leaders can empower young women to 1) get out of the unemployment bandwagon; 2) get affirmed as capable people; 3) get access to land; 4) get trained in agri-preneurship skills, and 5) be able to sustain themselves. To achieve this, respondents were administered a structured qualitative questionnaire with both closed and open-ended questions. The study employed a non-probability sampling technique through purposive sampling, which made it possible to access particular populations fitted well in the limited time within which this research was carried out. The data was read to present this study's results, followed by coding and categorization. Through coding, the researcher could identify themes by observing how they were related to the research questions. The next stage was the interpretation of data. The study's findings revealed that women are discriminated from men and are not given fair treatment, there is inequality, patriarchy, and women tend to be undermined in the workplace. Furthermore, the findings of this study revealed that the vision of value-based leaders could empower young women by equipping them to start their businesses. This study recommends implementing women empowerment programmes, whereby women will be trained, equipped with skills to start their businesses, motivated, and given financial support. The results of this study may lead to policy implications.

Keywords: women; empowerment; local economic development; value-based leadership

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1. Introduction

According to Bank and Sharpley (2022), most black people live demeaning lives and only perceive dignity in death. According to the writers, most black people believe their true freedom will come in the afterlife, so they spend so much money organizing their funerals. Furthermore, the situation has not improved due to the COVID-19 pandemic's effects. Women of all ages, young and elderly, have experienced discrimination before the COVID-19 epidemic, as evidenced by the numerous instances of gender-based prejudice and inequality. In light

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of how the Covid-19 pandemic has exposed and highlighted inequality in all corners of the world, Bapuji et al. (2020) urge organizations to take this crisis as a moment to hit the pause button, reflect on the consequences of organizational practices for societal inequality, and redesign their organizations to create more equal societies. The authors support studies that concentrate on how organizational practices affect societal inequality. Tihanyi (2020) makes a similar appeal to academics, urging them to conduct essential research as opposed to merely interesting research, research that will help society advance in some way. This study's foundation critically examines how value-based leadership can promote local economic development, particularly in light of the current COVID-19 pandemic. The study traces how the vision of value-based leaders can empower young women to 1) get out of the unemployment bandwagon; 2) get affirmed as capable people; 3) get access to land; 4) get trained in agri-preneurship skills, and 5) be able to sustain themselves.

2. Theoretical framework

Entrepreneurial development aims to direct a business by considering various internal and external elements and instilling creativity and valuable ideas and resources into an existing enterprise. According to Akiri, Onoja and Kunanzang (2016), most economies comprise active and inactive populations. "Economically active" refers to people who are able and eager to work. The unemployed and those actively involved in producing products and services are included in this category. According to Nkechi et al. (2012), the ability of a country to engage the economically active citizens of the population who have no jobs but are willing to work, those who lost their various jobs, and those who left their different places of employment voluntarily through a more reliable path called entrepreneurial development are what is meant by job creation. Job creation and employment are adversely correlated with unemployment because unemployment disappears when those who are able and willing to work can find paid employment (Nkechi et al., 2012).

It is possible to define entrepreneurial development and job creation as a situation in which individuals can launch successful enterprises and find and maintain well-paying employment. Idam (2014) argues that entrepreneurship development and job creation are crucial issues that every government should work to promote as much as they can because a higher unemployment rate can negatively impact poverty, a decline in the standard of living, a rise in social vices, etc. Local economic development in South Africa can be accomplished through the growth of the entrepreneurial sector, which might help the nation reach its objective of expanding employment creation in a profitable and advantageous way (Ikebujo, 2020).

3. Literature review

Definition of Value-Based Leadership

The theory of VBL was created and further developed since conventional leadership theories, such as those that describe charismatic and transformational leadership, do not consider the traits of ethics and morality in leaders (Copeland, 2014). The literature usually refers to VBL as a leadership ideology that gives leadership an ethical and moral foundation (Bass & Avolio, 1993) and puts other people's needs ahead of one's own (Taylor, 2010). According to published research, VBL research includes transformational leadership (Copeland, 2014).

VBL prioritizes and reflects strong ideals while also enhancing people's lives. All nations' socio-political and economic well-being depends on this idea (Sumanasiri, 2020). Several leadership ideologies, including charismatic leadership, transactional leadership, transformational leadership, and contingency-based leadership, have been researched by academics in organizational leadership (Sumanasiri, 2020).

This has resulted in an abundance of research on leadership in which the development of various leadership styles characterized by different definitions and attributes of leadership includes well-established styles such as transformational leadership. Value-based leadership has a major contribution to the LED policy of the NLM. This is based on the national economic development framework. This strategy is important for Nyandeni SMMEs since

it directs local economic growth in the country, including local authorities and the Nyandeni district. As a result, it provides local governments with practical steps for enhancing all aspects of local economic growth, including SMME development.

Based on the present National LED Framework Directive, the LED Strategy for the NLM concentrate on the following areas: Promoting Radical Economic Transformation; Accelerating Economic and Spatial Transformation; Plan Implementation; Monitoring Information Quality; and building on and utilizing the Back-to-Basics Programme, IUDF, CWP, and MIG. Putting more of an emphasis on leadership collaboration, integrating the youth and unorganized sector, creating an environment that supports small enterprises, emphasizing research, technology, and the green economy, and investing in inclusive economic growth.

Definition of Local Economic Development

The National LED Framework outlines a vision for how LED will be planned and implemented in South Africa. It provides a roadmap to various industries on how they might contribute to innovation-driven LED. The framework is based on six Core Policy Pillars that will have an impact on LED design, development, and implementation: creating varied and innovative local economies; creating inclusive economies; creating learning and skilled economies; Enterprise development and assistance; Economic governance and infrastructure; and increasing the effectiveness of local innovation systems.

In terms of generating jobs, money, and output growth, small enterprises contribute significantly to the South African economy. They are frequently the vehicle via which those with the lowest incomes can access economic possibilities, ultimately resolving economic difficulties. The NLM has acknowledged the need to promote and support the second economy to assist LED in the municipality. This initiative is seen as a test case for interacting with the sector, and it provides a valuable learning experience while identifying actions for future assistance and financing.

Youth is essential to transforming the rural economy. Compared to urban areas, young people in rural areas face special difficulties in terms of access to and availability of services and amenities, limiting their employment alternatives. As a result, the democratically-elected government of the Republic of South Africa has implemented several development programs to address the urgent need to permanently eradicate poverty by encouraging the expansion of companies that raise household incomes, produce jobs, promote saving, and improve the welfare of individuals. Cooperatives, small, medium, and micro-enterprises (SMMEs), and Broad-Based Black Economic Empowerment (BBBEE).

Internationally, various studies have shown that entrepreneurship, even at a survivalist level, assist in the economic development of nations and LED. Like most South African municipalities, the NLM is faced with unemployment. These challenges have been noted by (Gwena & Chinyamurindi, 2018), who relate them to other provinces. Thus, like with many other local cities, entrepreneurial development is being prioritized in the NLM.

The NLM has been and is continuing to support designated youth-owned projects. As part of Youth Month, the NLM Mayor, Mr Mesuli Ngqondwana, and the municipality's special programs unit (SPU) handed off equipment and components to five identified youth projects totalling R300 000. "Through this commemoration, the municipality hopes to promote youth development by backing youth-led projects, increasing their capacity to own a lifetime asset, and unlocking their potential," said Ncebakazi Kolwane, communications manager for the NLM.

How the vision of value-based leadership can empower young women to get out of the unemployment bandwagon

One of South Africa's largest socioeconomic problems is youth unemployment (Shava & Maramura, 2016). In October 2020, Statistics South Africa (Stats SA) reported that young people without work increased from 53.22% in 1999 to 55.75% (Statistics South Africa, 2020). The unemployment rate is high (Cilliers, 2017; Gobodo-Madikizela, 2014). The severity of the unemployment problem in South Africa is debilitating and disempowering. According to Statistics South Africa's (2020) findings, the country's unemployment rate is currently 26.7%, and the Eastern Cape's unemployment rate has risen to 34%. In the Buffalo City Metropolitan Municipality, there were 45 000 job losses from March 2017 to March 2018, and there was a 257 000 to 242 000 decline in the number of working persons, implying that 15,000 people lost their jobs solely between 2017 and 2018. (BCMM). In all these losses, black people, who make up 63,4% of all unemployed people and are disproportionately represented among young people (aged 15 to 34), suffer from the highest unemployment rate (Statistics South Africa, 2018).

One of the main goals of the South African government is to create jobs to battle youth unemployment and all its negative socioeconomic effects. For South Africa, youth unemployment is a major policy concern. Implementing and/or improving projects, programs, and policies that can encourage more people to choose entrepreneurship as a career is essential. Young people's skill development and the establishment of jobs in rural regions are projected ultimately to positively impact the sustainability and development of rural areas (Masha, 2020).

Women's empowerment is widely recognized as a worldwide policy goal and a critical component of global health and poverty-reduction measures. The Secretary-2020 General's Report states that although there have been some achievements in the workplace, gender inequities have come to a standstill. The allocation of unpaid caregiving responsibilities is uneven, and there are significant gender discrepancies in several sectors, including labour market participation, compensation for work of equal value, representation of women in high-paying occupations and managerial positions, and remuneration for work of similar value (International Labour Organisation, 2020).

How the vision of value-based leadership can empower young women to be affirmed as capable people

We believe that addressing the issue of the different discriminatory practices that restrict women from economic empowerment is necessary to empower women. When choosing this issue, consideration was given to the ongoing global struggle to end inequality, discrimination, and prejudice against women. Even though there has been a significant effort made in South Africa to reduce prejudice and progress toward a more egalitarian society (Banks et al., 2012; Steyn et al., 2018), discrimination based on gender is still well-documented (Kanze et al., 2018; Koburtay et al., 2020; Murray & Southey, 2020). In reality, gender inequality is observed in a variety of contexts and for a variety of subgroups within the general population, particularly how it negatively impacts women (Carnahan & Greenwood, 2018; Padavic et al., 2020), which exacerbates economic disparity (Bapuji et al., 2020). This has the consequence of preventing the young women who are the targets of such bias from realizing their full potential, which has repercussions in terms of unrealized potential within society.

Women from racial and ethnic minorities and other groups experience prejudice and numerous challenges and inequalities (WE EMPOWER G7, 2020) that perpetuate preconceptions about women's skills and goals (ILO, 2020) and make it difficult to participate in the mainstream economy. Evidence regarding discriminatory tendencies against women. These range from stereotyping (Warnich et al., 2022), gender-based violence (Smith, 2018), domestic abuse and inequality (Muralidharan & Prakash, 2017), strict societal standards restricting women's freedom of movement are motivated by concerns about the safety of women and girls (Anukriti et al., 2020), barriers to women's mobility limit their ability to network, poor access to healthcare and education (Anukriti et al., 2020), poor representation in politics and government (Miller et al., 2020), poor participation in the labour force (Jayachandran, 2015), poor representation in the political sphere in almost all countries (United

Nations Statistics Division, 2021), women are less likely to pursue employment outside the home due to a lack of time (Revenga & Dooley, 2020), mobility issues (Maitra & Mani, 2017), and patriarchy (Bernhardt et al., 2018; Bursztyn et al., 2020).

According to the United Nations (2018), if rural women and girls of all ages are to be empowered via sustainable development, there must be more than a surface commitment to the Sustainable Development Goals. Instead, a concerted effort spanning all nations and groups is necessary. All phases of policy creation, implementation, monitoring, and accountability must take the intersectional issue of gender equality into account. Women and girls in rural regions make major contributions to carry out and gain from sustainable development. Their empowerment is necessary for the effective implementation of the 2030 Agenda.

Women and girls, who experience several injustices, make up most of those impoverished in rural areas. The continuous and ongoing underinvestment in gender equality has impeded women's empowerment. These mistakes must be avoided. Sustainable development initiatives must address the likelihood of rural women and girls falling behind. Goal 5 and other Sustainable Development Goals must be included in policy development, implementation, and monitoring, as well as the opinions and perspectives of rural women and girls. This plan would promote the involvement of women and girls as leaders and decision-makers.

To ascertain whether rural women and girls benefit from sustainable development initiatives, accurate and trustworthy information using qualitative and quantitative indicators, including data supplied by citizens and the commercial sector, is essential. To measure gender gaps at each stage of life and design development programs to address inequities, it is essential to collect gender- and age-specific statistics and indicators on a national, regional, and international level. Only then will the situation of rural women and girls be fully understood. Data should be broken down depending on age, sex, marital status, region, income, disability, race and ethnicity, and other factors relevant to monitoring disparities, as mentioned in Sustainable Development Goal 17.18 (Including multiple inequalities experienced by women and girls).

While unequal social norms affect women's access to employment opportunities, there is evidence that employment programs can overcome these constraints by designing programs that befit their environment. For example, a study in Nepal found positive impacts of technical, on-the-job, and life skills training intervention on young women's employment and earnings despite it being a setting with more restrictive norms about women working outside the house (Chakravarty et al., 2019). In the South African situation, it is hoped that through value-based leadership, women can set up NGOs and resort to agriculture as an income-generating activity.

If sustainable development principles are effectively applied to empower women and girls, NGOs, including women's groups, must be involved. Through NGOs, women and girls will have a voice as equal participants instead of being co-opted into a development strategy that does not consider their needs.

How the vision of value-based leadership can empower young women to practice agriculture

South Africa suffers from food insecurity, albeit at a lower level. It's through access to agricultural land that women can practice agriculture. The problem of land tenure must be resolved to have access to land. According to a widely accepted definition of food security, this condition is one in which everyone always has access to enough wholesome food to meet their nutritional needs and make the food choices they want to lead active, healthy lives (FAO, 2001). Food insecurity develops when people have only marginally adequate access to food and struggle to meet their fundamental needs, as opposed to severely inadequate access to food, which occurs when there is a significant lack of food.

A study by Kuweyi et al. (2014) in the Kingdom of Eswatini found that families led by women are more likely than households headed by men to face food insecurity. On the other hand, it has been demonstrated that a larger

dietary diversity is highly connected with women's participation in household purchasing decision-making (Idowu & Olusayo, 2019). Women are considered producers, buyers, and processors of household food (Botreau & Cohen, 2020). Since South Africa's democratization in 1994, the government has given the battle against hunger and poverty an increasing priority. Policies and intervention programs have been developed and implemented to achieve this. Food security was particularly mentioned as a critical policy objective in the Reconstruction and Development Programme in 1994. Next, South Africa looked at its government's spending to increase food security for its formerly underprivileged citizens. Small-scale agriculture has also been selected as an instrument for rural area development and raising the living level for at least 370 000 residents there (Masuku et al., 2017).

Participation of women in agriculture

The majority of women rely on smallholder agriculture for their livelihood. Women make up over 50% of the agricultural workforce and have greater employment opportunities there than in other industries (Gollin et al., 2014). In Africa, women make up over 80% of the smallholder farmers. Large, intricate homes are usually run by women, who also engage in various vocations. They labour in agriculture and other rural enterprises, prepare and process food, cultivate crops and raise livestock. Women still do not, however, have access to land or other productive resources or services due to gender inequities (UN, 2012). If women and men had equal access to productive resources, their production may rise by 20-30%. By doing this, 100-150 million people might be kept from going hungry and living in poverty (FAO, 2012a). To overcome the obstacles women experience, it is necessary to ensure gender equality (Garvelink et al., 2012).

Women held 8114 commercial farms in South Africa in 2018, or nearly one out of every five farmers. In contrast, they mostly originated from the Western Cape (1331) and the Free State (1594), where there are more female farmers than in other provinces (SS, 2020a). To increase their food security by growing crops, the South African government has established legislation supporting women's professional development and participation in the mainstream economy. Due to that, more women are participating in government-sponsored agricultural projects in South Africa geared toward smallholder farmers (Nesamvuni et al., 2016). For this to happen, there is a need for women to have access to land.

Land tenure

The land is regarded as a means for providing income and alleviating poverty for the poor. However, gender disadvantages in access to land are not usually addressed adequately at the conceptualization level and even at the implementation level.

Land tenure is primarily concerned with the conditions under which individuals hold and occupy land (Payne & Durand-Lasserve, 2012). Land tenure systems govern access to land (Food and Agriculture Organization (FAO) 2002). The primary purpose of a land tenure arrangement is to reflect and even "formalize" people's relationships with (and behaviour toward) land (Payne et al., 2015). To put it in another manner, tenure arrangements are a group of customs, traditions, and institutions, both known and unknown, that control who has access to and control over land, housing, and natural resources and describe how property rights are dispersed in society. As a result, tenure regimes imply who can use what resources, for how long, and under what conditions (Council, 2017) is determined by the tenure regimes. There are many ways to create the right to tenure, including statutory, customary, religious, and informal laws.

These procedures impact how land and properties are used, transferred, and inherited. Some forms of tenure need to afford land users and holders formal documentation that guarantees their legal status. The assumption is that the formalization of tenure in the form of land titling can play a major role in eradicating poverty (Payne et al. 2015). In Global South, most conversations about women's access to land have focused on rural areas. However, the old liberal market for land management in this urbanizing sector has gradually given way to an almost entirely male-dominated market in the suburbs and pre-urban areas (Twum et al., 2020). As gender and land relations are

complex, policies and programs aimed at promoting women's access and rights to land resources must be examined critically to ensure that they benefit women and challenge existing inequalities patterns (Bob 2008). But more than having land to cultivate for agricultural purposes is required. There is a need for women to be trained in agri-preneur skills to make use of the land effectively.

How the vision of value-based leadership can empower young women to be trained in agri-partnership skills (and eventually sustain themselves)

Young people still do not engage in entrepreneurship, despite efforts by the South African government to address the issue of unemployment through measures supporting youth entrepreneurship (The World Bank, 2020). The National Youth Policy for 2020 states that many young people attempt to launch their own cooperative or enterprise; unfortunately, this is not well documented. The decision to launch firm results from an ongoing process in which attitudes and intentions change based on the growth of one's competence, experiences, and connections to the business environment (Davidsson, 1991). Young people in South Africa have a false impression that entrepreneurship needs to provide a reliable source of income (Dzomonda & Fatoki, 2019). Thus, just 10.9% of South African youngsters have declared an interest in starting their own business.

Increased attention is being paid to empirical issues that are thought to be crucial for economic growth both in South Africa (Govuzela & Mafini, 2019; Chimucheka et al., 2019) and internationally (Khan & Khan, 2019; Meyer & Peng, 2016; Pereira & Malik, 2018). According to research by Nwajiuba et al. (2020), South Africa continues to rank relatively severely in terms of start-ups when compared to other emerging market nations. But as many authors have noted including (Botha, 2019; Bugwandin & Bayat, 2022; Sonandi et al., 2021; Malgas & Zondi, 2021; Mmbengeni et al., 2021; Musara & Nieuwenhuizen, 2021; and Urban, 2016), entrepreneurship is the primary force behind economic growth and the creation of jobs in many countries.

A study conducted in Kosovo by Ramadani et al. (2015) highlighted several obstacles female business owners face in expanding their enterprises, including a lack of managerial skills, insufficient business acumen, constrained financial flow, a lack of technical expertise, and the inability to hire suitable workers. These women also need help to build long-lasting business networks and have limited access to appropriate technologies (Ramadani et al., 2015).

If these women were given access to entrepreneurship education, they might succeed as business owners. Due to socioeconomic issues, including poverty and socioeconomic instability (Conradie & Lamprecht, 2018; Maziriri & Chivandi, 2020), this becomes crucial (Dassah & Ngatse-Ipangui, 2019). This brings up the subject of entrepreneurial training.

Small businesses have been found to have a high failure rate while being recognized as a significant factor in South Africa's economic growth (Neneh & Van Zyl, 2012; Chinomona & Hove, 2015). Even though they have a significant impact on the socioeconomic development of South Africa, the majority of SMMEs fail within the first five years of operation due to the challenges they face (Bruwer, 2016). SMME failure rates in South Africa are still high even though many government programs and organizations have been established to help these businesses (Cant & Wild, 2015). One of the factors contributing to SMME failure is the need for entrepreneurship training. Entrepreneurship Education (EE) is described by Neck and Corbett (2018) as the process of developing the mentality, skill set, and practice required for founding new businesses while realizing the wide-ranging impacts of such education. One of the best methods for encouraging an entrepreneurial attitude is EE (Costa et al., 2018).

In the words of Barba-Sánchez & Atienza-Sahuquillo (2018), entrepreneurship can be learned and consequently taught. Understanding that EE affects how individuals think and feel about themselves is important. As a result, the value of EE in fostering rapid economic growth and a favourable environment has been acknowledged

(Kassean et al., 2015). Numerous nations are coming to understand entrepreneurship as a powerful tool for generating jobs, boosting productivity and competitiveness, enhancing the quality of life, and achieving social objectives (Jena, 2020).

Through EE, entrepreneurial skills are developed, with this scenario developing entrepreneurial skills and knowledge (Jwara & Hoque, 2018), cultivating an entrepreneurial mindset, and influencing the performance of entrepreneurs by increasing their profitability, entrepreneurial spirit, entrepreneurial attitudes, and chances of survival (Ho et al., 2018).

This study adds new knowledge to the literature on how value-based leadership leads to women's economic development by using Nyandeni Local Municipality as a case study. Previous studies on value-based leadership have yet to address the issue of how VBL leads to economic development for women. This study's limitations include that it was more qualitative than quantitative, preventing the generalization of the findings, and it only looked at a small portion of the Eastern Cape Province. In the future, a mixed-method approach can be used to perform a study of this kind to acquire insight and a deeper understanding of the problem. The study can also be carried out over a larger area or multiple municipalities for better results.

Research question

This study's research question is: How does value-based leadership contribute to local economic development for young women?

Research Methodology

A qualitative research approach hinged on an interpretive paradigm was used in this study. The researcher used an interpretive approach because it is more closely related to the qualitative research paradigm and generally excludes statistics and numbers. The interpretive paradigm presupposes an inductive approach to social reality. This study's qualitative research site (Babajide, 2022) was Nyandeni Local Municipality. The researcher pre-recorded a series of open-ended questions that were going to be asked of the participants using a structured interview methodology. 14 ladies were picked at random as part of the sampling. Data were collected on the 1st of September 2022. The sampled women provided useful information about the phenomenon being studied (Quinlan et al., 2019; Bertram & Christensen, 2021; Maxwell, 2021; Leedy & Ormrod, 2021; Rudansky-Kloppers, 2021; Tsang et al., 2019; Johnson & Christensen, 2020); they were also able to provide answers to the research questions (Tiel et al., 2019).

To present this study's results, the researcher first and foremost read the data, followed by coding, categorizing, and interpreting the data. (Teresa & Curtis, 2020). The researcher used the long data excerpt approach as a qualitative data presentation approach, which presents data in large text segments (Reay et al., 2019). This technique makes systematic analysis challenging, yet the facts help identify theoretical concepts. Thus, the lengthy data excerpt approach centres findings on the raw data. Before collecting data, we obtained the participants' informed consent (Hancock et al., 2020; Josephson & Smale, 2020; Trochin, 2020). The researchers gave the participants the freedom to select if they wanted to take part in the study (Okeke et al., 2022) and informed them that they could leave the study at any moment without incurring any fees (Badaru & Adu, 2020; Bouchrika, 2021; Coetzee & Schreuder, 2021). They also promised all participants in the study that their information would be kept private and anonymous (Alrehaili & Mutaha, 2020; Babbie, 2021; Bouchrika, 2021; Elman et al., 2020; Hoft, 2021). Using codes in the study is evidence of the efforts made towards anonymity.

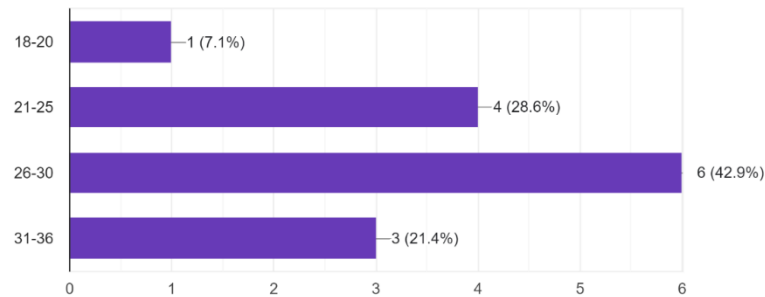
Findings

Discussion of Findings

Section A

Question 1

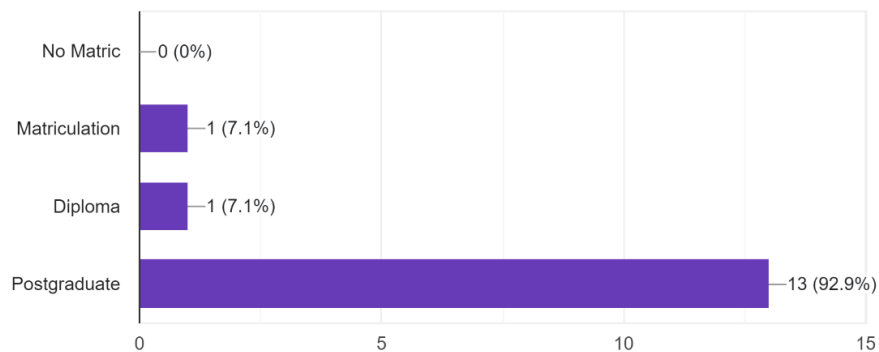
Age group
14 responses



Age-wise, 21.4% were between the ages of 31 and 36, 28.6% were between the ages of 21 and 25, 42.9% were between the ages of 26 and 30, and 1.7% were between the ages of 18 and 20 (Figure 1). According to these numbers, most respondents were young adults, while the minority were younger respondents.

Question 2

Level of education
14 responses



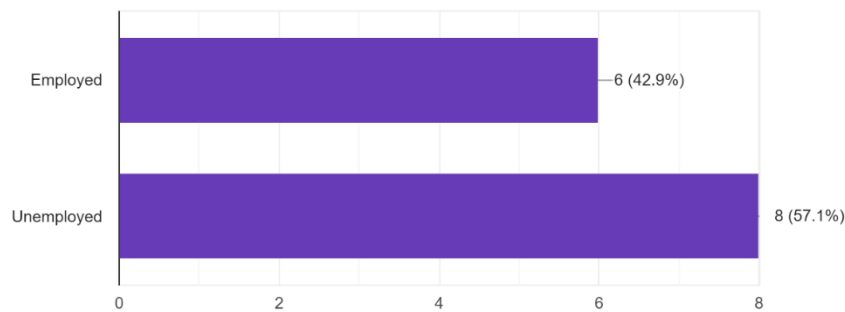
The respondents' levels of education ranged from less than matriculation to a postgraduate degree (Figure 2). 92.9 per cent of respondents held a postgraduate degree, compared to 7.1 per cent for respondents with a diploma, 7.1 per cent for those with matriculation, and none without matriculation. According to this statistic, most women are educated.

The authors Sartika, Franesti, Putri, and Saputra (2022:61) write that "Women are now required to play a variety of significant roles. Because when they enter the stage of adult development, women are also expected to be able

to decide on and take responsibility for the roles they will play. Women must be independent, worldly-minded, and robust in the current era of globalization if they are to achieve recognition and equality in the family and society. So that women can play a stronger role in the family and society, they need to be supported and given economic and educational opportunities.

Question 3

Employment status
14 responses



The sum of 57.1% of respondents indicated that they are unemployed, while 42.9% indicated that they are employed (Figure 3). This shows that:

Even though most young people are educated, as shown in Figure 3, they still find it hard to secure employment.

This is also supported by Dagume, Agyapong, and Gyekye (2016), who states, "Despite the government's attempts to educate young people and connect them with employment, the youth unemployment rate in South Africa has risen substantially".

Section B

Question 1

Other issues experienced by women in the workplace, according to the majority of respondents, include gender and sexual assault.

Most respondents (50 per cent) stated that discrimination is a challenge for women in the workplace. 35.7% said it is subordination, and 14.3% indicated it is underpaid. At the same time, the rest of the respondents stated that it is extortion, exploitation, and other (figure 4).

The participants went on to explain other challenges experienced by women in the workplace; they stated that:

P1: "Women are not regarded as leaders in most cases. Even if they are employed as leaders, they are sometimes disobeyed".

P2: "Some senior staff in the working environment take advantage and exploit young females".

P3: "Women always have to work harder to prove their knowledge and experiences in their respective sections. Many people, even females, when women lead, refuse to take orders from them".

P4: "Women are seen as not fit enough to be managers in an organization".

According to other participants, one of the difficulties women face in the workplace is a lack of equality, gender-based violence, and sexual harassment.

Question 2: What can be done to solve the difficulties faced by women in the workplace?

Aim of the question: To examine what can be done to solve the difficulties faced by women in the workplace.

The responses were as follows:

P1: Women should also be recognized whenever they have achieved something, and men should be educated not to see women as a threat or as people they compete with but as partners.

P2, P8: People should be treated equally in the workplace regarding positions.

P3: They must be given an opportunity, as BBBEE states.

P4, P5: To respect women and strengthen awareness about discrimination, the practice of human rights.

P6: Employers must always conduct employee wellness campaigns and educate employees to respect each other regardless of gender.

P7: Women must be given a chance and benefit from the doubt that they can lead and be successful like males.

P9: To apply the code of conduct to everyone equally.

From the above responses, it is clear that women are not respected in the workplace, and they are not given fair treatment.

According to Bapuji et al. (2020), gender-based discrimination and inequality against young and older women were commonplace before the COVID-19 pandemic.

Question 3: Do women face similar working conditions as their male counterparts?

Aim of the question: To ascertain if women face similar working conditions as their male counterparts.

The responses were as follows:

P1, P9: Not really, men are usually given high positions such as Chief Executive Office positions and other superior positions to women, and men are always treated and seen as superiors.

P2, P8: No, women are treated differently in the working environment; they are seen as if they do not have the power to lead, and women are always looked down on in workplaces; they don't get the same treatment as men.

P3: No, females are seen as sex objects and are underpaid.

P4, P6: No, the priority is given to men; they do not consider us as females when they do the ergonomics for the workplace.

P5: No, in some cases, women are expected to play gender roles which may include making sure that the workplace is clean and tidy even if they are not cleaners.

P7: No, women are often undermined and questioned if they are given a chance to lead. Sometimes I wonder when women are given significant positions to fill in a company, whether they are giving them these positions because they believe in them or want to be praised for progressing.

From the above responses, it is clear that men discriminate against women, and there is Patriarchy involved.

It is challenging for women from ethnic minorities and other groups to participate in the mainstream economy due to discrimination, numerous barriers, and inequalities (WE EMPOWER G7, 2020). These issues also propagate stereotypes about women's abilities and aspirations (ILO, 2020).

Question 4: Are there any programs or strategies that aim to advance women in your community or municipality?

Aim of the question: To ascertain if any programs or strategies seek to advance women in your community of municipality.

The responses were as follows:

P1, P3, P5, P7: No, not sure, not yet revealed.

P2: Yes, there are CPWP and women's development programs are being invested.

P4: Yes, there are programs. However, they are closed only to certain people.

P6: Yes. The Vukani maMpondo Craftwork in Nyandeni location is the program that aims at promoting women. Women craft beaded bracelets, necklaces, shoes, and traditional wear.

From the above responses, it is clear that there are minimal programs or strategies promoting women at Nyandeni Local Municipality.

Chakravarty et al. (2019) state that while unequal social norms affect women's access to employment opportunities, there is evidence that employment programs can overcome these constraints by designing programs that benefit their environment. For example, a study in Nepal found positive impacts of technical, on-the-job, and life skills training intervention on young women's employment and earnings despite it being a setting with more restrictive norms about women working outside the house.

If women and girls are to be empowered through the successful implementation of sustainable development concepts, NGOs, including women's groups, must be involved in the process. Through NGOs, women and girls will be given a voice as equal participants instead of being co-opted into a development plan that does not consider their needs (UN, 2018).

Section C

Question 1: What do you understand about value-based leadership?

Aim of the question: To ascertain your understanding of value-based leadership.

The responses were as follows:

P1, P3: Leadership is based on values, and it is a principle of sustaining values and doing things accordingly.

P2, P6: is the notion that for inspiration and guidance, leaders should look to their values and those of others, particularly those set forth by their organization.

P4: Good leadership skills, integrity, communication, honesty, practising Batho-pele principles in a workplace.

P5, P7: by establishing a set of core principles that all employees at all levels can follow, value-based leadership establishes the direction of the business.

The above responses indicate that participants had a clear understanding of what value-based leadership is.

In the literature, VBL is frequently described as a leadership philosophy that infuses leadership with an ethical and moral framework, impacts the organization, its clients, suppliers, and its shareholders, and does not prioritize personal gain (Sumanasiri, 2020).

Question 2

Aim of the question: To ascertain how value-based leadership can contribute to local economic development.

The responses were as follows:

P1: If leaders possess values when leading, that will result in them treating everyone equally and working hard to create employment for unemployed youth. This kind of leadership ensures that the community is developed by creating opportunities to benefit everyone and promoting Batho Pele principles.

P2: It can contribute to positive outcomes since leaders will do things according to established values and beliefs.

P3, P4: One of the local government objectives is to promote social and economic development in their communities, if the leaders are being taught value-based leadership, they can perform better in their duties, and that can promote local economic development.

From the above responses, participants stated that the vision of value-based leadership would promote social cohesion and create opportunities that will benefit everyone equally, leading to local economic development.

Question 3: How can the vision of value-based leadership can empower young women to:

- (a) Get out of unemployment
- (b) Get affirmed as capable people
- (c) Get trained and involved in entrepreneurship
- (d) Be able to sustain themselves and improve their livelihoods

Aim of the question: To ascertain how the vision of value-based leadership can empower young women to

- (a) Get out of unemployment
- (b) Get affirmed as capable people
- (c) Get trained and involved in entrepreneurship
- (d) Be able to sustain themselves and improve their livelihood.

The responses were as follows:

P1, P3, P5, P6: Young women would benefit if the leaders were accountable. They will get motivated to start their businesses and seek funds from the leaders. To generate opportunities for other individuals to find work, the young ladies must be equipped to launch their enterprises.

P2, P8: The invention of new programs for women can be very helpful. Where women gather in a conference for key ideas to beat unemployment. The community and economy gain when we give women more control over leadership and decision-making. Unemployment would be reduced by implementing agricultural programs where women raise chickens, till the soil, and sell the produce.

P4: It can enable young women to understand that their work or jobs add value to the organization and are crucial to attaining organizational goals.

P7: If people leading us had values, we wouldn't have many unemployed people, especially graduates at home. The vision of value-based leadership would be a good idea because those in power can check what they are doing poorly and how to change it instead of sitting and watching while the country is going down.

Most participants indicated that the value-based leadership vision might empower young women by giving them the tools they need to launch their enterprises, allowing them to create jobs for themselves and others.

According to other emerging market economies, South Africa continues to rank very poorly in start-ups, according to research by Nwajiuba et al. (2020). However, as stated by several authors (Botha, 2021; Bugwandin & Bayat, 2022; Malgas & Zondi, 2021; Mmbengeni, Mavhungu & John, 2021; Musara and Nieuwenhuizen, 2021; Urban, 2021; World Bank, 2021) entrepreneurship is the primary driver of economic growth and the creation of jobs in the majority of nations.

Question 4

Aim of the question: To identify the tactics that can be advised to enhance gender emancipation in local governments.

The responses were as follows:

P1, P4: Local governments should ensure that people are given equal opportunities regardless of gender and that their work is recognized.

P2: Removal of the bad stereotype that women cannot lead. Offer equal opportunities for all.

P3, P7, P8: Empowerment of women in leadership roles and mentorship by giving females a chance to lead and must be respected like males, paying females the same as males, women must not be questioned when given a chance to lead, END PATRIARCHY. Females must support and respect female leaders.

P5, P6: Providing equal job opportunities and career development opportunities can enhance gender emancipation. Implementing a good code of conduct that does not leave room for gender discrimination is critical to promote gender emancipation.

The above responses indicate that women are not treated equally as men, and they are not seen as fit to lead nor given opportunities or empowerment to leadership roles. The respondents suggested that women must be given fair treatment and equal opportunities, stereotypes and patriarchy must be ended, and women must be given access to leadership roles to enhance gender emancipation in local governments.

Occupation-related gender stereotypes lead women to sort into a low-return sector (Bernhardt et al., 2019) by hindering their participation in male-dominated sectors or large-scale entrepreneurship (Marcus & Harper, 2014). Women in leadership positions are negatively impacted by norms surrounding women's standing in comparison to men in public (BenYishay et al., 2020; Jayachandran, 2015).

Question 5: Is there any information that you can add as valuable for this study?

Aim of the question: To ascertain if any information you add is valuable for this study.

The responses were as follows:

P1: Women should always strive for success, work hard to improve their communities, and create opportunities that will benefit people around them and even the next generation.

P2: I can say women must be treated equally with men.

P3: Women are very much fruitful and powerful when they are given an opportunity. Let them rule to change the stubborn situations.

P4: Yes, women need to be equipped for leadership, and they must be encouraged to start their businesses.

P5: Yes, the study will shed light on women who are still disadvantaged and enlighten them.

Most respondents recommend that women must be allowed to lead and be equipped to start their businesses.

In reality, gender inequality is observed across a wide range of contexts and for a wide range of subgroups within the general population, particularly how it negatively impacts women (Carnahan & Greenwood, 2018; Padavic, Ely, & Reid, 2020), which in turn contributes to economic inequality (Bapuji, Patel, Ertug, & Allen, 2020). This has the consequence of preventing the young women who are the targets of such bias from realizing their full potential, which has repercussions in terms of unrealized potential within society.

Recommendations

According to Enslin (2021), there are two distinct types of recommendations: recommendations for further study and for practice. These are explained below.

Recommendation for future studies

This was a qualitative study that focused on Nyandeni Local Municipality. In the future, a study of this nature could be done across multiple municipalities using a mixed methods approach that would result in a deeper understanding of the issue. This study was confined to women; in the future, a comparison could be made between men and women to establish their different roles in LED.

Recommendations for practice

This study recommends women be equally treated as men; there are no sectors where they cannot be placed with the claim that it is men's job, women are as equally strong as men, and there is nothing they cannot handle. This mindset of discrimination and undermining amongst women should end. Women should not only be placed in less physical environments. They must be thought to do the work that men do. Furthermore, this study recommends implementing women empowerment programmes, whereby women will be trained, equipped with skills to start their businesses, motivated, and given financial support. Lastly, this study recommends that women be encouraged to participate in rural development, and the government should strongly emphasize women's empowerment through agriculture. The local economic development in South Africa can be achieved through entrepreneurial development, and this could help the country achieve its goal of increasing job generation and can do so in a way that is both profitable and beneficial. This is highlighted by the Entrepreneurial Development and Job Creation theory, which is the foundation of this study.

Conclusions

This study analyzed how the vision of value-based leadership can contribute to local economic development at Nyandeni local municipality. The study ascertained that young and old women have been victims of discrimination before the COVID-19 pandemic and up to now, as seen in the numerous cases of gender-based discrimination and inequality. Women still struggle to be involved in entrepreneurship because of the lack of skills, support, and programmes or strategies to empower women. Despite being the most educated category, young women still find it hard to secure employment. Women are discriminated from men and are not given fair treatment.

Furthermore, there is a lot of inequality, patriarchy, and women tend to be undermined in the workplace. The study also found that women are not allowed to be involved in leadership positions; they must be seen as fit or capable of holding leadership positions. According to the study's objectives, the vision of value-based leaders may empower young women by giving them the tools they need to launch their enterprises, allowing them to create jobs for themselves and others. The invention of new programs for women can be beneficial, where women gather in a conference for critical ideas to beat unemployment. Society and economy gain when women are empowered to take on leadership and decision-making roles. Introducing agricultural programs where women plough and sell veg or raise chickens would decrease unemployment, enabling women to get out of employment and make opportunities for themselves and their communities, which will contribute to local economic development.

Since most of the participants complained about being discriminated against, not treated equally, not represented in leadership positions, and not given fair treatment as men in the workplace, it is recommended that the government strengthen the equality law and ensure that every department complies with this law. The department needs to maintain a balance between the number of men and women in charge of the highest-paying and lowest-paying positions.

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**CIRCULAR ECONOMY IN EGYPT: AN OVERVIEW OF THE CURRENT LANDSCAPE AND
POTENTIAL FOR GROWTH*****Mohamed Ramadan A. Rezk¹, Tarek Y. S. Kapiel², Leonardo Piccinetti³, Nahed Salem⁴,
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Abstract. This paper provides an overview of the circular economy in Egypt. With the country facing significant environmental challenges, a circular economy approach can offer sustainable solutions to Egypt's environmental challenges by addressing issues like limited resources, waste generation, and a growing population in an eco-friendly and long-term perspective. This research employs a mixed-methods approach, including a literature review, surveys, and consultations with key stakeholders. The analysis reveals that although there are numerous challenges to establishing a circular economy in Egypt, such as limited understanding, insufficient government backing, and inadequate infrastructure, there are also opportunities, such as increasing demand for eco-friendly goods and services, as well as a receptive business environment. The paper recommends various policy and practical interventions to overcome these barriers and capitalize on these opportunities, including increasing awareness and understanding of the circular economy, developing supportive programs and regulations, investing in infrastructure and technology, and fostering stakeholder collaboration. This paper provides valuable insights into the potential for a circular economy in Egypt and the steps that can be taken to create a more sustainable future for the country. As such, it will interest policymakers, researchers, and practitioners working in the sustainability and environmental management field. The successful implementation of a circular economy in Egypt will require collective efforts from stakeholders to promote long-term sustainability and environmental stewardship.

Keywords: Egypt; Circular economy; SWOT; sustainable solutions; food waste; agriculture waste

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JEL Classifications: O1, O32

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1. Introduction

The paper is structured as follows: first, in this paragraph, we will provide an overview of the Circular Economy concept and its relevance to the food and agriculture sector. Second, we will review the literature on circular economy opportunities and barriers, focusing on Egypt. Third, we will present a case study of the agricultural circular economy in Egypt, including the current practices, challenges, and opportunities for circular economy interventions.

Circular Economy (CE) is a framework that seeks to reduce waste and pollution and maximize the value of products and materials by sharing, leasing, reusing, repairing, refurbishing, and recycling them. As a new economic development model, CE promotes maximum reuse/recycling of materials, goods, and components to reduce waste generation to the greatest extent possible (Ghisellini et al., 2018). This concept has recently captured the attention of scholars and practitioners (Kirchherr, 2022; Köhler et al., 2019; Milios, 2021; Hartley et al., 2020; Piccinetti et al., 2023). It is based on three principles: eliminating waste and pollution, circulating products and materials at their highest value, and regenerating nature (Nobre & Tavares, 2021; Kirchherr et al., 2023).

The conservation of natural resources has become a rising global concern in recent years, and the concept of Circular Economy has gained significant prominence due to its comprehensive nature, encompassing a wide range of related concepts (Geisendorf & Pietrulla, 2017). According to research, the CE can generate economic opportunities and help develop jobs. Various studies and reports have highlighted the potential job creation benefits of the Circular Economy.

The Ellen MacArthur Foundation's study on the European Union estimates that by 2030, the adoption of circular economy practices could result in the creation of 700,000 new jobs. These jobs would be in sectors such as recycling, remanufacturing, and refurbishing, which are essential components of any economy adopting circular models (Ellen MacArthur Foundation, 2015). The International Labour Organization (ILO) has also studied a circular economy's potential job creation benefits. The ILO study found that the growth of a circular economy could provide new job opportunities in sectors such as waste management, repair and maintenance, and recycling. This demonstrates the potential for the circular economy to provide both environmental and economic benefits by creating new jobs and opportunities for employment (ILO, 2019). The relevance of the Circular Economy in the East Mediterranean and Middle East (EMME) region has been highlighted by the EMME Climate Change Initiative because of its positive concurrent effects towards climate change mitigation and generation of local wealth (EMME CCI, 2022).

Egypt has a population of over 100 million people and a growing economy (World Bank, 2021). The country's resource consumption and waste generation have been increasing in recent years, putting pressure on the environment and limiting opportunities for sustainable economic development. Implementing circular economy practices could help address these challenges and promote a more sustainable future for Egypt (Milik, 2021). The Cabinet's Information and Decision Support Center (IDSC) recently released an infographic highlighting Egypt's continued inclusion in growth-stage countries in the Circular Gap Report 2021, alongside major emerging markets such as China, Mexico, Indonesia, Vietnam, and Brazil. The annual report covers 176 countries worldwide and is published with the World Economic Forum in Davos. Its purpose is to draw the attention of decision-makers in economically developed nations to the importance of adopting circular economy strategies for a more sustainable future. The growth-stage countries identified in the report are seen as promising economies that can lead the transition to a circular economy and are responsible for increasing resource recycling rates to ensure the success of relevant strategies. The report suggests that Circular Economy can potentially reduce global greenhouse gas emissions by 39 per cent and virgin resource use by 28 per cent through smart strategies and reduced material consumption (IDSC, 2022).

The concept of a circular economy has gained significant traction in recent years as more and more countries seek to address environmental challenges sustainably. In Egypt, a circular economy approach can potentially address waste management, resource efficiency and job creation issues. However, implementing such an approach has its challenges. (Iskandar, 2021; Roberts, 2023). For instance, a group of multinationals backed by Egypt's government have created a plastic recovery scheme which rewards informal collectors through digital credits (Iskandar, 2021). The United Nations Industrial Development Organization (UNIDO) will launch two pilot projects on circular textile production in Egypt (EU Neighbours South, 2022).

Limited research has been conducted on implementing Circular Economy principles in Egypt; however, some studies have examined the potential barriers and opportunities to implementing such practices in the country. According to a search query in the Scopus database, the number of publications on the Circular Economy in Egypt has steadily increased in recent years. As of the knowledge cutoff date of 2022, there were a total of 142 publications on CE in Egypt indexed in Scopus. Out of these, 92 were articles in scholarly journals, 5 were conference papers, and 4 were book chapters. The earliest publication on Circular Economy in Egypt was in 2018, and the number of publications has been growing (Figure 1). The topics covered in these publications range from case studies on CE practices in specific industries to policy recommendations for promoting CE approaches in Egypt. These publications reflect a growing interest in CE principles in Egypt and the need for more research and discussion on implementing these principles in practice.

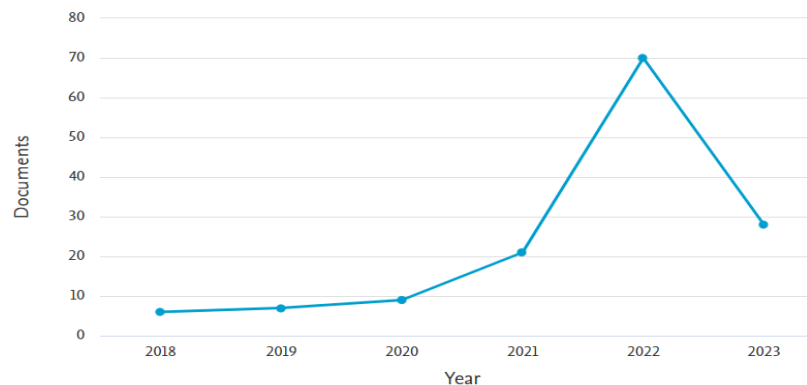


Figure 1. CE publications for Egyptian researchers (source: Scopus 2023).

The issue of waste management is a significant challenge for Egypt, as the country generates an estimated 100 million tons of waste annually, where the main streams of waste in Egypt are: agricultural waste (34%), cleansing of canals and irrigation networks (28%), MSW (23%), construction waste (6%) and industrial waste (5%) (Nassar et al., 2023; Chemonics Egypt and Cleantech Arabia, 2018). The lack of an effective waste management system has led to various environmental and health problems, including pollution of water and soil resources, air pollution, and public health risks. Recently, the Egyptian government has launched several initiatives and programs to improve waste management in the country. For example, in 2018, the government launched a program called "Egypt Without Waste," which aims to reduce the amount of waste sent to landfills and promote recycling and other sustainable waste management practices. The program includes various activities, such as awareness campaigns, infrastructure development, and business incentives to adopt sustainable practices.

Additionally, there have been efforts to develop recycling and waste management infrastructure in Egypt. For example, in 2021, the Egyptian government announced plans to build the largest waste-to-energy plant in the world in the city of Cairo. The plant will process 6,000 tons of waste per day and generate electricity that can be used to power homes and businesses in the city.

Egypt took a significant step towards addressing this issue with the publication of Law No. 202 of 2020, which promulgated a new Waste Management Law (UNEP, 2020). The new Waste Management Law in Egypt promotes Circular Economy principles by regulating waste management practices, including waste collection, transportation, and recycling. The law places a strong emphasis on promoting sustainable waste management practices, such as the reduction of waste at the source, the separation of waste at the point of generation, and the promotion of recycling and recovery of resources. By promoting these sustainable waste management practices, the law will help reduce the amount of waste generated in the country and promote the recovery of valuable resources from waste streams.

The number of waste recycling plants in a given area is closely related to the garbage disposed of daily. In areas with a high volume of garbage, there is often a greater need for recycling plants to manage waste and prevent it from ending up in landfills or polluting the environment. Conversely, areas with lower levels of waste may have fewer or no recycling plants. Table (1) shows the amount of garbage that is disposed of daily and the number of waste recycling factories in Egypt, which amounted to 51 factories in 2020, and the amount of waste that was disposed of in that year reached 32.0 million tons (IDSC, 2022).

Table 1. Number of waste recycling factories in Egypt

Indicator	2016	2017	2018	2019	2020
The number of waste recycling factories	63	49	49	52	51
The amount of garbage that is disposed of yearly (million tons)	15.5	21.1	87.7	36.6	32.5

2. Methodology

The methodology for the paper involves a mixed-methods approach that combines a literature review, case studies of companies that have applied the concept of circular economy in Egypt in the agriculture sector, and a SWOT analysis. The literature review involves gathering information on Circular Economy principles and their implementation in Egypt. The review includes academic articles, reports, and other relevant literature. Success stories of companies implementing circular economy principles in Egypt are also gathered and analyzed. Case studies of companies that have applied the circular economy concept in Egypt in Agriculture are conducted. Those case studies provide real-world examples of the challenges and opportunities of implementing circular economy principles in Egypt. The case studies also highlight the benefits companies can achieve by embracing circular economy principles. A SWOT analysis is conducted to identify the strengths, weaknesses, opportunities, and threats associated with implementing a circular economy in Egypt. The SWOT analysis is based on a literature review and expert discussions and aims to provide a comprehensive understanding of Egypt's current state of the art.

The analysis results are then used to identify the key barriers and opportunities and develop recommendations for policy and practical interventions to overcome these barriers and capitalize on these opportunities. The success stories of companies that have implemented Circular Economy principles in Egypt are used as examples to demonstrate the potential benefits of CE implementation and to provide guidance for policymakers and businesses looking to implement its principles in Egypt.

3. Results

The research will provide an in-depth analysis of the barriers and opportunities for implementing CE in Egypt. The outcomes of this research will help policymakers and stakeholders develop effective policies and strategies to promote a circular economy in Egypt, reduce waste, and promote sustainability. Additionally, the research will provide a foundation for future studies on the Circular Economy in Egypt and other developing countries.

3.1. SWOT analysis of Circular Economy in Egypt

Our SWOT analysis of CE in Egypt indicates numerous critical strengths, weaknesses, opportunities, and threats that impact the current and future perspectives of applying its concept in the country (Table 2).

Table (2) SWOT analysis of circular economy in Egypt

Strengths	Opportunities
- gypt has a rich cultural heritage and a strong tradition of craftsmanship. This strength can be leveraged in the circular economy by promoting local craftsmanship, traditional production methods, and artisanal products. (Moubarak & Qassem, 2018). - gypt has abundant natural resources, such as fertile land, renewable energy, and mineral deposits. - gypt's strategic geographical location, bridging Africa and the Middle East, presents regional collaboration and trade opportunities in the circular economy. - gypt can generate value from agricultural, food, and plastic waste through recycling, composting, and energy generation. (Hassan et al., 2014) - n light of the fluctuation of global prices, supply chain issues, and the failure to import products is one of the points that appear as a strength in the application of enhancing the efficiency of local resources by reducing imports of raw materials, fuel, and manufactured goods, and increasing competitiveness. - he Egyptian government has made a solid commitment to the circular economy, as evidenced by the recent passage of a new law on waste management No. 202 of 2020. - Egypt has a large and growing population, providing a significant market for recycled products. - Egypt has a strong manufacturing sector that could benefit from a reliable supply of recycled materials. - Launch of successful pilot initiatives and programs to develop the waste recycling sector and promote using recycled products. - Egypt has a strong entrepreneurial culture, which can help to drive the development of circular economy businesses	- There is a growing demand for sustainable products and services around the world that will allow Egypt to export circular economy products and services to other countries (Maxwell & van der Vorst, 2003). - The rise of the digital economy can support the circular economy in Egypt by making it easier to connect businesses and consumers, track the flow of materials, and manage waste. - Developing new technologies, such as 3D printing and nanotechnology, can help make the circular economy in Egypt more efficient and effective (Laskurain-Iturbe et al., 2021). - The Egyptian government increasingly supports the circular economy, which could lead to increased investment and policy support. - Public-private partnerships can help to bridge the gap between the public and private sectors and can be a valuable tool for implementing circular economy initiatives (Bogovac et al., 2021). - Egyptian universities' research and development can help develop new technologies and business models that support the circular economy. - Policy reforms of Egyptian waste management laws can create a more favourable environment for the circular economy by providing tax breaks or investment incentives. - Egypt's strategic location could be a gateway for circular economy activities in neighbouring countries, such as Libya and Sudan. - There is significant potential for circular economy activities in agriculture, which is a major contributor to Egypt's economy. - Egypt's textile industry could benefit from circular economy approaches, such as recycling and upcycling, as it is a major source of waste and pollution. - Egypt has significant tourism industry could benefit from circular economy initiatives around waste reduction and resource conservation.

Strengths	Opportunities
(Kirby & Ibrahim, 2010). The rise of the digital economy in Egypt can help to support the circular economy by making it easier to connect businesses and consumers, track the flow of materials, and manage waste (Hong Nham & Ha, 2022).	
Weakness	Threats
- Egypt relies heavily on imported raw materials, challenging resource independence in a circular economy. - The concept of a circular economy is still relatively new in Egypt, and there is a need to raise awareness and educate stakeholders about its benefits and implementation strategies. - The country needs integrated waste management infrastructure to avoid unhealthy waste mismanagement, pollution and poor sanitation. - The population needs to show more awareness of circular economy benefits and how it works. Despite education campaigns, widespread acceptance and participation in the transition may still be limited. - The recycling infrastructure in Egypt needs to be developed, with limited collection and processing facilities. - The informal sector dominates the recycling industry in Egypt, which can result in inefficient and unsafe practices. - Environmental, economic, and social challenges such as air pollution, water scarcity and high unemployment rates hinder progress towards a green economy (Geels, 2013). - Participation of the business sector in adopting sustainable business models helps the development of an effective green supply chain. - A lack of international cooperation on circular economy issues can make it difficult for Egypt to implement circular economy policies and programs.	- The economic challenges could impact the successful implementation of a circular economy (Cantú et al., 2021). - Shifting from a linear to a circular economy requires a significant change in behaviour and mindset among individuals, businesses, and policymakers. Resistance to change and reluctance to adopt new practices may hinder the transition (Upadhayay & Alqassimi, 2018). - Climate change exacerbates sustainability challenges and risks. Impacts are already being felt and will considerably hamper progress if not addressed through solutions that also reduce emissions. - There needs to be more funds and competing priorities to affect the implementation of CE in the country. - Powerful incumbent industries may actively work to obstruct a transition that threatens their linear business models and profits. - The lack of infrastructure and public awareness could hinder the growth of the recycling industry in Egypt. - Competition from other countries or regions with more developed recycling infrastructure could limit the growth of the recycling industry in Egypt. - The implementation of circular economy initiatives may face technical challenges that include developing new technologies, managing complex supply chains, or the integration of circular economy principles into existing business models.

3.2. Case studies of circular economy in Agriculture and Food Production in Egypt

Egypt has been actively exploring ways to implement circular economy practices in agriculture, and there have been some notable success stories in this field. Agricultural wastes in Egypt range from 30-35 million tons a year, of which only 7 million tons as animal feed and 4 million as organic manure are being utilized (Mustafa, 2015). According to CAPMAS, the amount of agricultural waste generated by some governorates reached 3.6 million tons in 2020, distributed over Dakahlia, Kafr ElSheikh, Sharkia, Behera, Damietta, Port Said, Gharbia, Kalyoubia governorates percentages of (41.8%, 14.2%, 11.8%, 10.4%, 10%, 6.5%, 5%, 0.3%) respectively (Figure 2), while the amount of agricultural recycled waste reached 1.5 million tons distributed over Kalyoubia, Kafr El-Sheikh, Gharbia, Behera governorates. (CAPMAS, 2022)

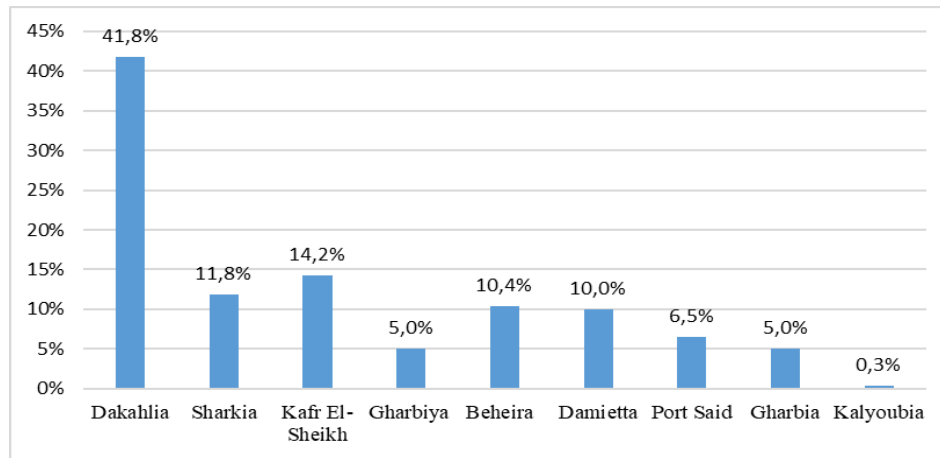


Figure 2. Percentage Distribution of the amount of agricultural waste generated in some governorates of the republic in 2020 (source: CAPMAS, 2022).

Adopting integrated farming systems is one example of successful circular economy practices in agriculture in Egypt. Crop residues, animal manure, and other organic waste materials are used as inputs for crop production in these systems, reducing the need for synthetic fertilizers and pesticides. This approach has improved soil health and fertility, increased crop yields, and reduced farmers' production costs (El-Mashad et al., 2003). Composting is also a widely used circular economy practice in Egyptian agriculture. Organic waste materials, such as crop residues, animal manure, and food waste, can be used by farmers to create high-quality compost that can be used as a soil amendment and fertilizer (Elfeki et al., 2017).

Aquaponics, an integrated system that combines fish farming and hydroponic agriculture, is another successful CE practice in Egyptian agriculture. Aquaponics uses a closed water cycle with low water and energy consumption, which can be provided by using renewable energy sources such as solar energy to produce fish protein and crops (Hanlon et al. 2013; Aguilera-Titus et al. 2014). Aquaponics has proven to be a highly productive and sustainable agricultural method in Egypt, particularly in urban areas with limited space (El-Essawy et al., 2019). These success stories show that adopting circular economy practices in agriculture can result in increased productivity, less waste, and greater resilience in the face of environmental and economic challenges. By implementing these practices, farmers in Egypt can benefit from improved soil health, lower production costs, and additional income streams.

SEKEM is one company in Egypt implementing circular economy principles in agriculture. It is an Egyptian agro-industrial company founded in 1977 to promote sustainable development and social responsibility. The company follows biodynamic farming principles, which emphasize the integration of agriculture, animal husbandry, and sustainability to create a closed-loop system that minimizes waste and maximizes resource use (Shahin & Khater, 2020); SEKEM cultivates its crops using biodynamic farming methods, which include the use of natural fertilizers, cover crops, and crop rotation to improve soil health and fertility. This method completely offsets the need for synthetic fertilizers and pesticides, as well as waste and the environmental impact of farming. SEKEM makes high-quality compost from organic waste materials like crop residues and animal manure, used as a soil amendment and fertilizer. This method reduces waste while improving soil health and fertility, resulting in higher crop yields and lower production costs.

SEKEM is dedicated to encouraging social responsibility and long-term development in Egypt. The company offers education and healthcare services to its employees, their families, and the public. SEKEM has also established several social initiatives, such as a school for special needs children and a vocational training centre

for women. SEKEM's circular economy practices have assisted the company in various ways, including improved soil health and fertility, reduced waste, and increased resource efficiency. Furthermore, SEKEM's commitment to social responsibility has aided in the well-being of its employees and the broader community. Overall, SEKEM's success demonstrates that circular economy principles can be effectively applied in Egyptian agriculture, leading to improved sustainability, resilience, and social capital.

TAGADDOD is another case study of a successful startup with a circular economy business model focusing on repurposing waste resources to create value. The focus of Tagaddod on converting waste cooking oil into biodiesel is an excellent example of a circular economy business strategy. They can develop a clean fuel that can replace standard diesel by collecting waste oil from hotels, restaurants, and now households. This not only helps to minimize waste and pollution but also helps to transition to a more sustainable energy system (Tagaddod, 2023).

Tagaddod is a waste management startup in Egypt that was founded in 2013. The company began as a senior class project in waste management of vegetable oil for Cairo University and has since grown into a successful business that focuses on bio-diesel production from used cooking oil. The startup's success is based on its circular economy business model that focuses on reusing waste resources to create value. Tagaddod's innovative approach to waste management has contributed to reducing waste and pollution in Egypt and allowed the company to expand its operations to other countries, including Lebanon, Jordan, and across the European continent. The company has received recognition for its innovative and sustainable practices, including being named one of the country's most promising startups by Forbes and being recognized by CairoScene's 25 under 25 in 2015 (Tagaddod, 2023).

It's impressive that Tagaddod has expanded its operations beyond Egypt and exported to other countries, demonstrating the potential for circular economy startups to have a global impact. Their recognition by CairoScene and Forbes further demonstrates the importance of their work and the potential for circular economy startups to be recognized for their innovative and sustainable practices (Tagaddod, 2023).

WOTECH aims to produce wood from rice straw. Rice husk is a byproduct of rice milling and is considered an agricultural waste in many countries, including Egypt. However, it can potentially be a valuable resource in a circular economy. In Egypt, rice husk is primarily used as fuel for boilers in the rice mills or sold as animal feed or bedding. However, there are also opportunities to use rice husk in other applications, such as energy production or the production of value-added products; the annual production of Egyptian rice is nearly four million tons, and the best practice of circular economy is to convert rice husk to wood. The Wotech project includes establishing a factory for producing wood "MDF" with a capacity of 205,000 square meters annually in the city of Idku, Egypt, with investments estimated at 217 million euros. It is the first factory for producing wood using rice straw in the Middle East using German technology (Wotec, 2023). The project will achieve double returns as it will reduce environmental pollution rates; in addition to that, it will contribute to meeting the needs of the local market for wood and medium-density boards (MDF).

4. Discussion

The transition to a circular economy in Egypt

Egypt is facing severe environmental challenges like water scarcity, waste mismanagement and depletion of natural resources. The linear take-make-waste economy needs to be more sustainable for Egypt's growing population and development needs. A circular economy is critically needed. Egypt has clear opportunities to adopt CE principles, especially in renewable energy and waste management. Some promising initiatives and projects are already underway. However, a larger-scale systemic transition is required. Egypt has the potential advantage over lower-income countries to accelerate the circular transition. Things like reusing and repairing waste are already part of everyday economic activity. Building on these strengths can boost the circular shift.

Obstacles like consumer mindset, reliance on primary resources and short-term attitudes must be addressed. Widespread adoption of circular principles, values and practices is critical.

Education and awareness raising are important. Where youth entrepreneurship and innovation enthusiasm in Egypt can be tapped into to drive new circular business models and solutions. Creating opportunities and platforms for circular startups is a smart move. International cooperation, knowledge sharing and funding support can greatly help Egypt's circular transition. The EU's Green Deal strategies and SDGs provide useful guidelines. Partnerships with leading circular organizations can help overcome challenges. Make no mistake; the circular transition will be transformative and immensely beneficial for Egypt's economy, environment, jobs, health and prosperity. The opportunities outweigh the obstacles. Nevertheless, a holistic and concerted effort is needed.

The transition to a Circular Economy is a complex process that requires collaboration and partnerships between businesses, policymakers, and other stakeholders. By working together, these groups can share resources, expertise, and best practices and help to create a more cohesive and integrated approach to circular patterns. Also, Support innovation and entrepreneurship in a circular economy, particularly in developing new technologies and business models. Egypt could benefit from targeted support for startups and entrepreneurs focused on circular practices, such as developing new recycling technologies or producing biodegradable materials.

5. Conclusion

Egypt has great potential to leverage its abundant natural resources, strong tradition of craftsmanship, strategic location, and growing entrepreneurial culture to transition towards a circular economy. The recent passage of a new law on waste management by the government demonstrates a solid commitment to this cause. However, challenges such as the lack of integrated waste management infrastructure, underdeveloped recycling infrastructure, and limited awareness of circular economy strategies and benefits still need to be overcome. The participation of the business sector in adopting sustainable business models and international cooperation on circular economy issues will be crucial for Egypt to fully realize the economic, environmental, and social benefits of a circular economy. With concerted efforts and collaborations, Egypt can turn its challenges into opportunities and become a leader in the circular economy in the region.

The SEKEM, Tagaddod, and Wotech case studies demonstrate the potential for circular economy practices to be successfully implemented in agriculture and waste management in Egypt. These examples show that circular economy practices can lead to improved sustainability, reduced waste, and increased resource efficiency while creating social and economic benefits. The success of these companies highlights the importance of innovative and sustainable business models in achieving a circular economy and promoting sustainable development. While challenges remain, such as the need for greater awareness and education, and the development of infrastructure and regulations to support circular economy practices, the examples of SEKEM, Tagaddod, and Wotech offer a glimpse of the possibilities for a more sustainable future in Egypt. With continued efforts and collaborations, Egypt can become a leader in the circular economy in the region, promoting sustainable development and enhancing its economic and social well-being.

6. Recommendations

Based on the information provided in the previous sections, several recommendations can be made to promote the adoption of circular economy practices in Egypt:

- Circular Economy's advantages must be made known to the Egyptian government, enterprises, and the public by running campaigns to raise awareness and educate the public and offering financial incentives to companies that use CE principles.

- Egypt must build the infrastructure required to enable Circular Economy that covers recycling facilities, waste management systems, and renewable energy sources.
- Creating public-private partnerships can be useful for putting circular economy policies into action.
- Research and development projects should be targeted towards creating innovative technology and business models that enable the circular economy.
- The government and the private sector should support circular economy startups, such as funding, training, and mentorship programs, to help them grow and expand their operations.
- The generation of disposable waste can be avoided by low-cost investments such as implementing local circular loops and digital systems to connect the circular stakeholders and improve the logistics.
- Enhancing waste collection and sorting infrastructure, offering financial incentives for recycling, and encouraging businesses and customers to support recycling will expand CE value chains, lessening the quantity of waste Egypt produces and reducing the dependency on imports.
- Egypt might create simpler goods to repair, reuse, and recycle. This might be accomplished by collaborating with companies to create new, more sustainable product designs.

Therefore, there is a need for more research to understand the potential benefits, challenges, and opportunities associated with Circular Economy practices in different sectors and regions of the country. This research can inform policymaking and help identify areas where support is needed to promote adopting CE practices.

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FOOD SECURITY AND NUTRITION GOVERNANCE POST-COVID-19 IN AFRICA

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Abstract. The article examines the food security and nutrition governance of South Africa, Nigeria and Zimbabwe post-COVID-19 in Africa. Drawn from a qualitative approach that utilises a case study design of multiple cases, this study compared the food security and nutrition governance interventions adopted by the three countries post-COVID-19. Using the Post Development Theory of Food Security, the key findings from the study indicate that, among the three countries, food security was threatened by COVID-19 as the supply chain of all the countries was abruptly disrupted owing to partial and total lockdowns. Reconfiguring the food security landscape to achieve nutrition governance requires the three countries to revisit their agricultural policies in the case of Zimbabwe, where farmers need extensive state support to revitalise grain produce. South Africa also recommends supporting agriculture and subsidies to smallholder farmers, which is fundamental for promoting food security and nutrition governance in many poor rural provinces. Nigeria also needs to improve regarding stakeholder support as agriculture was affected by the lockdown, and farmers' productivity declined. Therefore, the assessment of all three cases led researchers to conclude that state and stakeholder investment is fundamental in agriculture mainly, which is the backbone for promoting food security and food nutrition and safety policies are fundamental for ensuring nutrition governance among citizens. The creation of employment and provision of machinery to smallholder farming can mitigate food insecurity at the household level.

Keywords: food security; nutrition governance; post-COVID-19; Africa

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1. Introduction

In South Africa, since the outbreak of COVID-19, many families have struggled to ensure household food security due to either reductions or loss of business viability, among others. The government aid the situation through Social Relief grants, although common criticism point to the weaknesses of this grant as poverty persists. Food insecurity in South Africa because of COVID-19 triggered poverty, which manifests in various forms depending on the context (rural or urban). Katumba, Cheruiyot and Mushongera (2019) affirm that poverty remains a massive impediment in South Africa attributed to weak economic growth, escalating prices of

consumer goods, energy prices, and high unemployment, including policy uncertainty. Although urban sprawl is proliferated everywhere in urban municipalities, various micro-mechanisms were implemented by the government to mitigate poverty, including housing deficiencies.

Due to the declining economy in Zimbabwe, unproductivity in formerly white-owned farms and ailing industry trigger food insecurity challenges. Notwithstanding the effects of climate change, Zimbabwe, a once vibrant agricultural economy, saw citizens battling COVID-19 while guaranteeing household food security. Studies conducted on food nutrition governance have shown that Zimbabwe has been food insecure for the past decade, leading to various interventions from Food Agricultural Organizations (FAO), Red Cross Zimbabwe, and other humanitarian organisations to complement government food security initiatives (Murendo, Manyanga, Mapfungautsi & Dube 2021; Zhou 2020). While contestations arise in relief aid, Zimbabweans are at the most significant risk post-COVID-19. Previous government programmes such as Command Agriculture needed to have revitalised the agricultural economy resulting in dependence on other countries, such as Zambia, for grain. The COVID-19 lockdown measures in Zimbabwe disrupted food supply chains and limited access to food, especially for many urban families that rely on daily purchases of fresh produce (Zhou 2020).

Nigeria, one of the economic powerhouses in Africa, is battling food security following the aftermath of the COVID-19 pandemic. As noted by Obayelu, Bolarinwa and Oyeyinka (2021), Nigeria's agriculture, food security, and nutritional intake were not immune from the COVID-19 outbreak's effects on the disruptions in a wide range of global sectors. On February 27, 2020, the outbreak first hit the nation and had a detrimental impact on the socioeconomic situation and agriculture, food security, and nutritional consumption. The COVID-19 outbreak caused food demand and supply shocks, negatively impacting agricultural, food, and dietary intake. It lowers income and raises food prices. Nigeria's imprecise farming methods meant there needed to be more hired labour for the industry in 2020, resulting in low output and rising food prices. This view concurs with observations from South Africa and Zimbabwe, where food prices increased during COVID-19 due to short supply. Post-COVID-19 in Nigeria requires the government to stimulate agriculture and open markets to smallholder farmers to promote the growth of cheap and quality foods to improve people's nutrition.

This article applies the Post Development Theory to govern food security and nutrition in a few selected nations post-COVID-19. The study responds to the following queries: What has changed in South Africa, Nigeria, and Zimbabwe regarding food security and nutrition governance after COVID-19? Which initiatives have these nations taken to combat food insecurity and solve nutrition governance issues in Africa following COVID-19? And what difficulties do these chosen nations have in maintaining food security and nutrition governance beyond COVID-19?

After the introduction, there is a literature review grounded in theory, followed by a contextual study of food security and nutrition government, encompassing public administration, food security, and nutrition governance in Africa. The plans for achieving food security and nutrition governance post-COVID-19 in Africa and the methods and difficulties involved are covered in the following section. A summary of the study's findings and policy suggestions is provided in the last section.

2. Theoretical Framework: Post-Development Theory of Food Security

The paper draws from the Post Development Theory, which arose after World War II and developed in the 1980s. It embraces new ideologies in the wake of emerging developmental demands in society. It contradicts the Development theory with a bias of Western egocentrism but with merits of improvement and competitiveness. According to Gamble (2021), the ideology promotes modernity comprising the revolution of politics, economy, and arguing that *"If human beings wanted to progress, happiness, and liberty, they had to embrace and fight for the implementation and extension of liberal principles throughout the world"*. The Post Development theory is in

tandem with political and economic ideologies. However, one common way of implementing an economic revolution is through liberalism, which supports a market-based economy. The theory posits improved practices and ideas to change underdeveloped or developing countries' prominence into developed ones (Kippler 2010).

Nevertheless, the development of food security interventions is included in the pursuit, as it measures economic growth (Manap & Ismail 2019). Building on the premise of the Neo-Malthusian theory, food security and sustainable development are intrinsically linked and must be addressed simultaneously. Likewise, the Post-Development theory advocates for delivering developmental interventions vital for minimising development failures in other societal spheres. However, food security is a controversial concept that invokes debates over population growth and environmental pressure on productive resources.

Consequently, population growth in Africa poses a persistent challenge to the development efforts of governments in the region (Kaba 2020; Casterline 2017). Considering the population growth of Africa, projected at 2.5 million in 2050 (The Economist 2022), and the renewed focus on food security and nutritional governance in literature (Ogunniyi, Mavrotas, Olagunju, Fadare & Adedoyin 2020; Zanella 2019), there is an urgent need to strategise the approaches to the subjects in public policy. However, public policy is often saturated with various advocacies and criticism, similar to the arguments for and against the Post-Development Theory. While the development theorist questioned the superiority of developed countries over their undeveloped counterparts, the Post Development school of thought, although tagged as ethnocentric, argues that the theory promotes pluralism, giving room to alternative approaches to development. Nevertheless, apart from political activists, other members of the populace may not be interested in governments' policy formulation processes (Olowu 2019) and talk less about the ripple effects of such actions on the economy. For instance, food security is a global top on the list task for policymakers and governance because it impedes efforts at achieving sustainable development targets (Aliyu, Ozdeser, Çavuşoğlu & Usman 2021). However, in the recent reawakening of food security and nutritional governance, these issues concern all and sundry because of their role in ensuring sustainability.

The importance of the Post Development theory is best appreciated in the continent of Africa, which is regarded as the least-developed continent after Antarctica (World Bank 2022), as a result of corrupt governments (Onger'a 2021; Baez-Camargo, Bukuluki, Sambaiga, Gatwa, Kassa & Stahl 2020); the lack of funds and failed central planning (Girón, Kazemikhasragh & Cicchiello 2022), among other reasons. According to the UN (2021), a growing population and government efforts towards food production explain worldwide food scarcity in the long run. Meanwhile, food insecurity has persisted despite Sub-Saharan Africa's position as a net agricultural exporter (Bjornlund, Bjornlund & van Rooyen 2022). Nutritional governance in Africa must therefore take the form of *Schumpeterian's* 'creative destruction' school of thought, which argues that the dictates of capitalism are not static; rather, it continuously evolves in response to changes in new markets and new products entering the sphere (Adler 2019). Reasoning from the same angle, pursuing nutritional governance must follow suit to engender food security across the continent. Thus, to sustain food security, the government must ensure that their current food consumption is managed so that it does not hamper future demands. The Post Development Theory in this paper allows the three governments to become innovative and adopt alternative development models and ideas to address food insecurity while striving to attain nutrition governance among citizens.

3. Literature Review: Public Administration, Food Security and Nutrition Governance in Africa

Public administration in Africa is vital for implementing government policies that can guide food security and nutrition governance. Various public policies are mediums by which African and other bureaucracies address the requests of their citizens through their specific actions defined by their laws, mandates, or regulations established through political processes (Olowu 2019). For instance, in Nigeria, the Federal Ministry of Health, through the National Agency for Food and Drug Administration and Control (NAFDAC), among many other government regulations on food production, is saddled with the responsibility of nutrition governance. NAFDAC promotes

and protects public health by regulating the importation, manufacture, distribution, advertisement, and sale of processed foods within its purview (NAFDAC u.d). However, some countries tend to depend on specific food supplies. Hence, the vulnerability of such a populace is determined by the production of exporting countries as well as world prices.

As noted in Nigeria, public administration must ensure food security and nutrition in a country. The Constitution of the Republic of South Africa 1996, one of the most liberal in the world, was adopted in South Africa to guide the functioning of public administration as enshrined in Chapter 10. The rights to ensure everyone in South Africa's physical well-being and health, such as the right to food, are among the protections the constitution provides. According to Section 27 of the Constitution, the state must take reasonable legislative and other steps, within the limits of its resources, to achieve the progressive realisation of social security, including, if they are unable to support themselves and their dependents, appropriate social assistance, sufficient food and water, and health care services, including reproductive health care (RSA 1996). Besides the constitution, food security and nutrition are governed by various legislation, such as the Integrated Food Security Strategy (IFSS) 2002. When COVID-19 broke out, various measures were the Unemployment Insurance Fund (UIF), Solidarity Fund, National Disaster Benefit, and the COVID-19 Temporary Relief Scheme (C19 TERS). These measures were meant to temporarily assist in boosting household food security and reduce despair among retrenched and unemployed during COVID-19 9 (Zindi & Shava 2022). Other social protection measures, including social grants, were all governed efforts to ensure that qualifying citizens could have some income to put food on the table while providing nutrition. Although criticism surrounds these government social protection systems, these social and economic measures in the short term helped minimise food insecurity and malnutrition among several households in South Africa. Post-COVID-19 has shown that South Africa needs to do more to ensure its citizens' food security and good nutrition. This is because the social grants, for instance, are inadequate to alleviate household poverty and vulnerability due to more local development programmes that generate the income required to safeguard food security. This observation cuts across the three countries as loopholes were identified in the literature concerning food security policies that govern citizens' nutrition. In South African public administration, rural projects can be strengthened and aligned to the government's National Development Plan Vision 2030, which is also crucial for attaining food security and nutrition in South Africa.

In Zimbabwe, the government, through its public administration, has enacted in the past the Food and Nutrition Security Policy (FNSP) of 2013, which offers a cohesive multisectoral approach to enhancing food and nutrition security. The Zimbabwean government also passed the Zimbabwe Agricultural Investment Plan (2013-2017) to help revive agriculture and sustain production by developing the capacity of institutions and farmers, including promoting public-private sector investment while aligning with existing policies. Further efforts to combat food insecurity resulted in the development of the Zimbabwe National Nutrition Strategy (2014-2018), which guarantees nutrition security by implementing integrated nutrition-based interventions that include health services, water, and sanitation. Although food security and nutrition policies in Zimbabwe exist, the Government of Zimbabwe (2022) perceived some challenges that include: poor institutionalisation of nutrition issues into critical sectors (agriculture, social services, education, gender); fragmentation of government departments and ministries; poorly coordinated donor funding that results in segmentation and fragmentation of programs that minimally responds to community problems and the limited investment in urban nutrition programs, just like the three countries ensuring food security and nutrition governance is still a challenge despite the availability of policies. Arguably the role of public administration in the three countries should improve to ensure that food and nutrition policies respond adequately to citizens' plights. The policies should be aligned with stakeholder intervention to improve food access while ensuring stability post-COVID-19.

4. Food Security and Nutrition Governance Strategies post-COVID-19 in Africa

This section focuses on the state of food security and nutrition governance in South Africa, Nigeria and Zimbabwe, looking at the interventions being made and the gaps emerging.

4.1 South Africa

Black Africans were already experiencing moderate to severe food insecurity before COVID-19 owing to unemployment, limited financial support and relocation, to name a few factors. When COVID-19 first appeared in March 2020, it had a detrimental impact on the circumstances that caused moderate to severe food insecurity among South Africans. On a national level, South Africans suffered food scarcity because of job losses, lockdowns, limited access to food supplies, and rising food costs. All nine provinces were impacted within their respective spheres of influence. At both a local and macro level, this idea works against achieving the country's National Development Plan 2030 and Sustainable Development Goal 2: Zero Hunger.

In 2021, a person was regarded as poor in South Africa if their monthly income was less than 890 South African rands (about 62.8 USD) (Galal 2021:1). Under the worldwide absolute poverty line established by the World Bank, 16.3 million people in South Africa were surviving on less than 1.9 US dollars (Galal 2021:1). More people are hungry now than in the past due to the poverty rate. This was supported by van der Berg, Patel and Bridgman (2022) research to examine changes in hunger and food security between May/June 2020 and April/May 2021. The data shows that the percentage of households with insufficient funds for food decreased from 48% in Wave 1 to 38% in Wave 2. In Wave 3, this metric rose and stayed steady at 40% of homes; in Wave 4, it dropped to 37% of households. 35% of households needed more money to purchase food in Wave 5. Based on the findings of van der Berg et al. (2022), it can be deduced that people would have learned to utilise money in various ways as covid waves persisted and evolved with different strains. Some people used their funds and survived the crisis until their savings ran out. People would have acquired knowledge and accomplished cost-cutting measures to lower expenses. The most likely scenario was when many individuals lost their jobs and struggled to afford food.

Unemployment is the main factor contributing to South Africans' post-COVID-19 pain. For instance, Limpopo (47,8%), the Eastern Cape (47,3%), the Free State (45,3%), and the North-West (43%) had the most significant percentages of households without an employed individual in 2020, according to Statistics SA (2022:1). The current track of poor economic growth and rising unemployment in South Africa, particularly after COVID-19, as documented in several statistics releases, is further confirmed by Statistics SA (2022), which shows that eliminating food insecurity would be difficult given these trends.

Patrick, Khalema, Abiolu, Ijatuyi and Abiolu (2021:4) explain that global food supply networks saw fluctuations because of the high illness rates among employees working in the food sector. This led to the closures of several food processing plants, which reduced the purchasing power of individuals who lost their jobs. Additionally, it greatly impacted nutrition and food security, especially for underprivileged people. Additionally, Patrick et al. (2021:4) further highlight that depending on the scope and duration of the pandemic and the efforts made to contain it, there may be future risks to food security and nutrition, including the possibility of reduced food output and development. This is due to the high degree of unevenness and complexity surrounding the virus and its development. Although efforts to ensure food security and nutrition were made by the South African government through the R6,8 billion to the Department of Social Development (DSD), temporary relief was offered to citizens to curb hunger and food insecurity. More could have been done to ensure the safety nets are sustainable and could assist vulnerable families in returning to their feet post-COVID-19. Ensuring equitable food access and stability may require extra government efforts to help stimulate agriculture, promoting food security and nutrition sustainability in rural and urban spaces.

4.2 Nigeria

Presently, Nigeria is experiencing shortages of food supply and increased food prices. Agriculture was the mainstay of the Nigerian economy dating back from its independence in 1960 until 1970, when the nation experienced tremendous growth from its oil revenue, otherwise known as the *oil boom*. Unfortunately, the boom made the country pay less attention to agriculture than the oil industry. However, having realised that the contributions of the agricultural sector to the entire economy must be considered, especially its role in achieving food security, the government has engaged in a plethora of policies aimed at revamping the sector. The two major interventions, among others, put in place to curb the adverse effect of food insecurity are in the following areas:

- 1) Financing food production – a plethora of policies in the form of schemes, initiatives, programmes, and institutions have been advanced by the government to the agriculture sector. Specifically, the target of these financial interventions has been the following: Sectoral allocation of credits, specialised banks for agriculture and concessionary interest rates. The most recent of such was birthed by the Central Bank of Nigeria in 2015, the Anchor Borrower Programme (ABP). In line with the government's developmental agenda, the ABP targets smallholder farmers to increase their access to quality agricultural inputs and improve the quality of products to meet international standards (The Nation 2021). However, some questions arise, such as what effect do these policies have on the performance of agricultural production? It is also pertinent to ask if the existence of these policies translates that agricultural interventions are adequately funded. It is essential to ask if the financing schemes are appropriate strategies for Nigeria's agricultural financing and food security.
- 2) Food quality assurance –NAFDAC plays the role of nutritional governance on food quality and standardisation. The agency was established to control and regulate food production. The following are a few NAFDAC duties that are directly related to the food:
 - (a) registration of all food products produced locally within the country.
 - (b) standard requirements, rules, and recommendations for the manufacture, transportation, delivery, marketing, and selling of food.
 - (c) ensures that all food imported into the country meets prescribed standards of quality, safety, and efficacy.
 - (d) ensures that all processed food, drugs, etc., manufactured in Nigeria meet international safety, quality, and efficacy standards.
 - (e) it undertakes the control and issues quality certification of food.
 - (f) it issues guidelines on the requirements for approval and monitors food advertisements.
 - (g) NAFDAC maintains laboratories and facilities to execute its functions in many parts of Nigeria.

4.3 Zimbabwe

The underperforming agricultural economy in Zimbabwe is attributed to various reasons, such as the Fast Track Land Reform Programme (FTLRP) of 1998-2000, the decline in domestic currency, inflation, and corruption, among other factors (Mambiravana, Shava & Gunhidzirai. 2022; Mazwi, Chemura, Mudimu & Chambati 2019). These challenges, among others, triggered food insecurity woes experienced in Zimbabwe long before the COVID-19 pandemic outbreak. Policy interventions in the form of the Indigenization and Economic Empowerment Act (Chapter 14:3) in 2009 and the, most importantly, Zimbabwe Agenda for Social-Economic Transformation (ZIMASSET) could not effectively guarantee food security and nutrition, which exacerbated a food crisis as most citizens in rural provinces risk starvation amid recurring droughts and failing agriculture (Gunhidzirai 2022). Another strategic food security strategy introduced in Zimbabwe was the Command Agriculture, a contract farming scheme introduced to support the land reform programme that disrupted Zimbabwe's resilience, triggered food insecurity, distorted credit access, and triggered citizens' vulnerability to droughts (Dube 2020). This is because financial institutions were reluctant to give loans to farmers needing title deeds; hence, the government unwisely decided to fund farmers who left a huge taxpayer debt.

Another weakness of command agriculture as a food security strategy was that it was run by the military, who procured farm inputs, including supervising farmers, despite lacking agricultural skills to drive a vast national programme. Although a sound and economic food security intervention, command agriculture incurs a wasteful expenditure as an estimated US\$3 billion of unbudgeted public funds were spent between 2015 and 2018. Private companies that received funding to procure farming inputs never complied as they admitted before Public Accounts Committee to needing more knowledge and directive to claim repayment of loans from the farmers who benefited from this programme. Although these programmes target poverty alleviation and promote empowerment, their implementation could have been better due to corruption, absence of state capacity, limited stakeholder cooperation, and political interference. For instance, politicians utilised command agriculture and ZIMASSET as tools to champion their political legitimacy and popularity among the citizens. Before COVID-19, Zimbabwe was already experiencing food insecurity, as the previous efforts by the government to rejuvenate the agricultural economy showed signs of failure (Dube 2020). The lockdown measures in Zimbabwe threatened many informal livelihoods. They triggered food shortages, which require a drastic shift in the food policy framework to sustain the economy and ensure nutrition governance in the post-COVID-19 era.

5. Methodology

To understand how South Africa, Nigeria, and Zimbabwe implement Food Security and Nutrition Governance strategies post-COVID-19, the researchers employed a qualitative case study approach that uses multiple cases. A case study method, as affirmed by Creswell (2013), “explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information... and reports a case description and case themes”. This design was useful in comparing the food security and nutrition governance interventions adopted by the three countries to become food secure in the post-COVID-19 period. In this case, official government documents that informed food security and nutrition in the three countries were adopted as they contained statistical and verified information on the nature of food security, including the measures adopted to mitigate food insecurity and ensure nutrition governance in the three countries. To validate the qualitative discussions, peer-reviewed journal articles that inform food security and nutrition governance were drawn from various databases such as Scopus, Science Direct, Google Scholar and Web of Science. The selection of these databases was based on the various scientific studies done in the three countries on food security and nutrition; hence the information was fundamental for corroborating qualitative data from official documents. Content analysis was used to analyse the data acquired from documents and ensure it was relevant to this study.

6. Challenges of Attaining Food Security and Nutrition Governance post-COVID-19 in Africa

This section discusses findings using a document review analysis of the three cases.

6.1 South Africa

Several challenges caused the lack of food, food insecurity, and hunger post-covid. Bridgman noted in a piece that appeared in *The Conversation* on July 21, 2021, that at the end of April 2021, all sorts of emergency aid were ended. Social grant increases in April 2021 that lagged inflation also reduced the value of these grants. This was also accompanied by a decline in food assistance supplied to low-income households by the government, NGOs, and community support organisations. The National School Nutrition Program has not existed in many regions. The safety net was therefore compromised. While unemployment was soaring, millions of individuals were left in a desperate situation. Despite the Social Relief of Distress grant's modest financial worth (R350, or around US\$24 per month), it provided temporary access to over 6 million jobless individuals who were otherwise ineligible for unemployment benefits and the Temporary Employer-Employee Relief Scheme. At the end of April 2021, these advantages ceased to exist, as highlighted by Bridgman (2022). The government has also introduced the special

COVID-19 Social Relief of Distress grant to the unemployed. Despite these measures, challenges were encountered as some could not sustain the impact, and some were terminated due to financial implications.

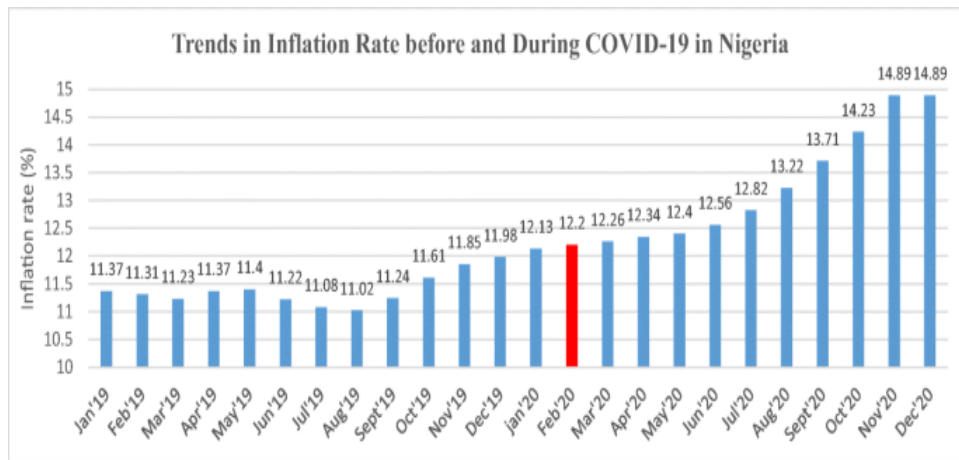
In addition, as highlighted by Chakona and Shackleton (2019; cited in Mlambo & Khuzwayo 2021:9-10), there are five main issues with Food Security and Nutrition in South Africa. First, there must be more safety nets; few wage workers and many dependents characterise impoverished households. Second, more support mechanisms and adequate disaster management systems must be required. South Africa has no formal framework for food security emergencies like droughts or floods. Thirdly, there need to be more predictable food supplies at the home or intra-household levels, leading to inadequate and unstable household food production, hunger, and malnutrition in South Africa. Lack of purchasing power is the fourth issue; in South Africa, most households need more capital to purchase food supplies. Finally, there is the issue of low nutritional status, where one in four children under six (or around 1.5 million children) are stunted because of chronic malnutrition. These issues have a larger impact on South Africa's capacity to guarantee food security for its expanding population under a post-covid situation.

It must be considered that regulations imposed during COVID-19 and inadequate infrastructure also caused challenges to accessing food. This situation is explained by Anelich (2020), who observed that informal traders were prohibited from conducting business during the first few days of the first lockdown since the government did not provide sufficient assistance and understanding. This influences the disadvantaged population's access to and cost of food. Numerous agricultural product providers suffered because of the roughly 40% of food commerce informal dealers carry out. Anelich (2020:12) further emphasised that the government issued restrictions without fully comprehending their implications and effects on the food supply chain.

6.2 Nigeria

The COVID-19 pandemic had its toll on virtually every sector of the economy. Indeed, its aftermath reshaped global societies and economies (Kalantaryan & McMahon 2020). After the pandemic outbreak in February 2020, the Nigerian agriculture sector, food security, and dietary intake were not exempted from the quack mire. The spread of COVID-19 recorded an unprecedented anomaly of our times to such an extent that economies cannot respond to it quickly and appropriately (Vyas-Doorgapersad & Olowu 2022). Regarding food security and nutritional governance, an analysis conducted primarily by the United Nations Food and Agriculture Organization (FAO) and the World Food Programme found that Nigeria, among other countries, remains at the 'highest alert' as a country with catastrophic conditions (Oluwole 2022). The COVID-19 pandemic made matters worse for food security and nutritional governance. The situation remains worrisome, as over 1.7 million children under five years of age are expected to suffer from acute malnutrition through August 2022 – a 34 per cent increase compared to the same period in 2021 (Oluwole 2022). The post-COVID-19 challenges to food security and nutritional governance in Nigeria are:

- a) *Conflicts* - reflecting on the high numbers of food insecurity, the report noted that the situation remains highly concerning in the conflict caused by the *Boko haram* insurgency affected areas of northern Nigeria, where insecurity and access to farmland challenges are likely to persist, as stressed by Oluwole (2022). Nigeria's ongoing battle with insurgent groups threatens farmers and farmland.
- b) *Unfavorable foreign exchange rates* -the agriculture sector heavily relies on importing fertilisers, chemicals and other agricultural equipment. However, the fluctuating rates of the naira against the dollar made the value of the local currency low when compared with the US dollar. Most stakeholders were unable to afford importation expenses. Also, due to the central bank's policy on forex regulation, there needed to be more bureaucracy before the commercial banks could disburse the dollars to people who needed it for business purposes.
- c) *Inflation* - A report by Obayelu et al. (2021) opined that high prices of fuel and inputs harmed the agricultural sector. For instance, farmers needed more money to afford the cost of finance needed for their activities. The prices of raw materials also frustrated the supply of farming inputs (see Table 1).

Table 1. Trends in Inflation Rate before and During COVID-19 in Nigeria

Source: Obayelu et al. (2021)

The increasing costs of imported foods, the persistent weakness of the naira, the high inflation rate, and the fiscal deficit recorded in 2022 will most likely contribute to unfavourable food prices in the future.

d) Political Sabotage of nutritional governance – amid the security challenges and the incapacitation of law enforcement agents to midwife government policies, the food distributional channels are unsafe and susceptible to attacks that are food security counterproductive. However, in its wisdom, the government initiated palliative measures comprised of foodstuffs for the rank and file of society who could not work and get an income during the *COVID-19* lockdown. Unfortunately, it was reported that some miscreants truncated the government's efforts to distribute food during the lockdown period, thereby frustrating nutritional governance at a time of urgent need for such intervention.

6.3 Zimbabwe

The analysis of extant literature has revealed that post-*COVID-19*, Zimbabwe will still be food insecure in Africa due to the declining agricultural sector associated with failing industries and markets, low economic growth, unemployment, minimal stakeholder support institutions that support food nutrition in schools in Zimbabwe bear the brunt of *COVID-19* pandemic severely outbreak which hurts nutrition of learners. This is confirmed by Murendo, Manyanga, Mapfungautsi and Dube (2021), who reiterate that many children in Zimbabwe rely on school nutrition programs. As a country experiencing low economic growth, Zimbabwe finances its food security programs through diaspora remittances. Due to the *COVID-19* outbreak, some families could not become food secure as their breadwinners have been either retrenched or stopped operating their businesses, especially in South Africa, where most diaspora remittances emanate (Murendo et al. 2021). The loss in income created a food ensure situation which later impacted on nutrition governance of many families in Zimbabwe.

Unemployment, poverty, and inequalities are major threats to ensuring food security and nutrition governance in Zimbabwe. Long before *COVID-19*, the Zimbabwean agricultural sector was struggling, and so were the livelihoods of rural and urban citizens. The subsequent lockdown measure by the government worsened the situation; people could no longer trade in local markets; hence informal livelihoods were adversely affected (Gunhidzirai 2022). Resuscitating informal livelihoods and agriculture is a prerequisite for the government to avert food insecurity and increase access to food (Hamblock, Homann Kee Tui & Ojiewo 2020). However, the ravaging hyperinflation constrains such efforts. Unlike the two countries, South Africa and Nigeria, which experienced minimal inflation, the World Bank (2022) study revealed that the situation in Zimbabwe had exposed most citizens to extreme poverty, which impacts food security and nutrition.

Table 2. Food Price Inflation: Top 10 list

Country	Nominal food inflation (%YoY)	Country	Real Food Inflation (%YoY)
Zimbabwe	353	Lebanon	72
Lebanon	240	Zimbabwe	68
Venezuela	131	Sri Lanka	30
Sri Lanka	91	Iran	29
Türkiye	90	Hungary	18
Iran	81	Colombia	14
Argentina	66	Djibouti	14
Moldova	38	Rwanda	14
Ethiopia	36	Burkina Faso	13
Rwanda	34	Costa Rica	10

Source: International Monetary Fund, Haver Analytics, and Trading Economics 2022.

Note: Food inflation for each country is based on the latest month from May to August 2022, for which the food component of the Consumer Price Index (CPI) and overall CPI data are available. Real food inflation is defined as food inflation minus overall inflation (International Monetary Fund, Haver Analytics, and Trading Economics 2022).

From Table 2 above, ensuring food security and nutrition is presently a challenge in Zimbabwe as food prices have skyrocketed to the detriment of many poor citizens. The table shows that Zimbabwe is leading the ten countries adversely affected by food inflation with a staggering 353% (World Bank 2022). These statistics show the extent of food insecurity and vulnerability as many poor urban and rural citizens can afford to purchase basic food, which may lead to malnutrition due to hunger and starvation. Compared to South Africa and Nigeria, a gap is evident in promoting food security measures in Zimbabwe, which leaves the government with the complex task of addressing food prices which is fundamental for attaining nutrition governance.

Preparedness to rejuvenate the agriculture sector is a challenge affecting the Zimbabwean government post-COVID-19. While the latest report from World Bank (2022) shows that in Africa, Zimbabwe remains one of the most food insecure countries, the government has done little to try and address the food insecurity situation, which has already impacted the nutrition status of many struggling citizens. As argued by Murendo et al. (2021), the failure of the government to adequately consult stakeholders to deal with the hunger situation in many Zimbabwean provinces shows the state of unpreparedness on the government's part to address food insecurity in the country post-COVID-19. This gap points to the need for the NGO sector to increase its role in complementing government weaknesses in bolstering food security resiliency and nutrition governance. For this to occur, revision of other inhibiting policies, such as the NGO Bill of 2004, is essential to allow the implementation of private sector projects in an autonomous environment, although aligning with the country's national policies on food security aid.

Minimal stakeholder support in Zimbabwe's food security programmes is constrained by the government's attitude and policy actions towards private sector organisations. As argued by Shava (2021), the existing legislation, such as the Public Order Security Act (POSA), including the NGO bill of 2004, discourages NGOs from increasing their role in complementing government food security and nutrition governance programs. The idea of signing Memorandums of Understanding (MoUs) and state interference in donor aid has resulted in ideological and methodological conflicts in delivering food programmes. Because stakeholders stick to their principles and beliefs for humanitarian assistance in Zimbabwe, the state is well known for dictating and attempting to redirect NGO aid which leads to either termination of food security programmes by NGOs or minimal funding from the donor community for such programmes such as fears of corruption, human rights abuses may evolve amid state

interference. Further analysis of the literature has shown that the Zimbabwean government needs an enabling regulatory environment that allows stakeholders to invest in food security programs while ensuring that nutrition governance is achieved primarily in school nutrition programs, where learners risk malnutrition, among other diseases.

Conclusion

The study employed the Post Development Theory to examine how the three countries (South Africa, Nigeria, and Zimbabwe) could ensure food security and nutrition governance post-COVID-19 in Africa. The analysis of the document has shown a cross-cutting impediment that may affect all three countries in terms of food security. Minimal investment in rural livelihoods has been noted as a challenge that affects agricultural productivity while triggering nutrition deficiencies, especially among poor households. Secondly, the public policies regarding food security and nutrition in all three countries have shown many loopholes as they fail to cushion the citizens during the COVID-19 era; hence, to guarantee food security enabling food policies are required to ensure investment is increased in agriculture, where most rural citizens seek economic refuge in. The participation of stakeholders is one of the missing links in food security intervention in South Africa, Zimbabwe, and Nigeria, as farmers, for instance, have a limited say on how they should be assisted with agricultural inputs and farm machinery. Only in cases where commercial farming is concerned agriculture thrives compared to smallholder farming. To survive post-COVID-19, including key stakeholders is critical in food security programmes that ensure that citizens consume nutritious food regulated in line with food safety standards.

Inflation has been depicted as a challenge that may prevent one of the African countries from attaining food security and nutrition governance post-COVID-19 in Africa. Zimbabwe is experiencing the highest inflation in Africa, which threatens food security. For instance, agriculture is becoming less profitable due to poor local market pricing and the unavailability of agricultural equipment and inputs to stimulate commercial and smallholder farming. Many citizens are adversely affected by the rising prices; hence, the government alone cannot combat the looming hunger in many provinces; hence, a widening gap may require stakeholders' intervention. South African economy has been staggering, with the prices of goods going up following what many attributed to the war in Ukraine, which triggered a rise in oil prices. Nigeria also suffers from political corruption, which sabotages relief food security packs during COVID-19. As noted in the review, politicians seize the opportunity to seek public sympathy while trying to achieve self-aggrandisement. This view is also shared in South Africa, where many cases of corruption on COVID-19 relief packages were recorded, threatening food security among vulnerable households. There need to be more support mechanisms identified in the three countries. For example, providing safety nets in South Africa is affected by limited support. Local authorities often need more funds to support disadvantaged households, threatening the attainment of nutrition governance. In Zimbabwe, support mechanisms must be improved as the state relies more on importing grain than promoting local agricultural production to feed its population. The role of NGOs is under threat owing to political interference; hence this disrupts food security and nutrition aid. In Nigeria, support mechanisms are lacking, and the insurgency emanating from Boko Haram in North Nigeria triggers limited stakeholder investment in farmlands. In this case, ensuring food security and nutrition governance in conflicted zones is complex. Deducing insights from the Post Development Theory, the three countries can create an enabling environment that supports alternative approaches to development, as attaining food security in line with SDG 2 (Zero hunger) require a network of actors that can pool their human and financial resources together to finance and support food security and nutrition programmes that culminate into successful nutrition governance.

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HIRED GUNS AGAINST TERRORISM: ASSESSING THE USE OF COMMERCIAL SOLDIERS IN NIGERIA'S COUNTERTERRORISM STRATEGY

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Abstract. Despite Nigerian military efforts, Boko Haram remains a major threat and the potential role of private security services in combating this threat is largely unknown. Through a qualitative case study, this study fills a critical gap by examining the potential role and impact of private security services and highlighting their effectiveness, commitment to long-term sustainability, and respect for human rights in the fight against Boko Haram. Applied to a broader context, the findings hold significant potential for developing more effective strategies in response to security threats, not only in Nigeria but also in other countries facing similar security challenges.

Keywords: private security services; terrorism; Boko Haram; Nigeria

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1. Introduction

The stillborn August 2000 defense agreement between the Nigerian government of President Olusegun Obasanjo and the Clinton administration of the United States on military aid is the first attempt to obtain foreign military aid since the establishment of the Fourth Republic in 1999. Despite debates over the nature and legitimacy of this agreement, it initiated the development of a US-sponsored program aimed at reforming the Nigerian military, increasing its effectiveness, and bringing it into line with democratic norms (Omoruyi, 2000; Akpuru-Aja, 2003; Kwaja, 2014). Although, according to Fayemi (2003) and Aning et.al (2008), critics raised concerns about potential encroachment on national sovereignty and military independence, this was the first integration of private security services into Nigeria's national security structure—a practice that would be repeated in the future.

The use of private security services in counterterrorism and counterinsurgency operations, while often criticized by local communities and occasionally viewed with disdain, has gained prominence due to a number of political and ethical considerations. Considerations for these companies, which provide security-related services such as military and security training, logistical support, and security personnel to states, individuals, and international

organizations, include their relative affordability compared to maintaining national armies, their technical and professional expertise and aversion to casualties that reduce public support for participation in military operations, and the need to be able to plausibly deny involvement in operations (Bamigboye, 2022). However, while their use in civil wars such as Sierra Leone and Angola in the 1990s and later in conflict zones such as Iraq, Afghanistan, Rwanda, and Sudan has been critically examined, discussions often revolve around their potential impact on modern statehood, the need for accountability and the risks of human rights abuses that require effective regulation (Singer, 2004; Tonkin, 2011). While these are important scholarly contributions that have shaped the literature on this subject, this article contributes to the existing literature on private security by shifting the focus from normative debates to an empirical examination of the potential of these private security firms in the rapidly evolving post-Cold War security landscape of our world by examining the effectiveness of the use of private security forces in the fight against Boko Haram in Nigeria. This is because the threat of Boko Haram persists despite the efforts of the Nigerian military and other security agencies, underscoring the need for alternative strategies and providing an opportunity to examine the potential of these companies for national security and stability (AFP, 2023). Given the need for more empirical data on the effectiveness of private security services in such contexts, this article adds to the burgeoning literature on private security services and aims to provide an insightful, results-based assessment of this approach in the context of its use in Nigeria.

Similar to other African countries such as Somalia, Kenya, Chad, and Cameroon, which have faced numerous terrorist attacks in recent years, Nigeria faces major security challenges, particularly from the insurgent organization Jamā'at Ahl as-Sunnah lid-Da'wah wa'l-Jihād, which means "Group of People of the Sunnah for Dawah and Jihad" in Arabic and is commonly referred to as Boko Haram (Kulungu, 2021; Okoli, 2022). In 2015, the government acknowledged the need for private military forces to participate in its security framework by hiring the Specialized Task, Training, Equipment, and Protection (STTEP) to intensify its counterterrorism efforts. Although the government initially denied the presence of private force within its borders because of their popular depiction as ruthless mercenaries until Leon Lotz, a South African private military personnel, was reportedly killed fighting Boko Haram on March 9, 2015, it confirmed that it had contracted the private security firm Specialized Task, Training, Equipment and Protection (STTEP) to intensify counterterrorism operations, demonstrating its reliance on foreign private security services in the fight against terror in Nigeria (Cropley, & Lewis, 2015; Ahmed-Yusuf, 2015; Allison, 2015; Nielsen, 2016).

This article makes two main arguments. First, it argues that private security firms, especially those that are well versed in the African context, can make an important contribution to addressing security challenges, which include the threat posed by Boko Haram in Nigeria, by increasing overall stability in northeastern Nigeria and other regions affected by the group. Second, the article argues for a collaborative approach between private security companies and other security actors, such as government agencies and local law enforcement to align security and development goals, which could lead to a more holistic and sustainable approach to security. The article first discusses the challenges posed by Boko Haram and the failures of the Nigerian military, then examines the role of private security services. It then examines the effectiveness of these services in the Nigerian context, and finally paves the way for a detailed discussion and conclusion.

2. Methodology

This article uses an outcome-based approach, similar to other studies that have attempted to assess the effectiveness of security interventions in different contexts to assess the effectiveness of private security companies, specifically Specialized Tasks, Training, Equipment, and Protection (STTEP) (Schroeder, Chappuis, & Kocak, 2013; Bell et al, 2013; Kinsey & Krieg, 2021, Shigenoi & Maekawa, 2022; Bjarnesen, 2023). STTEP is an international private military and security company with relevant experience in Africa that was selected for its significant engagement against Boko Haram in Nigeria between January and March 2015 (STTEP, 2009). Using

qualitative case study research, this study provides an in-depth analysis and exploration of participants' perspectives, attitudes, and experiences (Trochim & Donnelly, 2007). The choice of this methodology is primarily because it allows for open-ended questions and asks for more detailed responses and unexpected insights that emerge during data collection, which the author quantifies with statistical and numerical information on the frequency, patterns, and trends of terrorist attacks in Nigeria using datasets from the Global Terrorism Database. The Global Terrorism Database (GTD) is a data collection that provides comprehensive information on terrorist attacks at home and abroad and the organizations and individuals responsible for these atrocities. The National Consortium for the Study of Terrorism and Responses to Terrorism (START) at the University of Maryland records all incidents that have occurred from 1970 to the present and includes them in this database. It is common practice for researchers, policymakers, and counterterrorism practitioners to refer to GTD to gain a better understanding of the global nature, patterns, and trends of terrorism. In this way, thematic analysis provides an understanding of the experiences and viewpoints of stakeholders, while the Global Terrorism Database (GTD) can numerically assess the impact and consequences of the use of private security firms, providing an objective perspective on the issue by allowing the effectiveness of STTEP operations in Nigeria to be measured to support an outcome-based approach.

Additionally and for critical analysis, the author uses process tracing, a research method that shifts the analytical focus from causes and outcomes to the hypothesized causal mechanisms in between (Beach & Pedersen, 2019). In essence, the mechanisms are not causes, but causal processes that are triggered by causes and link them to outcomes in a productive relationship. In this way, this study examines the sequence of events or the course of decision-making, transforming initial situations into case outcomes. Specifically, the research outlines the strategies and tactics used by STTEP in the fight against Boko Haram in Nigeria from January to March 2015. The goal is to show the causal relationship between the independent variable (STTEP deployment) and the resulting dependent variable (success or failure in combating Boko Haram) via intervening factors such as cooperation between the private security contractor and the state military, psychological warfare, guerrilla tactics, relentless pursuit, and improved technologies used in the operation. In essence, the dependent variable-the success or failure in fighting Boko Haram-can change, underscoring the need to understand how the independent variable can influence it through the intervening factors.

Following the principles of counterinsurgency theory (COIN) which recognizes four fundamental principles of counterinsurgency, namely that the primary objective of counterinsurgency is to secure popular support, that the actor fighting the insurgency must define a precise political objective, that the actor must also fully understand the terrain, and that a significant commitment of labor, resources, and manpower is essential to a successful counterinsurgency, (Galula 1964), three outcome indicators-inclusiveness, sustainability, and effectiveness-are identified. In particular, inclusiveness is understood as the ability of the collaborative security web to include state institutions and private security actors without undermining the legitimacy of the state as a provider of public security. Sustainability is assessed in terms of the longevity of security outcomes from short- to long-term. That is the ability of the counterinsurgency effort to bring violence to the level manageable by local security forces, the establishment of political, economic, and social institutions able to address many of the structural problems fomenting instability, and the ability to eliminate the hatred, mistrust, and prejudices that fueled the conflict (Moore, 2007; Shemella, 2011) Finally, the effectiveness of the approach is assessed based on the recapture of territory, the frequency of Boko Haram attacks, the capture of Boko Haram members, civilian casualties, changes in Boko Haram tactics, and whether STTEP operations were in compliance with international humanitarian law.

3. The Boko Haram Insurgency

The transition of Nigeria, a federal state of about 223 million people in West Africa, from military rule to democracy after about four decades since its independence in 1960 has been overshadowed by an escalating internal security crisis that has caused great concern among the Nigerian government, citizens, and the global

community (Onuoha, 2010; Isma'ila & Madu, 2016; World Population Review, 2023). In just a decade criminal violence including kidnappings, militancy, religious conflict, and armed robbery has increased at an alarming rate. The most disturbing aspect is the sharp increase in religiously motivated violence, which threatens public order and the security of the people of Nigeria. This disturbing escalation of religious extremism, highlighted by events such as the Sharia conflict in several northern states in 2000 and the Miss World riots in 2002, poses a serious threat to Nigeria's statehood. Even more troubling, religious conflict claimed more than 10,000 lives in Nigeria between 1999 and 2003, and violent incidents have continued thereafter (Isaacs, 2003). The emergence of the Boko Haram insurgency has further exacerbated the situation and contributed to the growing number of casualties, displacements, and orphanages caused by religious unrest in Nigeria.

Boko Haram whose name is derived from Hausa and translates as "Western education is forbidden," is an Islamic extremist movement founded as a Salafist movement in 2002 by Mohamed Yusuf and active in northeastern Nigeria, Chad, Niger, and northern Cameroon. Its aim is to oppose Western education and ideals and promote the formation of an Islamic state in Nigeria. It first gained widespread attention in 2009 when it carried out a series of attacks against government and civilian targets in the northeast of the country and has since then committed various acts of violence throughout its history, including bombings, targeted killings, kidnappings, and attacks on educational institutions, places of worship, and commercial centers which makes it responsible for the deaths of numerous people, including civilians, military personnel, and politicians (Amaechi, 2016; Onuoha & George, 2016). Violent incidents such as the bombing of the police headquarters in Abuja on June 16, 2011, which killed two people and injured many, and the bombing of the headquarters of UN in Abuja in 2011, which killed 23 people and injured over 100, serve as examples of such hostile acts (Pantucci & Jespersen, 2015; Markovic, 2019).

It can be observed that Boko Haram's goals and strategies have changed over the course of its existence. Initially, the organization focused on confronting the Nigerian government and advocated for an Islamic state within the country's borders. After pledging allegiance to the Islamic State (ISIS) in 2014, it adopted more extreme and aggressive strategies, including the use of suicide bombers and attacks on civilians, and appeared even more lethal than ISIS (Hentz, 2018). For example, the group carried out 493 attacks in 2014, killing 7,112 people, including both victims and perpetrators (with victims accounting for 97 percent of the dead). On average, there were about 15 fatalities in each incident. Contrastingly, the Islamic State of Iraq and Syria (ISIS) carried out 1,241 attacks in the same year, killing 9,324 people. Consequently, ISIS was responsible for an estimated seven fatalities per attack in 2014, which is significantly less than half the average fatalities caused by Boko Haram per attack (Oriola, 2016).

The attacks carried out by Boko Haram in Nigeria have had a significant economic impact due to the group targeting its attacks on commercial enterprises, and essential public facilities, causing disruptions to economic operations and impeding progress. For instance, estimates indicate that Nigeria's macroeconomic condition has been significantly affected by the loss of foreign direct investment (FDI) and potential FDI inflows amounting to 1.33 trillion naira, affecting mainly the northeast region (Ikpe, 2017). This damage manifests itself in the form of infrastructural decay, disruption of local and intra-African trade, and mortality and displacement, each of which has profound implications for labor markets, tourism, and transportation. These challenges are exacerbated by increased business costs triggered by rising risk and insurance premiums, as well as disruption of foreign and local investment due to perceived instability and the resulting paralysis of services, particularly air transport. In addition, heightened border security measures have led to disruptions in intraregional trade and business, particularly between Nigeria and Cameroon, resulting in delays to infrastructure projects such as the Chad-Cameroon railroad.

Additionally, its impact on Nigeria's social fabric has been significant. In particular, the education sector in the northeast region has been affected by the group's targeted attacks on schools and teachers. The United Nations

Children's Fund (UNICEF) estimates that the extremist group Boko Haram is responsible for the deaths of some 2,295 educators and the displacement of more than 19,000 educators. This unrest is exacerbated by the destruction or looting of some 1,400 educational institutions, primarily in the northeastern region. The immediate result is that more than 600,000 children have no access to education (United Nations Children's Fund [UNICEF], 2017; Williams & Istifanus, 2017; Global Coalition to Protect Education from Attack, 2018). The group was also observed to target religious leaders and places of worship, fueling interfaith tensions (Olaniyan & Asuelime, 2014; Onapajo & Usman, 2015; Olojo, 2017). In addition, the group has reportedly abducted women and children, exacerbating the security situation in the region and leading to an increase in gender-based violence (Okoli & Azom, 2019; Ajayi, 2020; Oluwaniyi, 2021). Furthermore, the attacks perpetrated by Boko Haram in Nigeria also have humanitarian consequences in addition to security, economic, and social impacts. The group's activities have also resulted in significant displacement, forcing large numbers of people to leave their homes and communities. The number of people in need of humanitarian assistance such as food, shelter, and medical care has increased significantly. The United Nations recently reported that the number of people in need of aid has risen to about six million this year. Last year, the number was 5.5 million. At the same time, the number of people at acute risk of starvation in Borno, Adamawa, and Yobe states has risen from 4.1 million to 4.3 million, despite the fact that UN's 2023 Humanitarian Response Plan calls for \$1.3 billion specifically for northeastern Nigeria, but has been able to secure only 25 percent of the total amount needed (United Nations High Commissioner for Refugees [UNHCR], 2019; Onapajo, 2020; AFP, 2023).

The human rights implications of Boko Haram's attacks in Nigeria are equally significant, particularly as the group reportedly commits extrajudicial killings (Ojo, 2010). The Nigerian health care system has also been severely affected by Boko Haram attacks on hospitals and medical personnel, leading to a decline in the quality of regional medical care. This is true even as the phenomenon has had a significant impact on the physical and psychological well-being of the population, particularly in regions where the group operates (Solanke, 2018; Ekhtor-Mobayode & Asfaw, 2019; Oginni, Opoku, & Nketsia, 2022). The country's political landscape has also been affected by Boko Haram attacks. This is because the group's actions have increased perceptions of insecurity and instability in the country, affecting the government's ability to govern effectively and deliver services to the people, negatively impacting public approval of the government, and further exacerbating political unrest in the country (Hentz, 2018; Brechenmacher, 2019; Ojo, 2020).

In addition, Boko Haram's attacks also have regional implications. The group has been designated as a terrorist organization by several nations, including the United States. Its activities have affected regional security and economic development, contributing to overall instability in the West African region (Institute for Economics and Peace [IEP], 2015; Okolie-Osemene & Okolie-Osemene, 2019; Ojo, 2020). For example, the group has been involved in regional conflicts in the Lake Chad region, which is contiguous with Nigeria, Niger, and Cameroon and that has led to attacks in these countries and affected regional security and stability. In 2015, Chad experienced a series of attacks perpetrated by Boko Haram, including a detonation in downtown N'Djamena. More than 23 people were killed in that incident. Chad subsequently deployed military personnel to the region to combat the dissident group (BBC, 2015; Scott, 2020). Nonetheless, Boko Haram's involvement in fighting in Chad, Niger, and Cameroon has resulted in significant destruction and displacement, as well as disruption of economic and social activities. The abovementioned has also contributed to destabilization and insecurity in the region, which, combined with the immediate consequences of hostilities, harms the inhabitants of these countries and has had an unfavorable impact on Nigeria's position in global peacekeeping (Virginia, 2015; Hentz, 2018; Scott, 2020). In addition, the attacks perpetrated by the group have caused physical damage and instability, leading many people to evacuate their homes and seek refuge in protected areas and camps. The ongoing conflict has also led to significant degradation of basic services such as health care and education and has contributed to the spread of disease and other health problems in the region (Badewa, 2022; Kangdim et al., 2022). Although several countries have deployed their military resources and personnel to combat the group, and even formed regional alliances and partnerships to coordinate their actions, the group has continued to carry out attacks and has

demonstrated its resilience as a persistent threat (Falode, 2016; Mickler, Suleiman, & Maiangwa, 2019; Kindzeka, 2023; Delanga, 2023)

4. Nigeria's Military Failure to Combat Boko Haram

The inability of the Nigerian Armed Forces (NAF) to effectively counter terrorist threats can be attributed to the lingering effects of the country's long and intermittent military rule between 1966 and 1998, which prioritized regional quotas over qualifications in its military recruitment practices, reflecting ethno-political factions and fears of domination prevalent in the early years of the independent Nigerian military (Bappah, 2016). This fundamentally shaped the professionalism of the military and continues to cast a shadow over the nature of current civil-military interactions. Thus, despite the social and institutional changes in Nigeria since the transition to democracy in 1999, the country's foundational dynamics continue to influence sociopolitical structures and have manifested themselves in a deterioration of military professionalism post-1999 under civilian governments, inadequate counterterrorism management and doctrine by senior military leaders, and underlined the lack of resolve by President Jonathan's leadership and the military to fight the insurgency once and for all.

In particular, there was a significant shift in civil-military relations in Nigeria after the change from military to democratic government in 1999. Civilians exercised 'subjective control' over the military a development that led to the politicization of the military and consequently to an erosion of its professionalism (Huntington, 1957). This included the forced retirement of high-ranking military officers and the deliberate underfunding of the military to prevent it from becoming powerful enough to overthrow the fledgling democracy (Ibrahim, 2017; Varin, 2018). At the same time, concerns arose about the legitimacy of the recruitment process, which transformed military service from a national service into a platform for personal gain, career advancement, and self-aggrandizement (Onwubiko, 2013; Bappah, 2016), while dwindling professionalism was exacerbated by non-transparent security spending and pervasive corruption responsible for failing to procure the necessary weapons and ammunition that could be used to combat Boko Haram (Egbo, Nwakoby, Onwumere, & Uche, 2010; Stockholm International Peace Research Institute, 2015; Ukpog, 2017; Punch Editorial Board, 2021; Sahara Reporters, 2023).

Second, the Nigerian military, bound by its constitutional obligation to suppress internal revolts such as the Boko Haram insurgency (Federal Republic of Nigeria, 1999), initially downplayed the threat and even continued to ignore warnings of Boko Haram attacks even as the group aggressively exploited grievances in marginalized communities and among individuals to radicalize and recruit followers—a mistake that became apparent under President Jonathan in 2014 (Ajakaye, 2015; ThisDayLive, 2015; Pérouse de Montclos, 2018). That miscalculation took a heavy toll, especially after the unlawful execution of the group's leader, Mohammed Yusuf, in 2009, which inadvertently strengthened radical factions within the group. As a result, the insurgents, who subsequently resorted to suicide bombings, guerrilla warfare, and the strategic use of social media for propaganda, intensified their threat to national security. In response, the government imposed a state of emergency in three northeastern states, namely, Adamawa, Borno, and Yobe, signaling increased counterinsurgency efforts (BBC, 2013). However, these efforts were undermined by widespread discontent within the military, primarily due to inadequate equipment and declining morale, culminating in human rights abuses against civilians. This escalating discontent led to mutinies among soldiers and the proclamation of an Islamic caliphate by the insurgent leader. To make matters worse, the credibility of the military suffered from inaccurate public statements about its operations (Iwuoha, 2020). On the contrary, Boko Haram demonstrated superior strategic communications and often appeared more reliable than the military, which exacerbated the erosion of the military's credibility at home and abroad.

Although President Goodluck Jonathan approved the National Counterterrorism Strategy (NACTEST) on April 30, 2014, it proved ineffective. NACTEST included measures such as conventional military training, socioeconomic solutions to combat Boko Haram's recruitment methods, and community initiatives involving

religious and customary leaders. However, the program's implementation was hampered by corruption. This was in addition to Boko Haram's demonstrated ability to exploit grievances within marginalized communities and among individuals, effectively radicalizing and recruiting followers (Akinola, 2015; Eji, 2016). Furthermore, his perceived indecisiveness hampered both domestic and international assistance efforts. For example, alleged links between political elites, including then Borno State Governor Ali Modu Sheriff and Boko Haram remained largely uninvestigated, and fueled skepticism (Iyekekpolo, 2018). Criticism also stemmed from the Jonathan administration's underestimation of the insurgency's severity, which inadvertently contributed to its strengthening. For instance, the handling of the Chibok kidnapping also shed light on a missed opportunity to mobilize national and international support, even as Jonathan's preoccupation with his 2015 reelection campaign rather than fighting the insurgency was seen as a glaring shift in priorities (Bappah, 2016).

Given the obvious difficulty of addressing the root causes of the insurgency, preventing Boko Haram from recruiting members, combating the corruption that had beset the military, providing armament that could match that of Boko Haram, and devising an effective military strategy that could confront Boko Haram, which had developed an extraordinary ability to adapt its strategies and objectives in response to changing conditions, the Nigerian government determined that a different, comprehensive, and coordinated approach was needed to meet the multi-faceted and complicated challenge posed by Boko Haram. To this end, private military and security contractors were proposed and hired as a tactic to combat Boko Haram, and Specialized Tasks, Training, Equipment, and Protection (STTEP) was hired to train, advise, and provide intelligence support to the military and other security forces to improve their ability to combat Boko Haram (Freeman, 2015; Varin, 2018; Adamo, 2020; Kinsey & Krieg, 2021).

5. The Use of Private Security Services in Nigeria

Faced with the failure to contain the insurgency, incumbent President Goodluck Jonathan felt compelled to develop a strategy when he realized that the escalating threat of the Boko Haram insurgency could hurt his chances of winning the 2015 election, especially since the abduction of more than 250 Chibok girls had sparked reactions around the world (McVeigh, 2014). Although the Nigerian government justified the outsourcing of military expertise to contractors on the grounds that it was necessary for the training and deployment of sophisticated equipment, Varin (2018) argues that, on the contrary, the contract was a consequence of the inadequacy of the Nigerian armed forces and the failure of efforts to address the sociopolitical factors that fueled the insurgency, which necessitated an alternative approach to the problem. Moreover, as the Nigerian military struggled to contain the group and was criticized for its lack of success in countering its attacks, contracting STTEP was seen as a way to address these issues and provide the Nigerian military with the "strategic, operational, and tactical" support it needed to effectively combat the group, especially since it appeared that previous training by outsiders such as the US and France left much to be desired, due to a lack of effective training, misguided advice, the absence of a clear strategy, widely varying tribal affiliations, ethnicity, religion, languages, and cultures, coupled with a limited understanding of the conflict and the enemy, and particularly the nature of counterinsurgency (Murphy, 2020; Adamo, 2020).

Potential sources of support for Nigeria include its traditional geopolitical partners (such as the United States, the United Kingdom, and Israel) and private actors. Regrettably, the Nigerian government failed to obtain military support from its allies because of the Nigerian armed forces' reputation for human rights abuses, corrupt practices, and fears of possible infiltration by Boko Haram (Cromptley & Lewis, 2015; Murphy, 2015). Consequently, the government resorted to seeking assistance from the private sector, whose employees were expeditiously branded as "mercenaries" by the media (Kinsey & Krieg, 2021). Eeben Barlow, former chairman of STTEP, revealed that the company was originally contracted in mid-December 2014 to train a rescue force for the Chibok girls. However, due to the tactical growth of Boko Haram, the company was soon transformed into a combat force known as the 72nd Mobile Strike Force (72MSF). This transformation occurred when the insurgents began

seizing territory, including Gwoza, and extending their control to parts of Baga near Lake Chad in early January 2015. As a result, they gained control of about 20,000 square miles, which is slightly larger than Costa Rica. This strike force, which the company had carefully assembled “from scratch” to rescue the Chibok girls, had “its own organic air support, intelligence, communications, logistics, and other relevant combat support elements” and began training in January 2015 (Murphy, 2015a; Nielsen, 2016; Blair, 2015).

6. The Methods and Strategies Employed by STTEP

The STTEP approach as a security contractor enhanced the capabilities of local forces by providing training, strategic guidance, and air and artillery support to the 72nd Mobile Strike Force on the principle of relentless warfare. According to Eeben Barlow, “the Strike Force was never intended to hold the ground. Instead, it operated on the principle of relentless offensive”, which he describes as key to effective counterinsurgency, similar to the strategy employed by Executive Outcomes in Angola and Sierra Leone. This approach, a form of unconventional mobile warfare, involves continuously pursuing and attacking the enemy, particularly a non-state actor such as a terrorist group that does not have a defined battlefield or traditional command structure, without allowing it to regroup or recover (Murphy, 2015). The primary objective of relentless pursuit is to disrupt the enemy’s operations and prevent it from consolidating its gains (Barlow, 2011). To achieve this, a combination of military and nonmilitary means are used to pressure the enemy, such as targeted airstrikes, ground operations, reconnaissance, and psychological operations. In this way, the enemy’s operations are disrupted by creating a constant state of uncertainty that makes it difficult for them to plan and execute operations, keeps them on the defensive, and prevents them from gaining popular support.

In the past, Boko Haram relied on guerrilla tactics, striking unexpectedly and choosing its own time and place in the hope that media coverage would increase the impact of its attacks. Under the leadership of Major General Barlow, who commanded the 72nd Mobile Strike Force, a new strategy was introduced. Instead of adopting a defensive posture, the team actively sought out and engaged the enemy, using aggressive tactics to weaken its defenses and ultimately overwhelm it with superior firepower. To implement this relentless pursuit, Barlow emphasized the importance of troops being able to feed on the move, quickly track the enemy, use helicopters to stay ahead of the enemy, communicate effectively, be aggressive, be proficient in night operations, and have greater firepower than enemy forces (Murphy 2015b). This approach typically involves horizontal and vertical operations by special or intelligence forces trained to operate independently yet in coordination with other units such as reconnaissance units and military units equipped with advanced technology such as drones and other surveillance equipment. In this way, STTEP contractors were responsible for leading and organizing the mission. They were responsible for decision-making, communications, and strategy, working closely with Nigerian forces and directing them to specific regions, unlike previous operations that relied on aerial surveillance information conducted by US and French forces in the area and shared with Nigerian forces 24-48 hours after the fact (Barlow, 2018). At the same time, the hired forces employed aerial vehicles, such as helicopters and armed aircraft, maneuvering swiftly and close to the ground to engage Boko Haram militants both during the day and at night, which ultimately led to the destruction of numerous Boko Haram assembly points, concentrations, and equipment and negatively impacted the numbers and morale of Boko Haram forces.

The use of psychological warfare, also known as “psywar” or “PSYOP,” is not a new concept and was not developed in Nigeria, but it is recognized as an effective counterinsurgency tool and has been identified as an important component in the fight against Boko Haram in Nigeria. The aim is to sway the beliefs, attitudes, and actions of a target group or adversary, leading to a reduction in their will to fight while simultaneously gaining support from the [target] population (Crossman, 1952; Sun Tsu, 2013; Bennett, 2019). In this case, the Nigerian Army and the local population were the targets. This was largely because the Nigerian armed forces were struggling not only with a lack of capability but also with low morale, having previously often been overrun by insurgents and fled from operations, resulting in valuable equipment falling into the hands of Boko Haram.

Psywar, deployed on the principle of relentless pursuit and used to combat Boko Haram in the Mafa region in January 2015, proved successful. For instance, the terrorist group carried out a series of attacks on the local population, causing many to flee to Maiduguri. As a result, a military unit was dispatched to retake the town of Mafa, located about 57 kilometers west of Maiduguri. The mission was a success, recapturing the town and pushing Boko Haram back about five kilometers. The 7th Infantry Division took control of the town, and the 72 MSF soldiers returned to Maiduguri to the cheers of the local population. Despite ongoing efforts to retake key Boko Haram strongholds in Bama and Gwoza, MSF gunships continued to fly sorties, and a small helicopter unit conducted several mortar attacks on known Boko Haram positions. Tragically, during a nighttime operation to prepare for the attack on Bama, a Nigerian Army T-72 tank mistakenly fired on an MSF MRAP, resulting in two MSF combat casualties. As a result, the attack on Bama was temporarily postponed. Nevertheless, MSF managed to recapture Bama from Boko Haram 48 hours later. Subsequent troops from the 7th Infantry Division quickly took control of Bama and cleared it to repel possible counterattacks by Boko Haram. Similarly, media and security officials in Abuja confirmed that STTEP contractors conducted nighttime attacks against Boko Haram in Sambisa Forest, a large camp where the abducted girls are believed to be held by the insurgents. Accordingly, the Nigerian military reportedly moved in the next day and claimed credit for the successful operations (Nossiter, 2015). This suggests the effectiveness of psychological tactics and relentless offensive, as well as a strong partnership between the Nigerian military and STTEP.

At the same time, the STTEP approach aimed to shape warfare to meet the needs of the local population. This was achieved by teaching and enforcing basic ethical principles and by implementing social responsibility programs aimed at providing essential services to the local population, such as medical clinics, clean water, and job opportunities whose ultimate goal was not only to provide aid but also to encourage popular participation in the fight against Boko Haram (Barlow, 2018). In addition, the STTEP approach also worked closely with local citizen militias known as the Civilian Joint Task Force (CJTF). The CJTF, which was established by Borno State in June 2013 and now includes thousands of volunteers, is seen as a valuable force multiplier by the Nigerian security forces, although there has been frequent tension between the CJTF and the security forces due to police and military brutality against the vigilantes (Agbibo, 2020). Recognizing this divide and the utility of the local military for intelligence, translation, support, and local acceptance, the STTEP approach overcame these tensions by encouraging cooperation between uniformed forces and citizen militias in their operations to combat Boko Haram.

Table 1. Table of Findings

Findings	Descriptions
The STTEP approach	Improve the capabilities of local forces through training, strategic guidance, and air and artillery support to the 72nd Mobile Strike Force under the principle of relentless warfare.
Relentless Offensive strategy	Involves continuously pursuing and attacking the enemy without allowing it to regroup or recover. It involves using military and nonmilitary means to pressure the enemy, such as targeted air strikes, ground operations, surveillance, and psychological operations.
Horizontal and vertical operations	Through special or intelligence forces trained to operate independently but in coordination with other units, such as reconnaissance units and military units equipped with advanced technology. STTEP contractors were responsible for mission direction, organization, decision-making, communications, and strategy.
Use of helicopters and gunships	Attack Boko Haram both during the day and at night, ultimately destroying numerous Boko Haram staging areas, concentrations, and equipment.

Psychological warfare	Used to increase the aggression level of troops and instill fear in the enemy. The psywar, based on the principle of relentless pursuit and was used to combat Boko Haram in the Mafa region in January 2015, has proven successful.
The success of the mission	The mission succeeded, retaking the town and pushing Boko Haram back about five kilometers. MSF succeeded in retaking Bama from Boko Haram 48 hours later.
Tragic incident	During a nighttime operation to prepare for the attack on Bama, a Nigerian Army T-72 tank accidentally fired at an MSF MRAP, resulting in two MSF combat casualties.

Source: Author

Events after January 2015 suggest that the deployment of Specialized Tasks, Training, Equipment, and Protection (STTEP) may have not only helped Nigerian forces fight Boko Haram, but also laid the groundwork for the rejuvenation of the Multinational Joint Task Force (MNJTF), which was once a formation of LCBC states, i.e., the four littoral states surrounding the Lake Chad Basin (LCB), to promote sustainability, resolve disputes, and support integration, peace, and security in the LCB. Now it has been restructured into a unit to fight Boko Haram to address the problem of insecurity in the region. Thus, the MNJTF has now been transformed into a military alliance, established in October 2014, comprising soldiers from Nigeria, Chad, Cameroon, Niger, and Benin. This was in response to the increasingly cross-border nature of Boko Haram's insurgency and the realization that a coordinated regional approach was necessary to effectively combat the group (Agbiboa, 2017). This alliance has conducted several operations against Boko Haram since January 2015, resulting in the recapture of areas previously controlled by the group and the disruption of its operations. According to the Nigerian government, the Multinational Joint Task Force (MNJTF) successfully regained control of 36 towns in three different states during the months of February and March 2015 (Popovski & Maiangwa, 2016; Hassan, 2021). Despite these successes, however, the MNJTF has faced obstacles such as a lack of coordination and cooperation among its member states, as well as funding and logistical problems that have hampered its ability to fully carry out its mandate (Agbiboa, 2017).

7. Quantitative Findings from the Global Terrorism Database

According to the Global Terrorism Database (GTD), the provision of special operations, training, equipment, and protection significantly limited Boko Haram's ability to carry out terrorist attacks. When analyzing the number of incidents from July 2014 to December 2014, a total of 207 attacks were recorded, while between January and March 2015, when STTEP was operational, a total of 139 incidents were recorded, indicating a decrease in operations conducted by the insurgents. However, if we use the same database to calculate insurgent attacks, 301 attacks were recorded between March 31 and December 31, 2015, suggesting that STTEP's withdrawal left a gap for Boko Haram to exploit (Global Terrorism Database, 2015). This is consistent with Barlow's prediction that the insurgents would regroup and their operations would become much more violent after the company's tactical withdrawal at the end of the three-month contract, which expired around March 28, because President Jonathan had promised that the contract would not be renewed in the event of an electoral defeat (Murphy, 2015c; Adamo, 2020).

Further analysis of terrorist attacks perpetrated by Boko Haram from January to December 2016 shows that 251 attacks were recorded during this period, a decrease from the rest of 2015 following the STTEP's withdrawal. The author used the same database to track Boko Haram attacks from 2017 to 2020 and the results show that there were 300 attacks in 2017, 210 attacks in 2018, 300 attacks in 2019, and 219 attacks in 2020. These numbers indicate a fluctuation in the number of attacks by Boko Haram over the four-year period from 2017 to 2020. While the number of attacks peaked at 300 in both 2017 and 2019, it declined to 210 in 2018 and increased slightly to 219 in 2020, indicating fluctuations in Boko Haram activity that may be due to factors such as changes

in strategy, leadership, external support, or counterinsurgency effectiveness. However, the data presented suggest that despite a decrease in Boko Haram attacks in 2016 following STTEP's withdrawal, the fluctuating numbers of attacks from 2017 to 2020 indicate that counterinsurgency efforts were less stable without STTEP, indicating the significant influence of STTEP's strategic support in combating Boko Haram and maintaining a more controlled environment.

While this assessment, covering a short ninety-day period, gives an indication of short-term effectiveness, it is difficult to make a definitive long-term assessment given the time frame. However, one very plausible explanation is that the Nigerian Armed Forces were able to improve their strength and morale through the training they received under the Specialized Tasks, Training, Equipment, and Protection (STTEP) program, which in turn led to more successful counterinsurgency operations. In general, the role of STTEP appears to be critical to effective counterterrorism, as STTEP presence was associated with a decrease in Boko Haram attacks and STTEP absence resulted in an increase or fluctuations in violence, suggesting that organizations such as STTEP may be critical to maintaining a consistent and effective counterterrorism strategy. This also indicates the significant impact of the partnership on the operational strategies of the armed forces and provides valuable insight into the benefits of an integrated approach to the doctrine of "relentless pursuit." However, the significant decline and inconsistency in success rates is concerning, as it may indicate a possible return of the Nigerian armed forces to earlier, less effective strategies.

Table 2. STTEP's impact on Nigerian counterterrorism in data

Time Period	Boko Haram Attacks Recorded	Note
July-Dec 2014	207	Before STTEP's involvement
Jan-Mar 2015	139	STTEP operational, attacks decrease
Mar 31-Dec 31, 2015	301	Attacks increase after STTEP's withdrawal
Jan-Dec 2016	251	Attacks decrease from the previous year but remain higher than during STTEP involvement.
2017	300	Attack numbers increase
2018	210	Attack numbers decrease
2019	300	Attack numbers increase
2020	219	Attack numbers slightly decrease

Source: Author

Moreover, the decline in attacks over the life of the contract is also related to the number of civilian casualties and fatalities. If the frequency of attacks decreases, the likelihood that there will be fewer casualties also increases. To determine whether the decline in terrorist attacks and civilian casualties in Nigeria can be attributed to the presence of STTEP, this study examines the relationship between the decline in terrorist attacks and the decline in civilian casualties using data from the 2016 Global Terrorism Index (GTI) and the Global Terrorism Database (GTD). The GTI reveals a 34 percent decline in terrorist attack deaths in Nigeria in 2015 compared to the previous year, largely due to a decline in Boko Haram activity (Global Terrorism Index, 2015; Global Terrorism Index, 2016). More detailed data from GTD indicate that during the period STTEP was in operation (January to March 28, 2015), there were 1797 fatalities and 481 casualties, significantly less than the 2547 fatalities and 1159 casualties recorded during the previous period (July to December 2014). However, following STTEP's withdrawal, the number of fatalities and casualties jumped during the remainder of 2015, reaching 2903 and 2044, respectively. These fluctuations suggest that STTEP's presence was associated with a decrease in Boko Haram attacks and civilian casualties. The subsequent increase in attacks and casualties after STTEP may suggest that the absence of STTEP led to less effective counterterrorism measures or a possible return to earlier, less effective strategies by Nigerian forces. While these figures suggest a correlation, they are not conclusive evidence of causality, as other factors such as changes in Boko Haram strategies, regional political dynamics, or the actions of other security forces could also have influenced these outcomes.

Table 3. Impact of STTEP's Presence on Boko Haram Attacks, Fatalities, and Casualties (2014 - 2015)

Period	STTEP Status	Number of Attacks	Fatalities	Casualties
July – December 2014	Pre-STTEP	207	2547	1159
January – March 28, 2015	STTEP Operational	139	1797	481
March 31-December 31, 2015	Post-STTEP	301	2903	2044

Source: Author

Moreover, the impact of the fight against Boko Haram can be gauged in part by the number of terrorists arrested and killed, although the lack of credible official records casts doubt on the accuracy of these figures, especially given that Nigerian forces have faced accusations in the past of overstating insurgent casualties and understating civilian casualties, such as in the Baga massacre, in which the government claimed 150 casualties while 2,000 civilians were killed (Felix & Ola, 2015). The possibility of politically motivated reporting, especially considering that the company was contracted before the elections and contributed to the ruling party's victory, further complicates the matter and therefore makes it difficult to rely on such figures without significant proof. Nonetheless, the lack of a credible open rebuttal and the fact that the counterterrorism force was able to kill more Boko Haram fighters than its soldiers lost is some evidence of counterinsurgency success. The accounts of Boko Haram casualties in January and February 2015 vary. Some sources claim the Nigerian government killed 42 insurgents and captured 5 others, while others report over 200 dead in Maiduguri (ENCA, 2015). According to a report published on February 18, 2015, a joint military operation was conducted to regain control of 11 towns and villages from Boko Haram fighters in Nigeria. The report stated that 300 fighters from the extremist group were killed during the operation, reportedly by the Nigerian army (Felix & Ola, 2015). This research notes that the frequency of clashes that month likely resulted in more casualties than arrests and that despite the limitations, the fact that a primary objective of counterinsurgency operations is to destroy the insurgents suggests that success has been achieved in the fight against Boko Haram (Galula, 1964).

Table 4. Reported Boko Haram casualties in January and February 2015

Date	Reported Boko Haram casualties
January 2015	42 killed, 5 captured
February 18, 2015	300 killed
Remaining days in February 2015	Over 200 were killed in Maiduguri

*Note: There is no consensus on the exact number of Boko Haram casualties, and figures may be subject to politically motivated reporting.

Source: Author

8. Discussion and Recommendations

In assessing STTEP's involvement in Nigeria, the author notes elsewhere that the decision was a good one, largely because it has increased confidence in the government's efforts and boosted the morale of the national armed forces, which are now better able to fight the insurgents in a joint effort without undermining state authority in the region (Bamigboye, 2022). However, it is difficult to make a definitive statement about the overall success of the STTEP approach in Nigeria because success can be measured in different ways. Although the STTEP approach, which included the use of special forces and psychological operations as well as the involvement of local militias, resulted in a significant reduction in violence during the period in which it was used, it could also be argued that it did not fully succeed in eradicating Boko Haram and that the group remains a significant threat in the region, especially when considered in the context of an effective counterterrorism strategy (COIN), which is a comprehensive approach that employs various "instruments of national power" and includes all resources and means necessary to address the complexity of terrorist threats (Shemella, 2011). In this sense, an effective counterterrorism strategy as one that goes beyond military means to include intelligence, law enforcement, and cooperation with civil society, as each of these tools plays a unique role in counterterrorism (Bamigboye, 2022). Thus, it could also be argued that this collaborative security web has not fully addressed the underlying problems that led to the rise of Boko Haram, such as poverty, unemployment, and marginalization, nor has it been able to fully gain the support of the local population, as tensions continue to exist between the local population and the security forces (Bamidele, 2016). Therefore, the success of the STTEP approach in Nigeria can be described as mixed, as it had some success in reducing the level of violence and destabilization caused by Boko Haram during its time in Nigeria, and recapturing territory, but was not able to completely eradicate the group and did not fully solve the underlying problems or gain popular support. This means that the assessment of STTEP's effectiveness in the fight against Boko Haram considers only the military aspect and neglects the social and political factors. The result is that while STTEP has been successful at the operational level, social and political issues remain a problem in the fight against Boko Haram terrorists and insurgent elements. Therefore, it can be said that STTEP influenced counterinsurgency primarily at the operational level, resulting in temporary strategic success. The study's findings also show that the implementation of STTEP tactics through the use of Special Forces such as special operations forces and intelligence effectively hindered the group's operations and prevented it from gaining momentum. In addition, the integration of nonmilitary tactics, such as psychological operations and civil-military efforts, also played an important role in gaining popular support and isolating the group from its support networks consequently demonstrating the effectiveness of the STTEP approach in countering the threat posed by Boko Haram in Nigeria, albeit at the operational level.

It appears that the value of a public-private military partnership was recognized by President Muhammadu Buhari, a former military general, and successor to President Goodluck Jonathan. Buhari who had criticized his predecessor's use of a private military company before taking office. According to the Anadolu News Agency, it has been alleged that Buhari himself employed equipment and private military companies from STTEP, even though he had previously spoken out against the use of South African mercenaries and stated that their presence would not be tolerated under his leadership (Olasupo 2018). Although the Nigerian government has officially

denied these allegations, the possibility of rehiring these mercenaries is reportedly currently being discussed within the Ministry of Defense and the Nigerian military (Campbell, 2015). All of these suggest that it is critical to understand that political leadership must look at STTEP's military successes to establish a longer-term counterinsurgency policy. According to Onapajo (2017) the political leadership, especially after the transition from Jonathan to Buhari, who has a military background and is implementing a comprehensive strategy that includes diplomatic/multilateral tactics and internal military reorganization, has enabled a comprehensive approach to counterinsurgency that has resulted in favorable military engagement with anti-government forces and strategic investments, although the progress made should not be misconstrued as a victory. This research, therefore, suggests that it is important to recognize that STTEP alone cannot be considered a comprehensive solution to the Boko Haram insurgency. As a result, it is argued that it is critical to assess STTEP's success in the context of broader counterinsurgency efforts, as the insurgency in Nigeria is a complex problem that requires a comprehensive approach that includes not only military operations, but also political, economic, and social measures.

It is also important to consider the short- and long-term success of STTEP, especially since it has achieved short-term successes, such as reducing violence in the areas of operation, but it is uncertain whether these successes will last in the long term, especially since according to Mayeni Jones (2023), Boko Haram is still raging in the northeast and it is still too dangerous to travel by road between Yobe and Borno states unless a comprehensive approach is taken that addresses the underlying problems fueling the insurgency. The findings thus highlight the importance of considering the long-term sustainability of private security firms in the fight against Boko Haram. As the case study shows, when addressing pressing security issues, it is critical to consider the enduring consequences of security operations, as improving the capabilities of national security forces and other relevant security actors is crucial, without which achieving lasting stability becomes an illusion. Therefore, a systematic approach aimed at improving the counterinsurgency capabilities of the Nigerian armed forces is a more effective strategy for achieving stability than a single contractual agreement, such as the short three-month contract between STTEP and the Nigerian government.

There are other important implications for Nigeria's fight against Boko Haram. The data suggest that private security firms, particularly those with counterinsurgency experience in Africa, can provide valuable support to the Nigerian government and military in their efforts to combat Boko Haram because they have the expertise and unique experience in Africa to effectively address Nigeria's security challenges. In particular, the results of this research show that it is critical for PMSCs to understand and be sensitive to the cultural practices of the regions in which they operate. As indicated by the case study, STTEP's contractors have extensive experience in Africa since the 1980s and have most likely transferred their understanding of Africa's cultural and social complexities to their operations in the region through CSR projects, which explains their success, especially in the northeastern region where people have limited knowledge of different cultures due to lack of education. This also underscores the importance for private security companies to understand and adhere to the cultural and social conventions in an area of conflict in order to build mutually beneficial relationships with the local population. Companies thus have a responsibility to provide cultural training to security personnel to protect them from cultural misinterpretation by training them in local customs, traditions, and social conventions.

The establishment of collaborative and trust-building measures between private security firms and local communities has the potential to generate considerable advantages and is therefore considered crucial for effective counterinsurgency. In the same vein, an examination of the effects of psychological warfare on the military and local communities may lead to the achievement of effective security, especially if national forces and local populations have suffered a loss of morale due to frequent attacks. Furthermore, the findings of this research emphasize the crucial significance of host community backing in the efforts to counter terrorism and insurgency operations, specifically in the fight against Boko Haram. This is because it diminishes the support for terrorists within the local populace while simultaneously promoting community support. As shown in this research,

STTEP's strategy relies on the principles of open communication, collaboration, and corporate social responsibility (CSR) to cultivate trust and cooperation between private security companies and host communities. For this reason, the facilitation of communication channels between private security firms and community leaders has the potential to enhance the participation of local communities in security planning and execution.

Finally, STTEP's three-month deployment to Nigeria is noteworthy because there were no documented cases of human rights violations, illegal activities, or subversion of state authority by the organization. This is noteworthy because these are major issues commonly associated with the use of private security companies. Notwithstanding, it is of utmost importance that the Nigerian government and other concerned agencies establish clear regulations and guidelines for the use of private security companies and develop mechanisms to monitor and enforce their accountability beyond the requirements of international humanitarian law. This includes independent and fair reporting of cases of human rights violations.

8. Conclusion

In this article, the author examines the pivotal role of private security services using STTEP, a private military and security company (PMSC), as an example in the fight against Boko Haram in Nigeria. The author begins with an overview that highlights the remarkable contribution of private security companies like STTEP to the Nigerian security landscape, particularly in addressing the challenges posed by extremist groups like Boko Haram, and further explores this connection, highlighting how these companies' specialized expertise, rigorous training, advanced equipment, and comprehensive security services have significantly mitigated the threat posed by Boko Haram in northeastern Nigeria during their operation. As a result, security and stability were significantly improved in Nigeria's north during the period, albeit with varying degrees of success. Of particular importance is the observation that while STTEP has been militarily effective, it has not adequately addressed the root problems or completely won the hearts and minds of the local population. The study cautions, however, that the success of private security firms should not be considered in a vacuum, as counterterrorism requires a multifaceted strategy. As such, this article makes a strong case for addressing the root causes of the insurgency, such as poverty, unemployment, and marginalization, in conjunction with military action. In addition, the study underscores the importance of coordination between private security firms and other security agencies for long-term security outcomes. This collaboration would lead to the alignment of goals and promote coherence between security-related operations and broader development objectives without undermining the role of the state as the primary provider of security. Finally, it underscores the indispensability of transparency, accountability, and ethics in the operations of these companies. This can be achieved by establishing a robust legal and regulatory framework that delineates their duties, ensures compliance with national and international standards, and ensures adequate reporting mechanisms for human rights violations to prevent possible abuse of power or misconduct.

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ENVIRONMENTAL POLICIES, WASTE AND CIRCULAR CONVERGENCE IN THE EUROPEAN CONTEXT

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Abstract. This work explores the transition process towards a circular economic model in the European context. By placing the role of policies and waste as a focus of the debate, it first examines the possible effects that a stringent policy can generate and, secondly, how much waste and its management can influence the goodness of the transition process. By analyzing European data on major indicators of circularity, waste generation, and management, this paper attempts to provide a snapshot of the European situation and its different speeds along the transition path. In light of the recent development programs established by European institutions in the aftermath of the Covid-19 pandemic that strained the world economy, the trends show how program resources should be directed towards key sustainability sectors that can stimulate European countries towards a common circular pathway.

Keywords: Environmental policy; Circular Economy; Waste Management; Sustainability transition

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1. Introduction

During the last few years, concerns over the long-run effects of climate change and the pressures on ecosystem services in Europe have increased (EEA, 2019a). Although the European Union (EU) environmental policies have undoubtedly provided essential benefits, many European countries face urgent environmental issues due to global megatrends amplifying the environmental crisis, implying multiple environmental, societal and economic challenges (EEA, 2019b). The EU is experiencing numerous transitions linked to important demographic, technological, fiscal and financial structural changes that may affect the effectiveness of the long-term EU policy objectives to achieve a sustainable transition and decarbonization of EU's members during the first half of this century (EEA, 2019b). Therefore, a proper and effective ecological transition must be placed within a policy process that integrates different dynamics of sustainability and change (technological, fiscal, demographic, etc.),

which may come into conflict, undermining the social acceptability of the sustainability transition itself (EEA, 2019b; Mazzanti and Pronti, 2021).

This systemic and multidimensional macro-perspective is embedded in the EU strategic macro-sustainability long-term strategy and related policy framework recently established by the European Commission (EC). European countries are undertaking the most important path toward an unprecedented ecological transition through the implementation of the Next Gen EU (NGEU), the European post-pandemic recovery program for EU's member states, which has the ambitious objective of restructuring the whole European socio-economic system (NGEU, 2022). The NGEU program is the largest public stimulus ever to the European economy to support reforms and investments to "make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions" (NGEU, 2022). The post-pandemic recovery program is strictly linked to the European Green Deal (EGD), the EU Commission program for a total restructuring of the whole European economy toward a zero-carbon transition to be reached by 2050 (EGD, 2022). The EGD's main goal is to reach carbon neutrality for EU members by 2050, with an initial cut in carbon emissions by 50% from 1990s levels in 2030, and decoupling economic growth from resource use (EC, 2019; EEA, 2021).

Moreover, the EU is moving toward a digital transition of its members which is embodied in the communications "Shaping Europe's digital future" and "Europe's Digital Decade: digital targets for 2030", which jointly aim at improving the connectivity and digitalization of the public and private sectors to increase the EU's overall productivity (EC, 2021, 2020). The EU's Digital transition is strictly linked to the ecological transition. It will play a relevant role in supporting at the same time the achievement of the Green Deal objectives' in many different sectors as a key element for decoupling through increased productive efficiency and dematerialization of products into services to stimulate material circularity (FEEM, 2020, 2019). A widespread digitalization is an enabler of the 'Fourth Industrial Revolution' that can provide more integrated and efficient production processes, new jobs and economic growth (EEA, 2021). The NGEU has implemented the ecological and the digital transitions (known as twin transitions) with a total public expenditure of at least 37% of the Recovery and Resilience Facility (RFF) plans to support the green transition, and at least 20% to boost the digital transition (EC, 2022a; NGEU, 2022).

The recent public interventions carried out by the European Community represent an unprecedented opportunity for an epochal ecological and digital transformation of the whole European economic system toward a decoupled and sustainable system in which economic growth is materially efficient and detached from the production of waste. EU environmental policies, i.e. regulatory, economic and voluntary tools, may substantially contribute to fostering sustainability actions in production and consumption activities (e.g. eco-innovations, increasing resource and energy efficiency, circular economy) which can lead to the decoupling of economic growth from environmental depletion (Fusillo et al., 2020).

However, the effectiveness of EU policies for the ecological transition is difficult to monitor at this implementation stage, as they are still in progress and need an adequate framework for counterfactual analysis. But the need to understand the potential scenarios and effects of the new EU's policy framework is of extreme relevance, and the first step might be a descriptive analysis of the main trends that occurred in the recent past among EU countries.

The flow of waste treated in the EU domestic market (or abroad) represents a tool to monitor main trends to quantify the effects after the Rio Conference in 1992, which may be considered as the first steps on the path towards environmental transition taken by European countries (Marin et al. 2017). In turn, another aspect to be monitored to assess sustainability performances and ecological public objective achievements is how all the waste generated within the socio-economic system is reduced as avoided waste through reuse, recycling and the repair of goods.

This last point is strictly linked to the concept of circular economy as a new productive model opposite to the predominant "take, make and dispose" paradigm more focused on regeneration, restoration of energy and materials and the resiliency of the productive system (de Jesus et al., 2021). This model is based on closing the loop of energy and materials used within the economic system through a structural change of the productive system as a whole (from the extraction to the end of use) to build long-term resilience, business opportunities and social benefits (Suchek et al., 2021).

The paper contributes to the scientific debate on waste management and circular economy, on the one hand, by providing a comprehensive description of the main EU legal framework on waste and circular economy, and on the other, by analyzing the most recent Eurostat data on waste and material flow at national level highlighting main macro-trends, in terms of waste management and circularity, occurred in the EU in the last 20 years. The work offers a detailed analysis of the EU policy framework and the main trends on waste and circularity of materials which can be used to qualitatively discuss the main weakness, strengths, and future scenarios of the EU in achieving the decoupling and sustainable transition goals decoupling and the main objectives of the sustainable transition of the NGEU and EGD programs.

The paper is structured as follows: Section 2 offers a short background on the interplay between Environmental policies, Waste management and the Circular economy concepts; Section 3 provides a background on the waste management policy framework at EU level, describing the most relevant normative linking waste management practices to the CE concept; in Section 4 are described the most relevant trends at EU level on waste and material flow; in Section 5 a discussion on the main trends, policy implications and potential scenarios is performed; finally the paper presents some concluding remarks highlighting the central point for the future research agenda and policy analysis perspectives.

2. Background

2.1 The role of environmental policies for sustainability

Decoupling assumes a crucial role in integrating economic, technological and environmental dimensions in sustainability and ecological transition. Decoupling can be defined as the general reduction of environmental impacts related to productive activities, either by considering the use of resources in production processes per unit of output or the reduction of the environmental effects (waste, pollution and other negative externalities) of each individual unit of output (UNEP, 2011). The decoupling process associated with the use of resources and emissions of pollutants is one of the key factors in describing the growth of social welfare and economic prosperity by limiting the environmental impacts, thanks to the processes of technical and technological innovation, in a sustainable development perspective (Lodi et al., 2020). A classic example describing decoupling at a macro level is the environmental Kuznets curve¹ which outlines the relationship between economic development and environmental impacts and has an inverted U-shape. According to this theory, supported by environmental and innovation policies, the overall environmental impacts decrease to almost zero (Grossman and Krueger, 1995; Stern, 2004). Measuring decoupling between the economic, and environmental dimensions at the national level is essential to monitor impact reduction processes and sustainability performance at EU level, but it requires considerable effort. Therefore, It will be increasingly relevant to analyze territorial dynamics of innovation and structural changes to understand the real effectiveness of environmental policies and regulations. Decoupling is strictly related to increasing material efficiency to reduce resource extraction and creating waste along the supply chain or at the end of the consumption process to guarantee long-term sustainability (Speck and Zoboli, 2017).

¹ From Nobel Prize winner Simon Kuznets who studied the relationship between economic development and inequality

Environmental policies and regulations have a crucial role in the sustainability transition. They may act as a booster for structural change in the economy, reshaping the sectorial industry mix by stimulating improvements in the technological system and new combinations of domestic production and consumption process influencing the overall sustainability performances of the economic system (Speck and Zoboli, 2017). Stringent environmental policies may release twofold benefits: reducing environmental impacts and improving economic performances through greater eco-innovation due to higher competition (Costantini and Mazzanti, 2012; Porter and Linde, 1995). In this context, environmental innovations (Barbieri et al., 2016; René Kemp, 2010) are one of the most crucial enabling factors for the ecological transition by improving resource efficiency, reduction of materials extraction and the generation of waste (Speck and Zoboli, 2017). Nonetheless, environmental innovations can be hindered by a set of barriers such as financial constraints, high risks and organizational inertia (Ambec et al., 2013; Speck and Zoboli, 2017), which are especially strong in small and medium firms (SMES), that represents about the 93 per cent of the European total enterprises (Executive Agency for Small and Medium-sized Enterprises. et al., 2021).

The great public effort in terms of incentives in the forms of public policies and funds will help European firms to internalize part of the benefits of EIs, while reducing their innovation risks (Marin et al., 2015), and favoring a mass green technological change with important benefits for society at the same time (Popp et al., 2010). Technological change towards environmentally sustainable production models can lead to win-win situations in which environmental quality improvement and economic growth coexist by reducing the cost of achieving environmental objectives for society (Barbieri et al., 2016). This is well explained by the so-called 'Porter hypothesis' (Porter and Linde, 1995) which states that well-designed environmental regulations can translate into Pareto improvements leading to "innovation offsets" that can improve environmental performance and compensate for the additional cost of regulation. These are due to the increasing profits and competitiveness of the regulated sector that had obtained improvements in their products or their production processes compared to non-regulated ones (Ambec et al., 2013). Following Jaffe and Palmer (1997), one can identify mainly three different versions of Porter hypothesis: 1) "weak" which states that environmental regulations may spur innovation in general; 2) "narrow", indicating that flexible regulations have greater incentives for firms than prescriptive ones in terms of flexibility for compliance and 3) "strong" stating that innovation offsets may overcome regulatory costs increasing in an overall increase of competitiveness of a sector (or a nation) (Ambec et al., 2013; Jaffe and Palmer, 1997).

The 'Porter hypothesis' theoretical framework can be applied at micro- and meso-level considering firms or sectors respectively, alternatively, the Porter hypothesis may be tested at macro level considering regions and nations. Therefore, the analysis of the impact in a 'Porter hypothesis' view of the new EU green policy framework in terms of waste management and circularity would be remarkably interesting in terms of the potential domestic and international competitiveness of European countries. But this is extremely complicated for two main reasons. The first is that even if the 'Porter hypothesis' has a strong theoretical appeal, empirical evidence is unclear (Barbieri et al., 2016). Secondly, the difficulty of applying the 'Porter hypothesis' framework is even more complicated when one considers that this political process is still ongoing and counterfactual analyses are not possible.

2.2. Waste Management and Circular Economy

As Periathamby (2011) stated, waste represents a by-product of human activities investing in every aspect of social and economic life. The current aim of the European Union is to find a strategy to promote waste prevention and apply a waste management hierarchy. According to van Ewijk and Stegemann (2016), the Waste Hierarchy (WH) concept originates from prioritizing reduction, recycling, and reuse of waste over treatment or disposal. In 2008, the WH principle was included in the Waste Framework Directive 2008/98/EC (WFD) (European Parliament and Council, 2008). It was subsequently transposed into the national law of European Union (EU)

Member States. The European WFD defines the waste hierarchy as the priority order of operations to be followed in waste management: prevention, preparing for reuse, recycling, other recovery (including energy recovery), and disposal. In 2015, the Circular Economy Strategy from EU COM/2015/0614 (EU Commission, 2015) defended the role of waste management based on a waste hierarchy as the way to lead to the best overall environmental outcome and to get valuable materials back into the economy. Although there are attempts to quantify waste operations by a single indicator, there is still no shared consensus (Pires and Martinho, 2019), nevertheless, WH is present in all national and international regulations as a tool to promote the implementation of the Circular Economy (CE). Despite the concept of CE has been extensively investigated by the current literature, for the CE a commonly accepted conceptual framework does not exist yet, and CE builds its strength based on several concepts developed since the late 20th century². It shares, for example, the tentative idea of surpassing the current open-ended economy by relating to Boulding's idea of a spaceman economy. CE also calls for the application of integrated, productive processes in line with the industrial ecology of Frosch and Gallopoulos (1989). Later on, the CE concept was combined with different notions, e.g. clean production (de Jesus et al., 2018; de Jesus and Mendonça, 2018; Kalmykova et al., 2018), product-life extension, material efficiency (Rashid et al., 2013), product- service systems (Stahel, 1982), Cradle-to-Cradle (McDonough and Braungart, 2002). Many relevant definitions embrace the holistic dimension in which the CE concept lies. Among the others, the Ellen MacArthur Foundation recognizes CE as an industrial economy that is restorative by intention; aims to rely on renewable energy; minimizes, tracks, and eliminates the use of toxic chemicals; and eradicates waste through careful design (Ellen MacArthur Foundation (2013), p. 22). The EU Commission, in turn, defines CE as an economy where the value of products, materials and resources is maintained in the economy for as long as possible, and waste generation is minimized (p. 2). Against this background, it emerges that CE strives for a new approach based on minimizing resource use and waste accumulation by creating continuous cycles of materials. The current linear model indeed exceeds the environmental capacity. So, as the availability of resources and the regenerative capacity of renewable sources are depleted, multiple economic consequences will emerge, such as increasing prices, materials shortage or dependence. Given these assumptions, recycling is typically referred to as one of the strategies of the WH to move from a linear to a circular economy (Alaerts et al., 2019). Still, as Iacovidou et al. (2017) pointed out that the recycling rate is not a measure of the goodness of the overall waste operations quality, efficiency, and sustainability, since it can show only the waste that is re-entering the economy. It represents only a segmented indicator.

As Mazzarano et al. (2021) state, the waste role is more ambiguous in a circular economy where actions range from waste prevention to allowing waste production as a source of material and resources. This ambiguity generates a sort of duality in the common view: on the one hand, a stringent environmental policy - could improve the overall environmental quality by increasing the level of eco-innovation and implementing in this way the CE; from another hand, decreasing waste production could mean reducing the amount of waste that - in such a way- is the feed of the circular model increasing the intrinsic value of waste and making it even more attractive to countries where the policy is not stringent. What emerges is that maintaining the current stock of resources constantly became, therefore, a challenge. The WH recognizes prevention as the first step of environmental strategies and policies (Mazzanti et al., 2022), reducing waste and recycling human activities' by-products. Overall, the approach of CE regards: A) reduce new resources' extraction, favour efficient exploitation, and prioritize renewable materials; B) extend products' life through practices, e.g. of, repair, remanufacturing and reconditioning; C) valorize waste through recycling and integrated production process.

2.3 The EU Policy Framework on Waste and Circular Economy

The European Green Deal (EGD), introduced at the end of 2019, represents Europe's comprehensive strategy for a sustainable future (European Commission, December 2019). It serves as a long-term roadmap to transform the EU economy into a carbon-neutral by 2050, and resource-efficient. Due to its complexity, many new policies and

² In their work, Kirchherr et al. (2017) have identified 114 different definitions of CE

measures have been issued at both EU and national levels. Among the others, in March 2020 a New CE Action Plan (COM(2020)98 final) was proposed, by underlying the pivotal role of CE in scaling up the transition toward zero carbon emission, the decoupling of economic growth from resource use, while guaranteeing competitiveness and social just (European Commission, 2020).

From a CE perspective, resources must remain in the cycle for as long as possible by minimizing the need for new raw materials extraction and waste accumulation into landfills. Indeed, current patterns of production and consumption put tremendous pressure on the ability of the environment to continue providing its services for the foreseeable future. This means a progressive degradation of natural biodiversity and the impossibility of guaranteeing development for present and future generations, which lies precisely in maintaining the quality and quantity of natural capital stable (Dasgupta, 2021).

To meet the demands of a new circular model, the European Union has worked to ensure more sustainable waste management in recent years. This concerns the development of a new vision, no longer aimed at the correct and safe management of waste into landfills, but at preventing waste generation, preserving the value of waste, and putting it back into the production cycle. In accordance, recent literature has recognized the central role of waste management in supporting environmental sustainability and the development of a circular economy. Specifically, numerous studies on the subject (e.g. Stahel, (2016); Fellner et al., (2017); Aghbashlo et al., (2019); Zeller et al., (2019)) have confirmed that more efficient resource management and the reduction of waste produced cannot prescind from the design and implementation of new waste management systems. For instance, as pointed out by Stahel (2016) and Ranjbari et al. (2021), while mainstream WM is aimed at preventing waste from being dispersed in nature by minimizing costs of collection and disposal, differently in a circular economy perspective, WM systems should process waste to favour its reinjection in the economy, hence avoiding new virgin materials' extraction.

As Chioatto and Sospiro (2022) highlight, in the last twenty years, EU has framed a comprehensive regulatory action aimed at shifting WM practices, based on end-of-stream solutions, to SWM systems focused on strengthening the relation between waste treatment and resource recovery (See Table 1 for a summary of the main EU Directives on waste). Specifically, to enable the reintegration of waste as a resource within the economic cycle». For this purpose, the waste hierarchy concept has been placed at the heart of the plan to achieve more sustainable waste management within Member States. The waste hierarchy provides an order of priority in waste management, and as Fig. 1 shows, waste prevention is the most preferred option, followed by reuse, recycling, recovery and ultimately disposal. Focusing on municipal waste, in the First 2015 CE Package, the EU has revised the main directives on waste, Dir 2008/98/EC (waste), Dir 1999/31/EC (landfill), Dir 94/62/EC (packaging), that were definitively amended on the 30/5/2018 with the new Dir 2018/851, Dir 2018/850, and Dir 2018/852.

For this purpose, the EU has set different MW management targets that Member States have to achieve by developing effective systems of waste-separated collection. For instance, by 2020 the reuse and recycling of waste materials (such as paper, metal, plastic and glass) from households shall be increased to a minimum of overall 50% by weight, and by 2025, the preparation for reuse and recycling of municipal waste shall be increased to a minimum of 55%, 60% and 65% by weight by 2025, 2030 and 2035 respectively. In addition, MSW landfilled should be reduced to less than 10% of the total MSW generated by 2035 (Directive 2018/851). Monitoring activities are, therefore, fundamental to understanding where we stand in the transition from WM to SWM to CE, which means what effect European policies have had and what obstacles need to be corrected.

First, it is essential to identify and analyze SWM performances that member states have achieved since the WFD came into force. Next, understand whether efforts and achievements are taking place homogeneously across the different states, thus whether policies can trigger a convergence process that allows for a transition that is not only circular but also equitable. In relation to this, recent studies have shown that the WFD has produced positive

results in increasing recycling rates and decreasing landfilling. However, the transition path appears heterogeneous within EU countries.

Among others, Marin et al. (2017) Castillo-Giménez et al. (2019a) and Castillo-Giménez et al. (2019b) revealed that there are still significant differences in the treatment of MSW: Northern and central EU countries report high recycling and incineration rates, however, Mediterranean and Eastern countries still dispose of large amounts of waste in landfills. Furthermore, despite these efforts and major improvements in waste management, the total amount of waste generated has not significantly reduced. Still, all EU economic activities generate 2.5 billion tonnes of waste, and households produce nearly half a tonne of municipal waste on average. In addition, the presence in certain EU countries of low recycling rates and low-quality recycles highlights the need for more efficient waste collection systems. For this reason, the EU Commission is revising the WFD to align waste management with the waste hierarchy and comply with the polluter pays principle European Commission (2020).

On the other side, it should be questioned and monitored, as Fellner et al. (2017) pointed out, whether increasing quantities of recyclable materials also effectively translate into increased secondary raw materials used by EU firms. Indeed, strengthening waste policy cannot effectively transition to a circular model. In this case, it is essential that, where waste management effectively saves resources that would otherwise be discarded, there are systems for feeding secondary materials back into new production cycles, thus saving new extractions of virgin materials. This requires overcoming the challenges connected with secondary raw materials' safety, availability, performance and cost, which hinder the creation of a well-functioning market able to compete against primary resources. Secondly, firms must be able to integrate secondary raw materials into their production processes and thus increase their share of the total resources used to manufacture goods. In this concern, the New CE Action Plan plans to introduce requirements for recycled content in new goods, preventing the mismatch between secondary raw material demand and supply. The EU plans to double its circular material use rate in the coming decade. Besides this, the Plan further foresees waste reduction targets and clarifies actions to favour reuse, repair and recycling. In addition, the Critical Raw Materials Strategy aims to support research and innovation on critical raw materials, significantly improving collection rates, recycling efficiency, and recovery and extending producer responsibility for these materials.

Table 1. EU legal framework on waste and circular economy.

	Objective	Targets
Waste Framework Directive (Directive 2018/851 of the European Parliament and the Council on amending Directive 2008/98/EC on waste)	Creates a legal framework for treating waste in the EU, intending to protect the environment (reduce raw material extraction and enhance resources' use) and human health. For this purpose, it favours recovery and recycling techniques.	• Set minimum requirements for extended producer responsibility schemes • Strengthen rules on waste prevention • Set municipal waste targets: by 2025, at least 55% of municipal waste by weight will have to be recycled. This target will rise to 60% by 2030 and 65% by 2035. • By 1 January 2025, separate collection of textiles and hazardous waste generated by households • By 31 December 2023, biowaste should be collected separately or recycled at source
Landfill Directive (Directive 2018/850 of the European Parliament and of the Council amending Directive 1999/31/EC on the landfill of waste)	Introduces more stringent requirements (technical and not) to prevent or reduce as much negative impacts (e.g. on surface water, groundwater, soil, air or human health) from waste landfilling.	• Restrictions on landfilling: from 2030 all waste that is suitable for recycling or other material or energy recovery • Municipal waste landfilled should be limited to 10% by 2035 • Introduces rules on calculating the attainment of municipal waste targets • Requires EU countries to create an effective quality control and traceability system for municipal waste landfilled
Packaging and Packaging Waste Directive (Directive 2018/852/EC 2018/852 of the European Parliament and the Council amending Directive 94/62/EC on packaging and packaging)	Introduces more stringent measures, on the one hand, to prevent the production of packaging waste, and on the other, to better manage packaging residual through reuse, recycling and other forms of recovering packaging waste, in line with circular economy objectives.	• By 31 December 2025, at least 65% by weight of all packaging waste must be recycled. Includes targets per material: – 50% of plastic – 25% of wood – 70% of ferrous metals – 50% of aluminium – 70% of glass, and – 75% of paper and cardboard. • By 31 December 2030, at least 70% by weight of all packaging waste must be

waste).		recycled. Includes targets per material: – 55% of plastic – 30% of wood – 80% of ferrous metals – 60% of aluminium – 75% of glass and – 85% of paper and cardboard.
Batteries Directive (Directive 2018/849 of the European Parliament and of the Council amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment).	It aims at reducing the amount of hazardous substances dumped into the environment (e.g. mercury, cadmium and lead). First, it ban the placing on the market of certain batteries or accumulators with a mercury or cadmium above a fixed threshold. Secondly, it boost the increase of collection rates, reuse and recycling of waste batteries.	● Prohibits batteries: – containing more than 0.0005% by weight of mercury – containing more than 0.002% by weight of cadmium ● Encourages end-users to discard spent batteries at collection points in their vicinity or to take them back at no charge by the producers ● Producers (or third parties acting on their behalf) have to bear the net cost of collecting, treating and recycling industrial, automotive and portable batteries
WEEE Directive (Directive 2012/19/EU of the European Parliament and of the Council on waste electrical and electronic equipment (WEEE) (recast 2018/849/EC))	Encourages sustainable production and consumption. Specifically, it aims to prevent the creation of waste electrical and electronic equipment (WEEE), promote WEEE recovering practices (i.e. reuse, recycling), and favour the recovery of valuable secondary raw materials.	● Provides a categorization of WEEE (e.g. small and large equipment temperature exchange equipment, screens, lamps and small IT and telecommunications equipment) ● Foster cooperation between producers and recyclers to design electrical equipment which can be reused, disassembled or recovered ● Reduce the unsorted WEEE disposal in municipal waste ● Ban the disposal of WEEE collected separately that has not been properly treated ● Set a minimum annual WEEE collection rate: a target for collection of 85% of the total WEEE generated.
End-of-Life Vehicles Directive (Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of-life vehicles)	Establishes measures to prevent and reduce waste from end-of-life vehicles (ELVs) and their components through the promotion of their reuse, recycling and recovery.	● Manufacturers must ensure that new vehicles are: – reusable and/or recyclable to a minimum of 85% by weight per vehicle – reusable and/or recoverable to a minimum of 95% by weight per vehicle. – avoid the use of hazardous substances (e.g. lead, mercury, cadmium and hexavalent chromium) ● Manufacturers, importers and distributors shall guarantee collection systems for ELVs and, whether technically feasible, used parts from repaired cars. ● Manufacturers must meet all, or the majority, of the costs involved in delivering an ELV to a waste treatment facility.
Waste Shipment regulation (Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste)	It controls waste shipment in compliance with environmental protection the provisions of the Basel Convention and the revision of the OECDs' 2001 decision on the control of transboundary movements of waste addressed to recovery operations.	● Parties involved in waste exchanges shall ensure that waste is managed in an environmentally sound manner ● Exports to non-EU countries of waste for disposal are prohibited ● Exports for recovery of hazardous waste are prohibited (except for those directed to countries to which the OECD decision applies) ● Imports from non-EU countries of waste for disposal or recovery are prohibited, with some exceptions.

Source: Own elaboration



Fig. 1. Waste Hierarchy

Source: EU WFD

3. Main trends on waste and circularity of materials

3.1 Data description

In this section, the main trends observed in terms of CE and waste management in European countries are shown. The data employed are from several Eurostat datasets focused on material circularity and waste management at EU level, considering both members and not members states. The main databases used in this paper are the Material flows and resource productivity and the Waste database from Eurostat. That database have been recently updated and offers a vital picture at macro level on material and waste management strategies at the country level, covering a timeframe of twenty years from 2000 to 2020. Data have been elaborated and ranked through Excel sheets, tables and graphs to give a clearer interpretation to the reader on the main trends that occurred among European selected countries in the last twenty years. By doing this, our analysis offers an introductory depiction of the results obtained in terms of decoupling and circularity in Europe. The trends analysis considers different aspects detailed in the sub-sections below.

3.2 Material Flow Accounts

These indicators are part of the Economy-wide material flow accounts (EW-MFA), a multi-purpose information dataset which provides an aggregate overview of the material flows within European countries' economies. The EW-MFA provide a rich empirical database for numerous analytical purposes; the indicators used in this analysis are: the Domestic Material Consumption per capita, the national Resource productivity, the Material import dependency and the Circular Material Use rate. All of those are expressed in different forms (e.g. total quantity, percentage, value, or quantity of waste per capita). As stated by Eurostat, the EW-MFA database covers solid, gaseous, and liquid materials, except for bulk flows of water and air (EW-MFA, 2022).

3.2.1. The Domestic material consumption per capita

The Domestic Material Consumption (DMC) is the most relevant indicator informing on material use by a given economy used in the literature for quantitative analyses on the circularity and material efficiency at the macro level (Bianchi et al., 2020). Combined with other socio-economic variables it can provide important information in terms of socio-metabolism (Krausmann et al., 2008) of an area with indications of the interactions and the coupling between society and the environment (Bianchi et al., 2020; Fischer-Kowalski et al., 2011). DMC is defined as the total material directly used in an economy equal to the domestic extraction plus the imports for inputs minus the exports of material extracted (EW-MFA, 2022). In this paper is used the DMC per capita as a measure of resource coupling of the economy for each domestic resident, and it represents all the net material extracted for productive purposes within a country per inhabitants³. It can be considered as an interesting measure of socio-metabolism to observe potential decoupling occurred over time. DMC per capita is based on the EW-MFA which considers the overall material inputs into national economy in tonnes per capita. EW-MFA covers all solid, gaseous, and liquid materials, except water⁴ and air.

The average of DMC for the EU27 in the last twenty years did not change much, staying stable 15 Tonnes per capita. Still, data show important heterogeneities among countries with different trends over time. The majority of countries considered shown a stable level of DMC per capita, such as Belgium (15 Tonnes), Sweden (22 Tonnes) and Finland (34 Tonnes), even if with some dispersion over the timeframe considered. On the other hand, some countries shown a descending trend of DMC per capita, suggesting the decoupling of their economies or a general reduction of material extraction, whereas others showed an increasing trend of DMC per capita. Those showing a critical decreasing level of DMC are: Italy, Ireland, Spain, Iceland and Greece, with an overall reduction of the

³ For the 'per capita' calculation of the indicator the average population is used (the arithmetic mean of the population on 1st January of two consecutive years) (EW-MFA, 2022).

⁴ Water embedded in products is included (EW-MFA, 2022).

DMC per capita larger than 30 per cent⁵. Increased efficiency of material explains this use both domestic and from an increase in the imports of materials which both indicate a decoupling of domestic economic activities or otherwise, by a rise in exported extracted materials to other countries.

Conversely, other East European countries have experienced a substantial increase in DMC per capita over the last twenty years, especially those which experienced higher levels of economic growth such as Poland (+25 percent), Bulgaria (+65 per cent) and Romania (+275 percent). This may also depend on the overall growth of economic activities after the beginning of the last century in Easter Europe due to cheap labour costs, which attracted an essential flow of investment from Western countries (Bianchi et al., 2020). Sweden is the only non-Eastern European country that experienced an increase in DMC per capita, with a total variation in the timeframe of +22 per cent. Figure 2 is shown the trend of a set of selected European countries from 2000 to 2020.

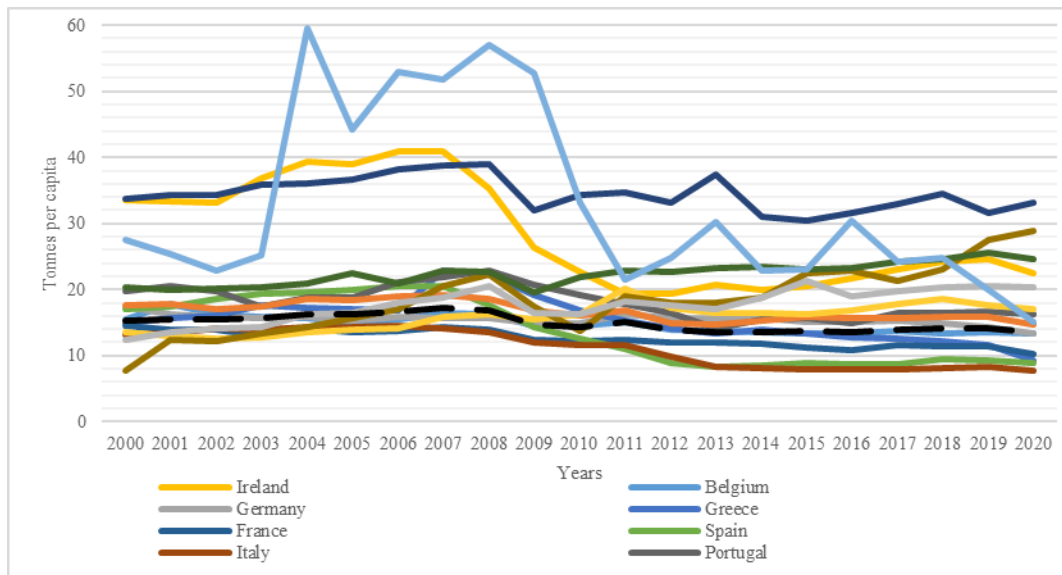


Fig. 2. DMC per capita (Tonnes per capita) for selected European countries and EU27 from 2000 to 2020.

Source: authors' elaboration on EW-MFA (2022) data.

3.2.2. The Resource productivity indicator

The resource productivity indicator is part of the EW-MFA (EW-MFA, 2022) data from Eurostat, and it is calculated as the ratio of gross domestic product (GDP) over domestic material consumption (DMC) using various units of measurement. This indicator reflects the GDP generated per unit of resources the economy uses, which can be presented alongside labour or capital productivity (EW-MFA, 2022). In this work, we used the resource productivity indicator expressed in terms of GDP in current prices expressed in purchasing power standard (PPS)⁶ (Eurostat, 2022a) per Kilogram of DMC to remove differences in relative purchasing power across countries to increase comparability (Figure 3) and using the resource productivity with index the year 2000⁷ to show the development of aggregates excluding inflation (Figure 4).

⁵ It has been calculated considering the overall variation rate between 2000 and 2020.

⁶ PPS is a fictional currency unit which considers purchasable parity among countries. The same amount of goods and services can be bought in each country. PPS are derived by dividing any economic aggregate of a country in national currency by its respective purchasing power parities (Eurostat, 2022a).

⁷ Index, 2000=100 (based on GDP in chain-linked volumes normalized to 2000 prices) (EW-MFA, 2022)

European countries generally experienced increased resource productivity during the period considered. On average, the EU27 countries show a value of 1.67 PPS per Kilogram of material extracted over the twenty years, with an overall variation of +86 per cent. As above, significant heterogeneities are evidenced among European countries in terms of value created, with best-performing countries showing average values above 2 PPS per Kilogram, such as Italy, Spain, Belgium and France. In contrast, all the other set of countries considered showed values higher than 1, indicating value creation (values above 1 evidence GDP greater than DMC, therefore a more significant value creation than material extraction). Only Romania, Bulgaria, Poland, Estonia and Finland (those last four are not presented in Figure 3) have shown values lower than 1, indicating a higher level of extraction than GDP, suggesting inefficiency in the use of resources.

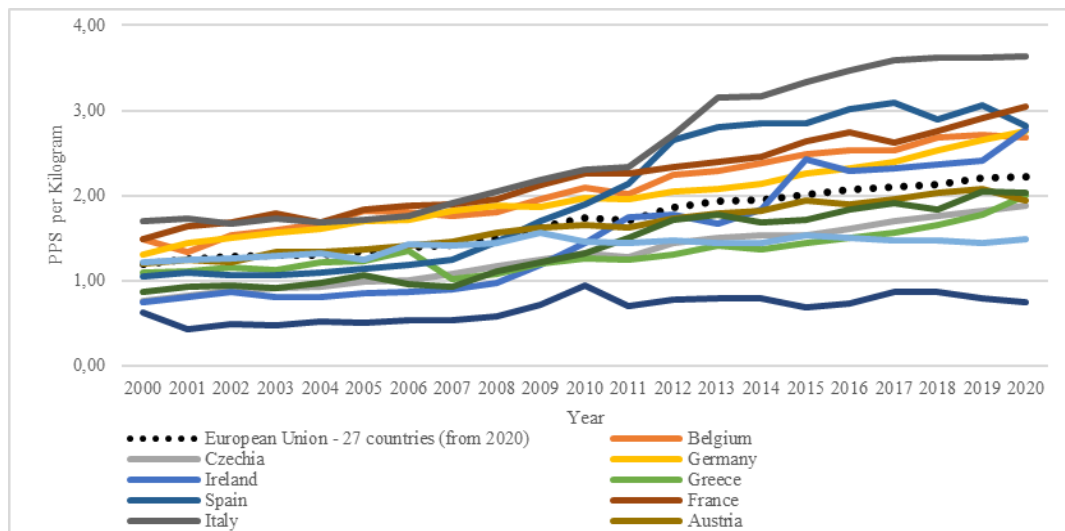


Fig. 3. Resource productivity in PPS per Kilogram of materials for selected European countries and EU27 from 2000 to 2020.

Source: authors' elaboration on EW-MFA (2022) data

In general, in terms of growth, all European countries had shown a positive growth rate of resource productivity, indicating that the GDP increased more than DMC and suggesting a partial decoupling, but not considering the potential outsourcing of material-intensive extraction and processing abroad (Bianchi et al., 2020). Figure 4 evidenced a positive increase in the resource productivity indicator compared to the year 2000, representing the baseline. Only Romania, as evidenced above, had experienced decreasing performances in resource productivity, suggesting a low level of efficiency in resource use.



Fig. 4. Resource productivity with index=2000 for selected European countries and EU27 from 2000 to 2020.

Source: authors' elaboration on EW-MFA (2022) data

3.2.3. the Material import dependency indicator

The material import dependency indicator is also part of the Eurostat EW-MFA dataset (EW-MFA, 2022). It is computed as the ratio between imports and direct material inputs (DMI) which indicates the direct input of material into the economy both from direct extraction and from imports⁸ (EW-MFA, 2022). It is expressed in the percentage of total imports on the DMI, and it indicates the importance of imports in meeting domestic material needs, value around zero indicate that a country does not rely on imports for its internal material needs, while values close to 100% indicate that no domestic extraction occurred and that the country totally on imports of materials from abroad to satisfy its material needs. The graphs in Figure 5 show the material import dependency indicator considering the total material⁹ processed within a country for a set of selected countries.

The average rate for EU27 countries is an import material dependency ratio of 23% along the time frame considered but with high variability among countries with values larger than 70% for the Netherlands and Belgium and around 20% for Romania, Poland and Bulgaria. Overall, during twenty years since 2000 the indicator remained stable for many countries (an increase of the ratio of less than 50%), indicating that the structure of how materials are processed within European economies did not change over time. Nonetheless, some countries increased substantially their dependency from imports on materials for their domestic productions with an overall increase of the indicator in the timeframe considered, such as Czechia (+55%), Greece (+79%), Poland (+64%) and Slovenia (+64%). The only countries that experienced a reduction of the indicator are Romania (-31%), Sweden (-17%) and Bulgaria (-1%). In contrast, all the others remained stable with an average growth of 23% along the timeframe considered.

Those above may suggest that within the EU, not many improvements have been made in terms of self-sufficiency of material use, but anyway, this indicator does not reveal the origin of the materials, therefore it may

⁸ DMI includes all materials of economic value and available for use in production and consumption activities. It is calculated as the sum of domestic extraction plus physical imports: $DMI = DE + IMP$. Where DE is the total amount of domestic extraction of material extracted within a country from the natural environment direct to other processing activities into the economy, and IMP indicates imports of products in their simple mass weight (EW-MFA, 2022).

⁹ The total physical imports in relation to direct material inputs for all the materials processed within the economy considering Biomass, Metal ores, Non-metallic minerals and Fossil energy materials extracted domestically or imported (EW-MFA, 2022)

also reflect an increase in the internal exchanges of materials within Europe itself in during the timeframe considered.

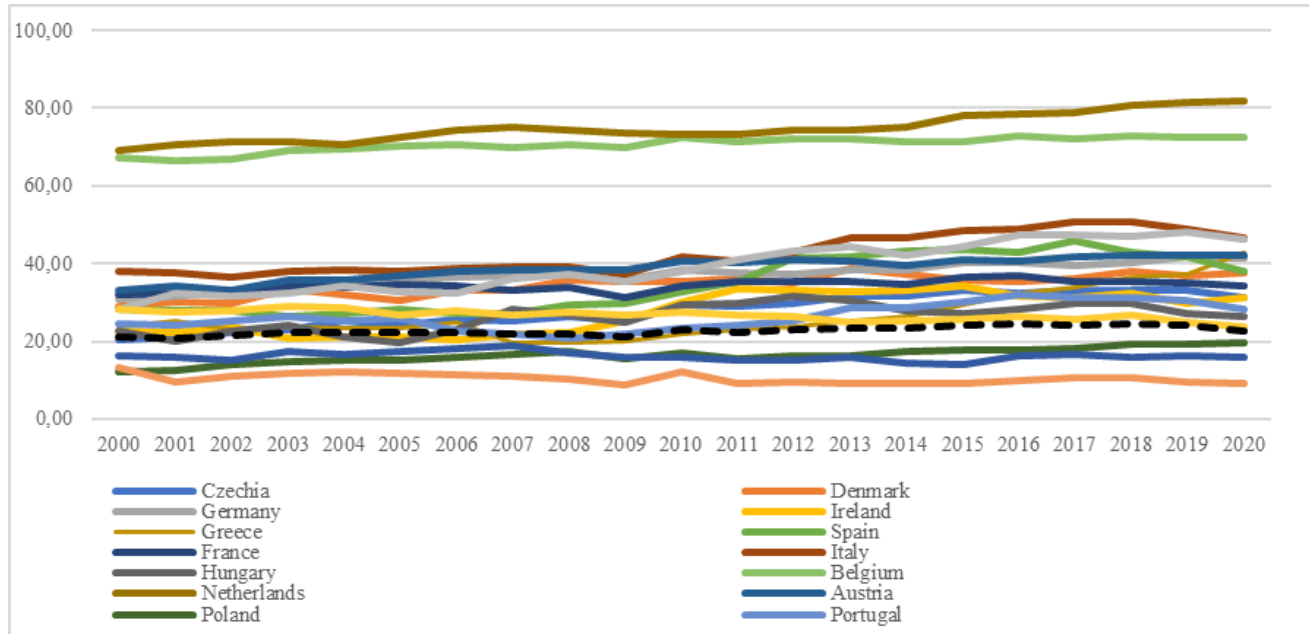


Fig. 5. Material import dependency indicator for selected European countries and EU27 from 2000 to 2020.

Source: authors' elaboration on EW-MFA (2022) data.

In terms of single materials, the indicator aggregated at EU27 country level, shows that, on average, material dependency on material imports related to metal ores and fossil fuel energy materials is the most important (Figure 6). Metal ores show an average of 59% over time, even if the dependency in the period considered has been reduced by -21% from 2000 levels. Whereas, for fossil energy materials, the time average of the material import dependency indicator is 61%, with an increase in the overall time frame of 21% from 2000. On the other hand, the average values for biomass and non-metallic materials are 11% and 3%, respectively, with an overall variation rate of 26% and 19%.

These elements evidence the structural dependence of many European countries on imported fossil energy materials and metallic materials. On the other hand, they highlight an essential independence for relying on biomass and non-metallic materials. This reflects the weakness of the natural endowments of European economies in terms of strategic input materials for manufacturing and the industry (both heavy and non-heavy), indicating that structural changes in terms of reliance on inputs for production may be needed in the future and that the twin transition of the European economy may go in this direction. Moreover, the lower reliance on imports for biomass highlights the strong independence of Europe for food, timber and other natural resources strategic for food security.

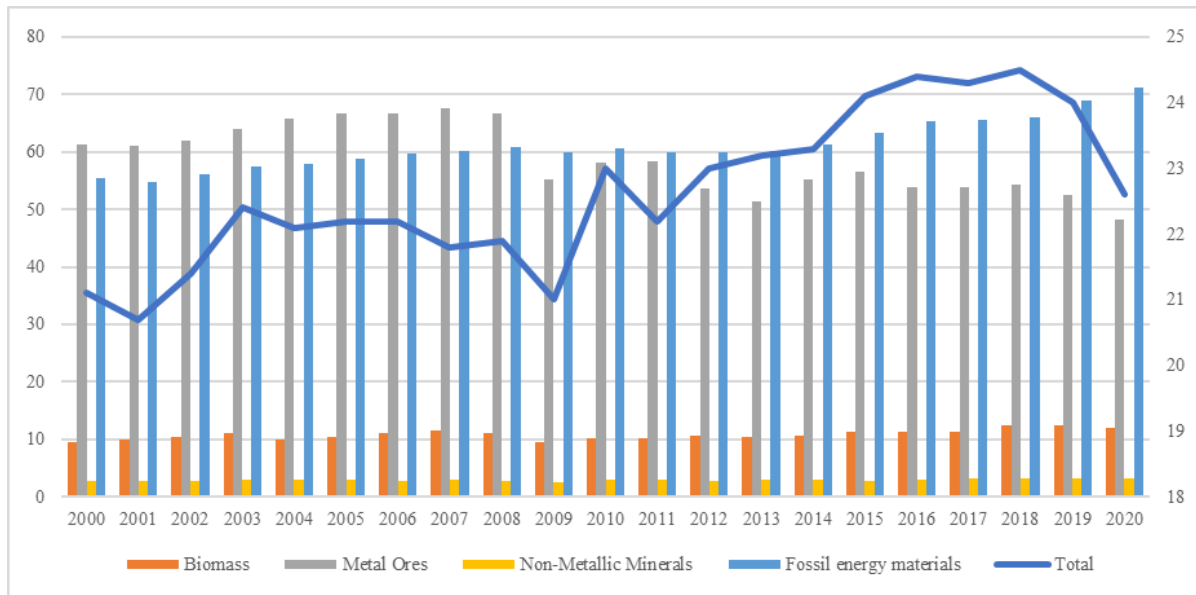


Fig. 6. Material import dependency indicator of Biomass, Metal ores, Non-Metallic minerals and Fossil energy materials for EU27 from 2000 to 2020.

Source: authors' elaboration on EW-MFA (2022) data.

3.2.4. The Circular Material Use rate

The circular material use rate, or circularity rate, is part of the material flow accounts of Eurostat (Eurostat, 2022b). The circularity rate is a proxy of circularity in European economies. This indicator measures the saving extraction of primary raw materials as the share of material recycled and fed back into the economy on the overall material use in a country's economy. It is computed as the ratio of the circular use of materials (U) to the overall material use (M), this last one is calculated as the DMC plus the circular use of materials in the economy ($M = DMC + U$)¹⁰ (Eurostat, 2022b). A higher circularity rate value suggests that more secondary materials are substituting primary raw materials increasing the overall circularity of the economy and reducing at the same time the impacts primary material extraction on the environment (Eurostat, 2022b).

The graph in Figure 7 shows the trends of circular rate for EU27 and selected countries along the horizon 2010-2020. Some countries are well above the EU27 average of the period (11%), with good performances of circularity in their economies, such as France, Belgium and Italy, respectively with 19%, 18% and 17% of circularity rate. The best performer is the Netherlands, with an average circularity of 28%. On the other hand, many other countries are performing less than the EU27 average such as Slovenia and Finland with a circularity rate of 9% and Denmark showing an average rate of 8%. The worst average performers over the period are Bulgaria with a circular rate of 3%, Portugal and Romania with 2%.

In figure 8 is shown the circular rate divided into a class of materials. The figure shows a more or less constant level of circularity among different classes of materials with high-levels of circularity rate around 24% for metal ores, 15% for non-metallic minerals and 9% for biomasses. Fossil energy materials show the lowest rate of

¹⁰ The circular use of materials (U) is approximated by the amount of waste recycled in domestic recovery plants (RCV_R) minus imported waste destined for recovery (IMPw) plus exported waste destined for recovery abroad (EXPw). RCV_R is approximated by the amount of hazardous and non-hazardous waste treated in recovery plants excluding amounts used for energy recovery and backfilling (recovery operations R2 to R11 as defined in the Waste Framework Directive 75/442/EEC). European statistics on international trade in goods (ITGS) approximate the net imports of waste destined for recycling (Eurostat, 2022b). The circularity rate (CMU) is equal to: $CMU = U/M = ((RCV_R - IMPw + EXPw) / (DMC + (RCV_R - IMPw + EXPw)))$

circularity with a 2% average rate along the timeframe considered. The static performances on circularity rates suggest that there have been no noticeable structural, technological changes in terms of material recovery in the last decade and that the most important gaps to be reduced concern fossil energy materials.

Table 2 and Figure 9 shows the ranking of EU members in 2020 regarding circularity. The best performer is the Netherlands, Belgium, France, Italy and Estonia, reflecting the historical trends. In contrast, at the bottom of the ranking, a part of Romania and Bulgaria are also Latvia the 22nd place, Portugal at the 24th and Ireland at the 25th place in the European ranking. Again, these data highlight the strong heterogeneity among European countries in terms of circularity and material strategies. This evokes an essential element of diversity, suggesting that implementing directives in different countries leads to different results.

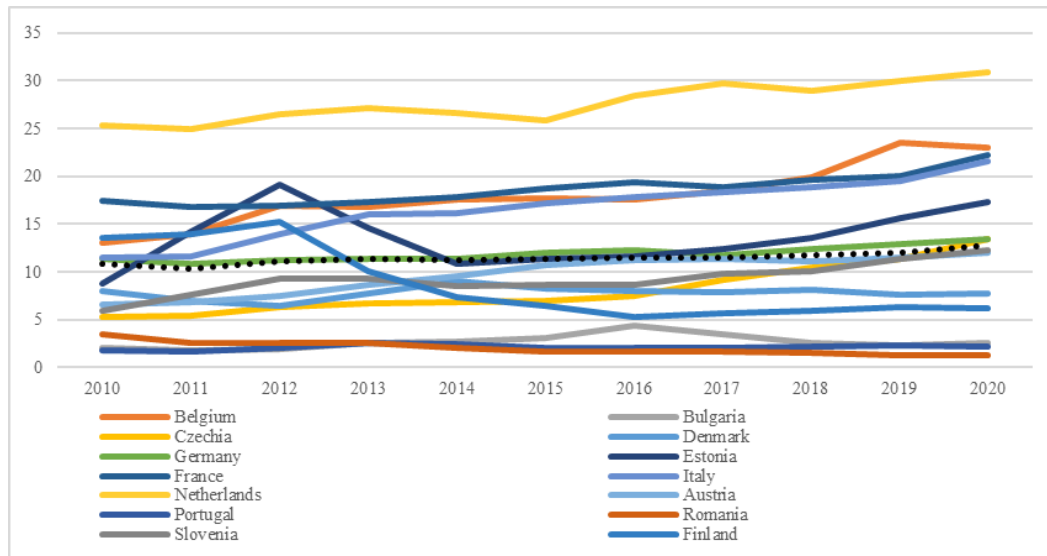


Fig. 7. The circularity rate for selected European countries and EU27 from 2010 to 2020.

Source: authors' elaboration on Eurostat (Eurostat, 2022b) data.

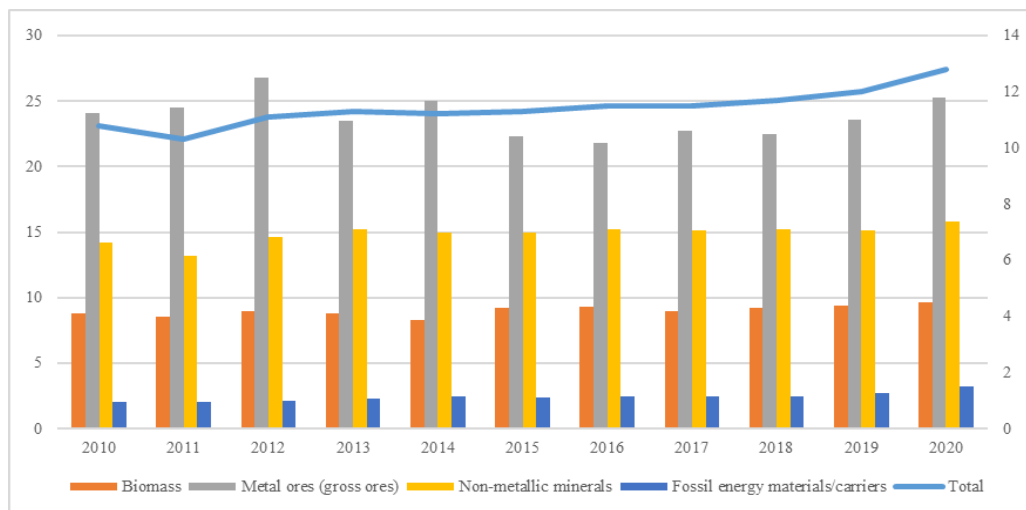


Fig. 8. The circularity rate for the EU27 by different type of materials: Biomass, Metal Ores, Non- metallic minerals and Fossil energy material from 2010 to 2020.

Source: authors' elaboration on Eurostat (Eurostat, 2022b) data.

Table 2. Circularity index ranking in 2020.

	Country	Circularity index
1	Netherlands	31
2	Belgium	23
3	France	22
4	Italy	22
5	Estonia	17
6	Luxembourg	14
7	Czechia	13
8	Germany	13
9	Slovenia	12
10	Austria	12
11	Spain	11
12	Poland	10
13	Hungary	9
14	Malta	8
15	Denmark	8
16	Sweden	7
17	Slovakia	6
18	Finland	6
19	Greece	5
20	Croatia	5
21	Lithuania	4
22	Latvia	4
23	Bulgaria	3
24	Portugal	2
25	Ireland	2
26	Romania	1

Source: Eurostat

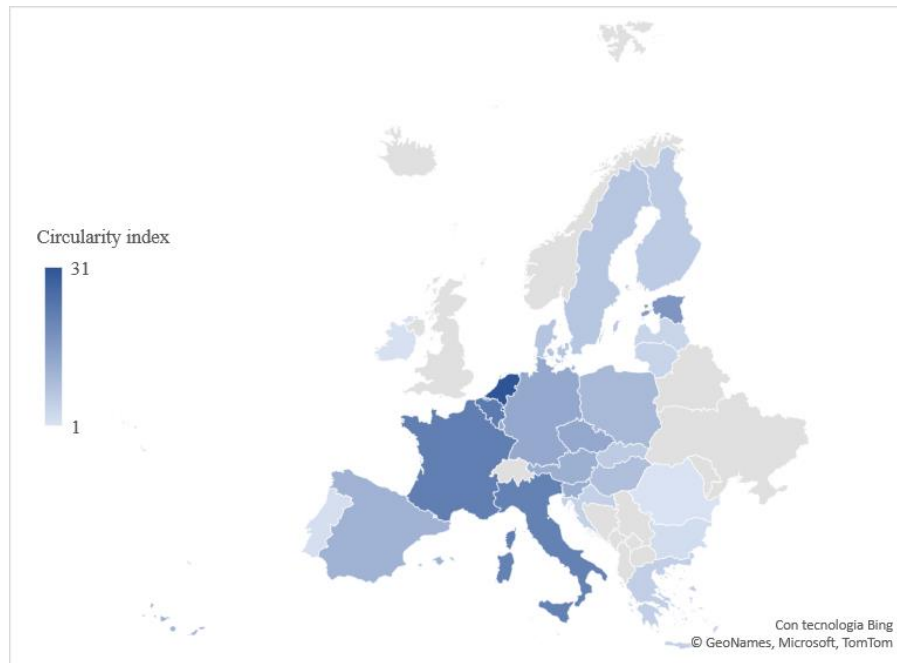


Fig. 9 Circularity index map in 2020.

Source: own elaboration on Eurostat data

3.3 Waste Management in the EU

To have a general picture of waste management in Europe, we employed the Waste database of Eurostat (Eurostat, 2022c). We focused on waste generation relying on the data from Eurostat on Municipal waste by waste management operations. We considered waste generated per capita divided into non-households and household waste generation to enhance comparability among countries.

This data is part of the Resource Efficiency Scoreboard (2022b), which illustrates the progress towards increased resource efficiency of Member States in the EU. This dataset covers between 2004 and 2020 generation of waste per inhabitant of all the European countries, excluding major mineral wastes, dredging spoils and contaminated soils (2022d). Municipal solid waste is not included and is exposed later on.

The data on waste generation remain mainly stable along the timeframe considered, with an average of 1.7 Tonnes per capita of waste produced at EU27 level without evident signal of reduction in waste production among countries, apart from Finland, which reduced its waste generation -43%, as did Hungary and Romania both by -41% and Austria by -34% (Figure 10). Just a few countries slightly increased their waste generation between 2004 and 2018; the most remarkable changes occurred in Bulgaria, Poland and Germany, with an increase of 42%, 38% and 27%, respectively.

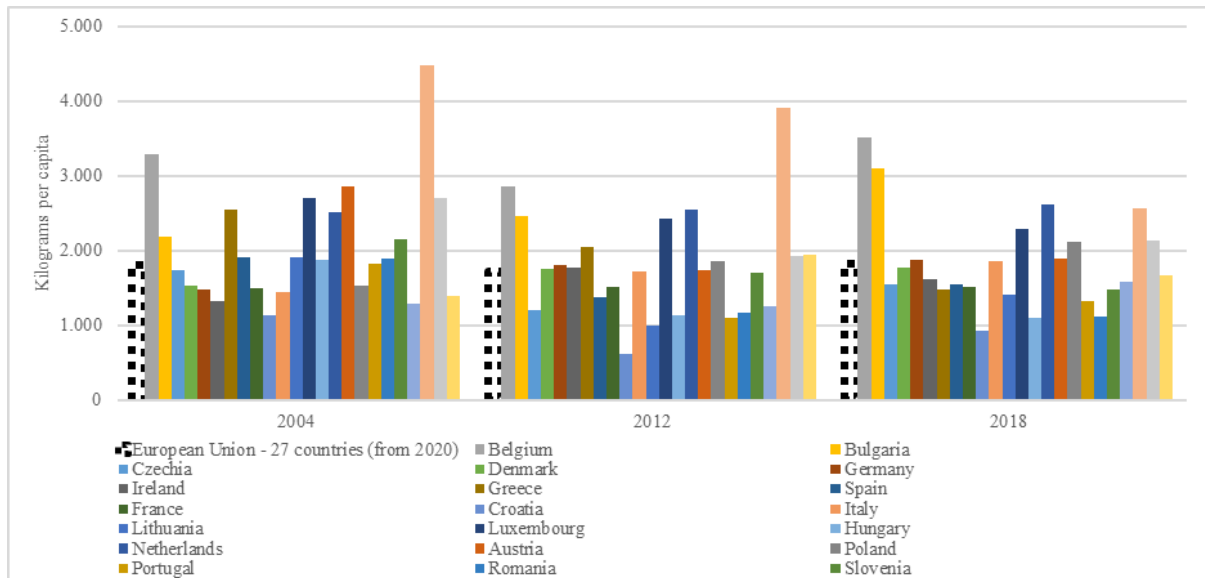


Fig. 10. Waste generation per capita in Tonnes of waste excluding MSW composition from 2004 to 2018 for EU27 and selected countries.
Source: Authors' elaborations from Eurostat (2022c).

Then we analyzed general trends of municipal solid waste (MSW), which can be considered as the waste produced principally by households¹¹ and collected by or on behalf of municipal authorities and disposed of through the waste management system (EW-MFA, 2022). Also, the total waste generation per capita for MSW has been stable among European countries. Still, the mix in the waste treatment operation evidenced some changes with an increase in the recycling of materials, a reduction in incineration and the disposal in landfills. Figure 11 shows the composition of MSW by treatment as an average of the EU27 members. In contrast, Figure 12 depicts the general trend of the EU27 average of incinerated and recycled waste per capita. In this last figure, it is possible to observe the reversal trends between the declining level of incineration and the increasing level of waste recycling.

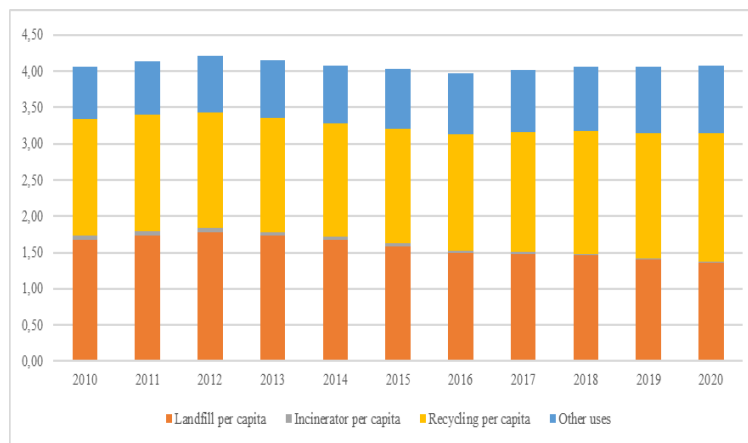


Fig. 11. Total MSW per capita composition from 2010 to 2020 in Tonnes of waste divided between: Landfill, Incineration, Recycling and Other uses. Values as average for EU27 member states.
Source: Authors' elaborations from Eurostat (2022c).

¹¹ Similar wastes from sources such as commerce, offices and public institutions are included. The amount of municipal waste treatment is reported for incineration (with and without energy recovery), recycling, composting and landfilling. Wastes from agriculture and industries are not included

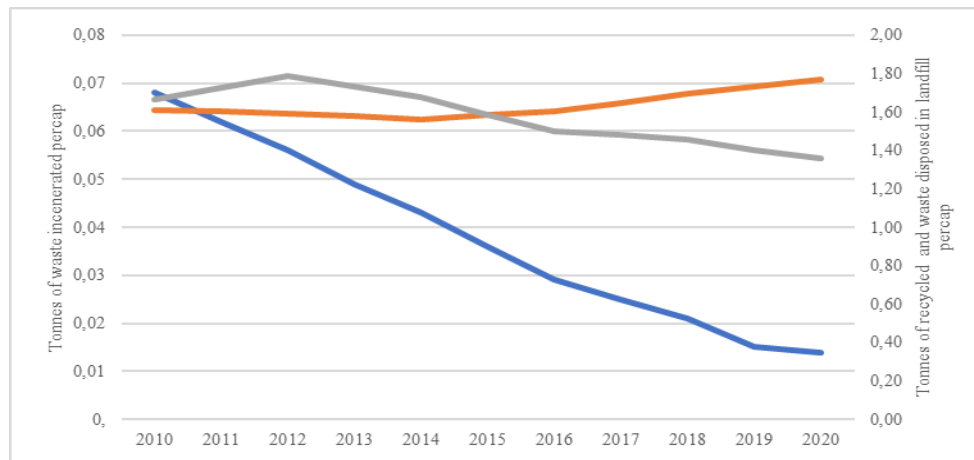


Fig. 12. Trend of incinerated and recycled waste per capita in Tonnes of waste from 2010 and 2020. Values as average for EU27 member states.

Source: Authors' elaborations from Eurostat (2022c).

According to Figure 12 the incinerated waste per capita at EU27 level fell from 0.07 Tonnes of waste per capita in 2004 to 0.014 Tonnes per capita in 2020. On the other hand, the level of recycled waste per capita at EU27 level increased from 1.61 Tonnes per capita in 2004 to 1.77 Tonnes per capita. Whereas the quantity of waste disposed in landfill per capita only slightly decreased along the timeframe passing from 1.67 Tonnes per capita in 2004 to 1.36 Tonnes per capita in 2020.

Individual European countries show important heterogeneities in terms of waste treatment. The amount of waste landfilled has been substantially reduced over time, especially for Denmark, Italy, Greece and Ireland, by -84.66, -69.73, -64.35 and -50.64 Tonnes per capita, respectively. Some countries experienced the opposite path, with an increase in landfill waste per capita between 2010 and 2020, such as Finland +50.71, Poland +27.87 and Romania 14.14 Tonnes per capita.

This general pattern of reduction of landfilled waste is also confirmed by the trend of recycled waste per capita, shown in 13 for a selected set of European countries. The figure shows a general convergence path towards around 2 Tonnes of waste recycled per capita, with a slight increase in all the countries between 2010 and 2020. The only exception is Finland which experienced a general reduction in the amount of recycled waste per capita falling from 5.4 in 2010 to 1.98 Tonnes per capita in 2020. This is also confirmed by the Recycling rate shown in Figures 14, 15 and 16 for two different subsets of countries. The indicator measures the share in percentage of recycled municipal waste in the total municipal waste generation, including material recycling, composting and anaerobic digestion (Eurostat, 2022c). Figure 15 shows the convergence trends towards the 'best-performing countries' for selected Western European countries, while Figure 16 depicts the same convergence path for Eastern and Mediterranean European countries. The two figures clearly show a difference in the convergence process between Western and Eastern Europe. The convergence in recycling rate growth occurred at a relatively constant path between 1998 and 2020 for Western countries; conversely, Eastern countries experienced a strong convergence path with the critical rate of recycling growth along the same timeframe passing from a meagre rate of recycling (around 0) towards the highest levels of recycling rate in Europe. For instance, Italy and Slovenia reached 2019 a rate recycling level above 50% as the best-performing Western countries.

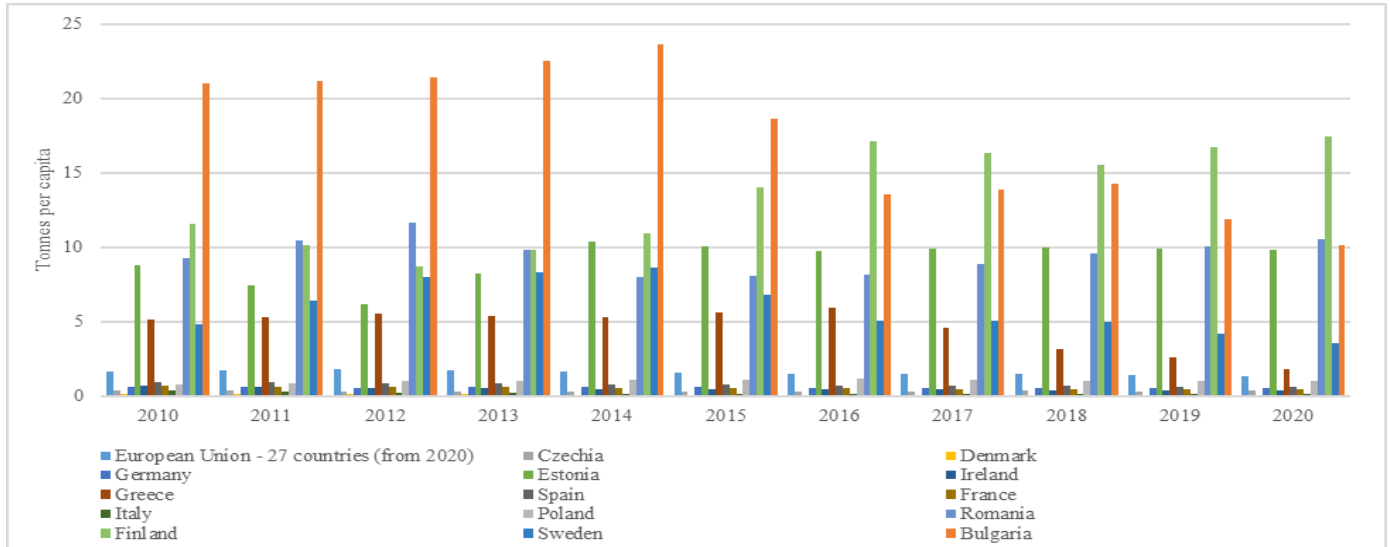


Fig. 13. Waste in landfill per capita for selected set of European countries from 2010 to 2020.
Source: Eurostat

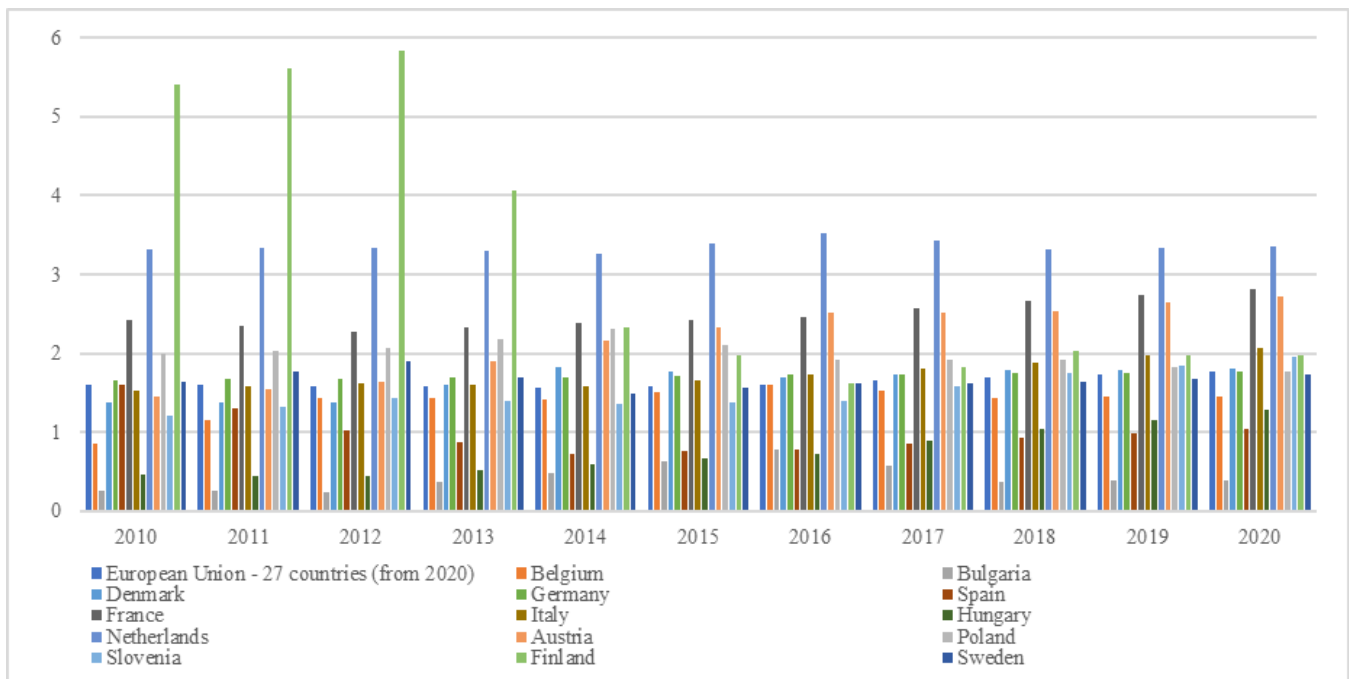


Fig. 14. Recycled Waste per capita for selected set of European countries from 2010 to 2020.
Source: Eurostat

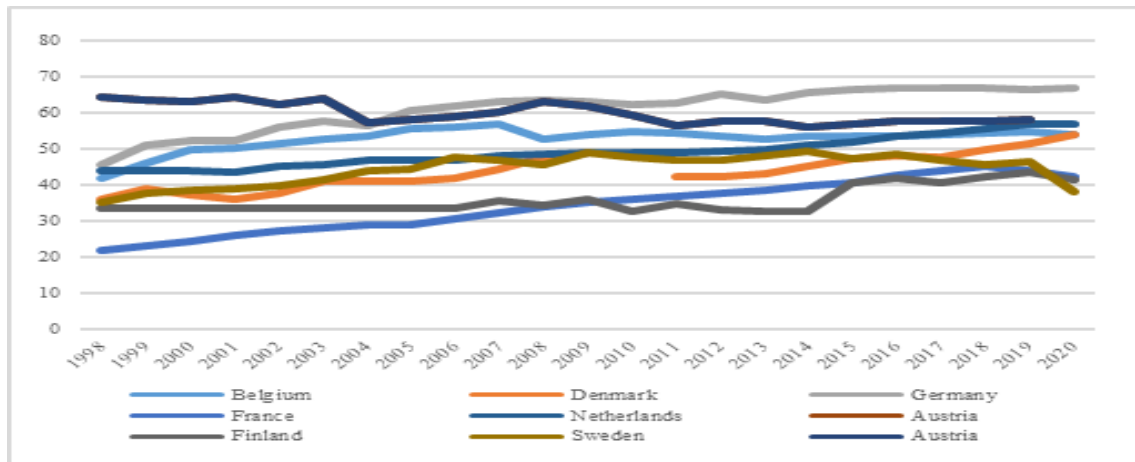


Fig. 15. Recycling rate of Western European Countries between 1998 and 2020.

Source: Eurostat

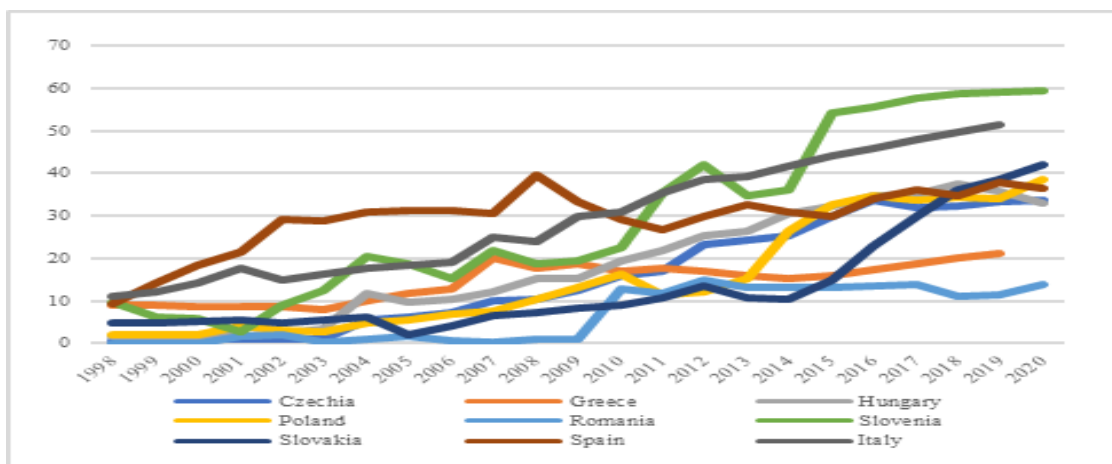


Fig. 16. Recycling rate of Eastern and Southern European countries between 1998 and 2020.

Source: Eurostat

Conclusions

The global order and challenges of the contemporary world are putting a strain on all economies. Governments and institutions strive for change, and an ever-stronger push towards sustainability.

For this reason, efforts are being concentrated on implementing recovery programmes that during (and after) the Covid-19 pandemic aim to support recovery sustainably. Programmes such as NextGenerationEU aim to invest in environmentally friendly technologies, introduce greener vehicles and public transport, and make our buildings and public spaces more energy efficient. Indeed, the energy crisis 2022 has put the world economy at a turning point, making it clear that the development and growth model followed so far is no longer viable. The transition towards a more sustainable economic, social and environmental model has put several issues on the scales, and the shift towards a circular economy is undoubtedly one of the most debated topics on which

governments and experts are focusing their attention. As discussed extensively throughout this paper, the economic literature (Kirchherr et al., 2017; McDonough and Braungart, 2009) has recognized the CE as a regenerative economic model, which proposes different business models to close the loop. In this context, a leading role is played by waste. CE offers a model in which waste does not exist, each product is designed to become something else once it reaches the end of its useful life (EMF 2013), and environmental policies and regulations are key in improving economic performance while reducing the environmental impact.

Monitoring this transition is a challenging task. Indeed, analyzing trends in waste and materials is one of our available tools. Following the WH we can have an idea on waste prevention, reuse and recycling by studying the trends related to the material flows, resource productivity and recycling. By doing this, it is possible to observe how heterogeneous the European countries are, which - although sharing a policy framework set by the European institution - show different convergence speeds. As the DMC and Circularity Material Use Rate analyzed above suggests, the average for the EU27 in the last twenty years did not change much, but data show significant heterogeneities among countries with different trends over time.

The same heterogeneity is visible also exploring the trend of resource productivity, which highlights different performances, especially looking at the differences between Western and Eastern EU countries that show a higher level of inefficiency in the use of resources. This indicates that radical technological innovation in terms of circularity and efficiency, which may have fostered a structural change in the EU by decoupling the economy from the natural system, has not occurred in the last two decades. As Porter's hypothesis suggests, this could also be the effect of delays in policy implementation that result in a reduction in economic performance. In addition, within the EU, few improvements have been made in terms of material use self-sufficiency. Indeed, what emerges quite clearly is the structural dependence of many European countries on imported fossil energy materials and metallic materials.

By analyzing trends in waste and circular material use, strictly related to implementing circular strategies, the marked difference and heterogeneity between the European countries becomes even more evident, reflecting a different geographical location and industrial structure.

Such a varied situation between different European countries is undoubtedly an obstacle to transition, especially if we look at the implementation of a circular economic model that implies deep links between different economies. By its conceptualization, the CE requires close contact between countries that must dialogue to exchange secondary raw materials (real or potential through waste recycling) and work together to create a model that can regenerate itself and ensure sustainable growth. The need for policies that can converge European countries towards the same results at the same speed is becoming increasingly apparent. Therefore, harmonizing EU members' national strategies can increase the likelihood of a successful European circular transition. These harmonized strategies can include standard policies, incentivizing tools, and monitoring methods to be shared among EU members, including some convergence mechanisms to help laggards converge towards best-performing countries.

The pattern of change in the EU over the last two decades is clear regarding waste management. A general reduction in the amount of waste generated has occurred among EU countries, with landfilling and incineration being replaced by recycling. Still, it has happened languidly over the last two decades. Also, in the case of waste management, a marked heterogeneity among a cluster of countries has been evidenced in this work. Again, it is emphasized that although the EU regulatory framework on circularity and waste management has clear objectives, the overall results of the European ecological transition plan are highly dependent on national implementation strategies and therefore, harmonization, cooperation and convergence mechanisms are needed.

The role of waste management in transitioning to the circular economy still needs to be determined. If on the one hand, waste reduction is imperative to achieve circularity; on the other hand, waste generation represents the 'raw material' for reuse activities (Mazzarano et al., 2021). The general concept of the circular economy could thus get trapped in a 'no-waste production system', which in reality needs waste for socio-economic activities, failing to self-sustain the system itself. Therefore, a deeper understanding of the interconnections between these two dimensions is needed, and further studies should go in this direction.

This paper introduced the topic of environmental policies in the European Ecological Transition Plan framework, trying to highlight an even closer link between policy, waste and CE, which represent three pillars of environmental transition. The general legal framework has been discussed after introducing some basic concepts of the Circular Economy and environmental policies. Then the main trends in terms of material use, circularity and waste management were examined using a descriptive and graphical visualization of data from the Material flows and resource productivity and the Waste database of Eurostat. We are aware that this contribution needs to be more comprehensive. Still, this exploratory study will help further analysis of the circular economy at the European level to contribute to the realization and implementation of a genuine ecological transition in Europe.

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CONSTRUCTING A SPECIAL TAX REGIME FOR DEVELOPING SCIENCES, TECHNOLOGIES AND INNOVATION IN CUBA

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Abstract. This paper aims to build a theoretical approach to the master lines of constructing the new Cuban tax law. This special tax regime allows the tax governance of several actors of the national economy directed to develop technologies, change of productive matrix and growth of Cuban science products' introduction in the Cuban enterprises net. We used the analysis-synthesis; induction-deduction; sociological; exegetic, and modulation theory as methods. The main results obtained provide the master lines for constructing a novel political approach towards future tax regime. The authors offer systematization of the Cuban economic scenarios and provide novel and practically instrumental suggestions for transforming the current tax regime.

Keywords: taxation; tax policy; tax regime; innovation; technologies

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1. Introduction

The Cuban economic context is very complicated; when we should explain it, we recommend imagining a mix of spaghetti; each spaghetti represents a cause, and their interactions symbolize effects; we can understand the Cuban scenario's extraordinary complexity through this simple graphical representation. With this educational method in the front, we propose one of the solutions to Cuba's economic troubles from a tax perspective. Indeed, attracting FDI has been a remarkable goal since the first Cuban economic transformation in 90 decades (Falcón, Montero, & Ferrer, 2022; Castellanos, 2022; García & Molina, 2023). However, the emergence of new economic actors such as SMEs, cooperatives, and autonomous workers (which earlier were restricted to the agriculture and fish area) raises the need to assume technological paradigms that increase competitiveness in international markets. New actors can substitute imports and become essential entities in the construction of national technological sovereignty under a severe economic crisis and the intensification of the US blockade on the country, which is not a flattering international scenario. These actors are the constant temptation of importing long-lasting, scarce and finished products and reselling them in the national market, and in that way affecting the weak manufacturing

production, constituting an inflationary factor, increasing technological dependence and evaporating the few international currencies in circulation in the country.

In recent times, the government has begun the implementation of the science-based government model, seeking to increase competitiveness in the various actors and form value chains, all from an ongoing administrative decentralization process (Díaz-Canel Bermúdez & Delgado, 2021). This political-theoretical proposition constitutes one of the cornerstones of President Díaz-Canel's administration, and, indeed, it is a necessary transformative vision in the Cuban scenario. However, no tax correlation rewards the behaviours of economic subjects that adopt the model in its internal management and penalize the costs of those who are not innovators or developers of research in technologies; the tax system hinders and slows the development of the model itself. On the other hand, this tax regime could serve as a dumbbell or a kind of flexible hinge to provide local governments with tax policy instruments that help to adjust their respective development strategies that are conceptually based on the government system supported by science and innovation. From a practical point of view, it would generate a critical mass of economic subjects in which innovation and the development of technological paradigms endowed with sovereignty would be positive selective incentives for their costs.

The Cuban tax system was created in its main current guidelines by the Law of Tax System in 2012. This is the universal heir to the creation of the tax system in 1994 as part of the policy to correct the macroeconomic imbalances caused by the disappearance of the Soviet Union and the socialist camp that left Cuba without its traditional markets and caused a 35% drop in GDP, the most pronounced in the history of the region without the presence of war as a factor in the fall. This fact is not minor because Law 73/1994 and its decree Law 169/1999 were born with a collection will, a principle that carries the current norm 113/2012 and remains a watchword for the tax administration, ignoring the extraordinary importance of the extra-fiscal dimension, both for the functioning of the tax system itself considered as well as in its facet as an instrument of economic policy in general.

It comprises of a general tax regime and several special regimes, for example, agricultural activity, foreign investment, non-agricultural cooperatives, MSMEs, mining activity, customs regime, regime for the economic development zone of Mariel, etc. Generally, it has 17 taxes, three rates and three contributions. In Cuba, subnational entities, i.e., Municipalities and provinces do not have the competence to create taxable events; hence they participate in the collection of income ceded by the central budget for the collection of the generality of taxes according to variable formulas. Only in the private sector, which contributes less than 22% of GDP, can municipal administrations increase or decrease the tax rates of certain taxes, according to a range provided by the Ministry of Finance in its capacity as a financial authority in the Republic of Cuba. For these reasons, the construction of a Special Tax Regime for R+D+i activity is a huge challenge for the entire Tax System and for Cuban society in general.

Hence our scientific problem is the non-existence of a special tax regime for innovation, and the development of science affects the development of innovative behaviours and scientific development in economic subjects in Cuba. Consequently, as a working hypothesis, we assume that the existence of master lines for the creation of a special tax regime for innovation and the development of science will facilitate its design and, in turn, will make it possible to change the behaviour of economic subjects in Cuba, favouring innovation and development of technologies, as primary purpose since a theoretical approach the master lines to the construction in the new Cuban tax law a special tax regime that allows the tax governance of several actors of the national economy directed to develop technologies, change of productive matrix and grown of Cuban science products' introduction in the Cuban enterprises net. The main results obtained were seven master lines for adopting this political approach and future tax regime, systematization of the Cuban economic scenario and their descriptors and the theoretical basis of the new tax regime.

2. Methods

As methods, we used the analysis-synthesis in the analysis of the leading tax categories, in the compared theoretical proposals, in the systematization of tax techniques and in the condensation of effects on the R&D+i* activity; induction-deduction as part of the description of the criteria, the results, the tax interrelationships, the analysis of the Cuban scenario and the interpretation of the trends that affect the proposal and the tax system adjacent to the R&D+i activity; sociological essentially used in the analysis of the socioeconomic characteristics of the Cuban scenario as well as the behaviour predicted by the various economic actors in the face of reality and the proposed tax regime.; exegetic, legal research method par excellence, showed its extraordinary usefulness in normative analysis; the statistical method facilitated the analysis of trends in the economic series used for the financing of science, its sources and its composition; on the other hand, it was also applied in the analysis of macroeconomic variables such as GDP, interannual growth, fiscal deficit, and modulation theory to sketch the categorical interactions as part of the proposed diagram.

3. Results

The main results reveal main criteria for adopting this political approach and future tax regime, systematization of the Cuban economic scenario and their descriptors and the theoretical basis of the new tax regime. Those are Accounting and factual verifiability of R&D[†], Impact of the R+D+i[‡] in the strategic axes and sectors defined in the National Development Plan, creation of developments following local strategies, Sustainable changes in technological and productive paradigms and impact on the availability of liquidity in the country and forming part of public-private partnerships.

4. Discussion

Prior studies have noted the importance of tax treatment for research, development and technological innovation (Elschner, 2013; Mirrlees & Adam, 2010; Sánchez & de Haro, 2004). Several juridical orders have adopted lines in this address with the creation of special tax treatment for this kind of activity, whether tax deductions, benefits, attenuation of tax rates, or elimination of formal tax obligations with transcendence to costs. The chosen form varies according to the circumstances and the objectives pursued, manifestly extra fiscal. This tendency is obtained from such development that now talks of a particular legal regime - broader than tax question only- for such issues as digital innovation (Efremova & Gordienko, 2022).

A strong relationship between tax treatment and the development of research and innovation has been reported in the literature (Afif et al., 2019). Except for environmental taxation originally included in the law, extra-fiscality has meagre vestiges throughout the taxable events provided for by the Cuban legislator. This case at hand is no exception. In the Cuba case, no regime or tax category tends to prize the financing of new products resulting from research or innovation. Many times, it has been said that our tax system has an enormous regulatory weight that prevents it from addressing non-fiscal purposes with the necessary comprehensiveness and complexity and operating as a system (Limonta Montero, 2021, 2022; Maceira, 2014; Otero & Moya, 2020). This last assessment must be taken into account in all the discussions that we will carry out since it explains, to a large extent, the categories and relationships provided for in the Cuban tax system law

One question that needs to be asked is the behaviour in science activity inversion in Cuba; this data constitute the foundations for constructing a coherent policy on research, development and technological innovation. According to the displacement in amounts and time of this kind of public financing, could it be the critical crossing; its

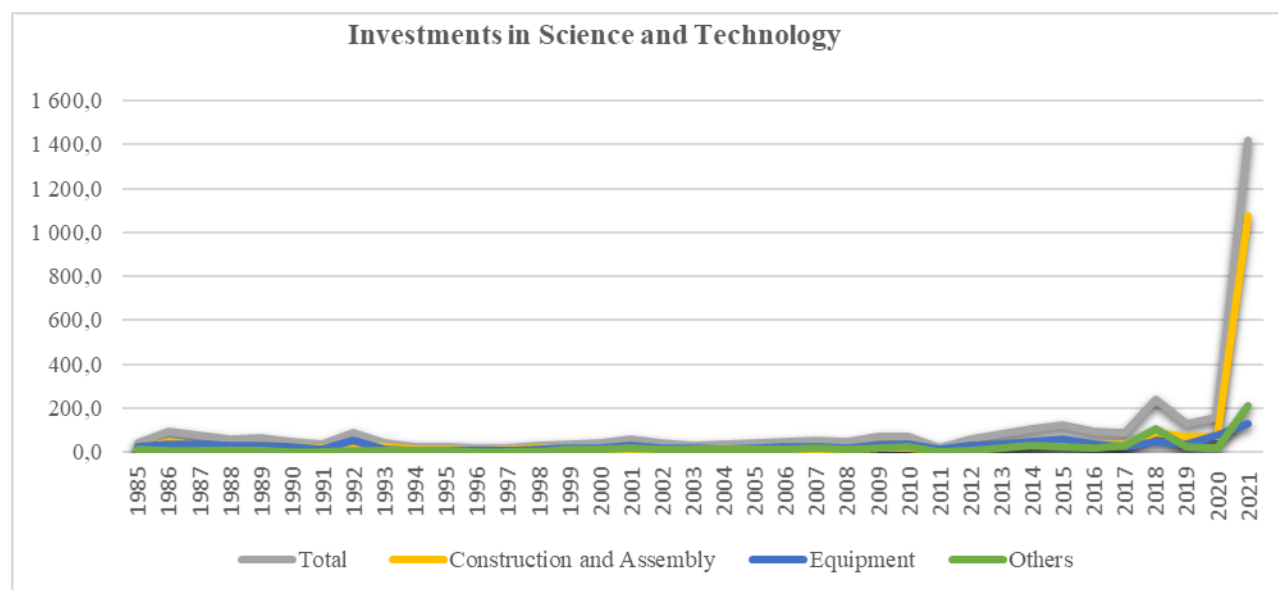
* Research +Development +innovation

† Research + Development

‡ R&D+i

necessary to invest more private funds in development, research and technological innovation? Or can we increase the public funds? In the Cuban case, the answer is a truism. A more significant public, private and mixed business sector commitment is necessary for these objectives. Another question that needs to be asked, however, is whether Governance mechanisms are available, in this tax case, to ensure that financing occurs and has a tangible impact on the Cuban economic process while not contributing to raising the numbers of tax avoidance. R+D+i should simplify the technological transformation in critical areas such as energy, food production, transportation, e-commerce, export & import process, international currencies availability, etc.

The following graph shows that there has been a sharp increase in investment in science activity according to data of the Cuban National Statistical Office. Interestingly, this data shows that a significant part of public funds is directed to science activity because of the substantial part in the sequence corresponding to public entrepreneurial plus budget expenses. Consequently, our proposal of a particular tax system should be the composition of this graph, increasing the private funds as an independent line. Another chart shows the design inside the funds. The data in Graph 1 shows that the equipment variable is underfunded concerning construction and assembly, even in front of a miscellaneous variable as others.



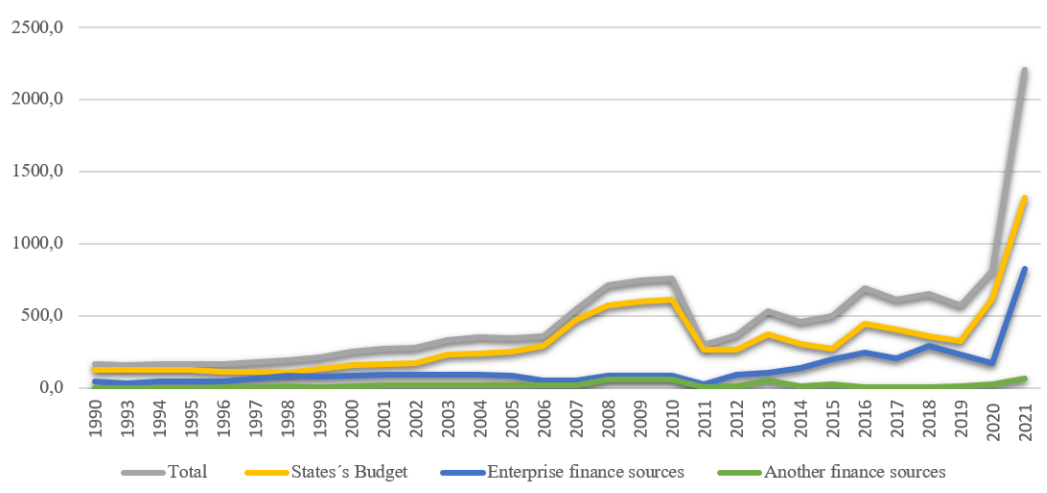
Graph 1. Graph of Investment in Science and Technology. Source ONEI Cuba

This tendency is exceptionally remarkable in designing a special tax regime because it should be valued as a prevalent behaviour of taxpayers. However, this point could explain one circumstance of Cuban economic management. The significant difference between the two shows a negative impact of the supra explanation. In terms of R+D+i, the equipment variable had to have a more ascending sequence than construction and assembly, even if considering the significant infrastructure works for the creation of scientific centres, for example, the western scientific centre from the capital, which became BIOCUBAFARMA[§], or the impressive extension of the CIGB^{**} in the development zone of Mariel. The statistics show that the few funds allocated to equipment are

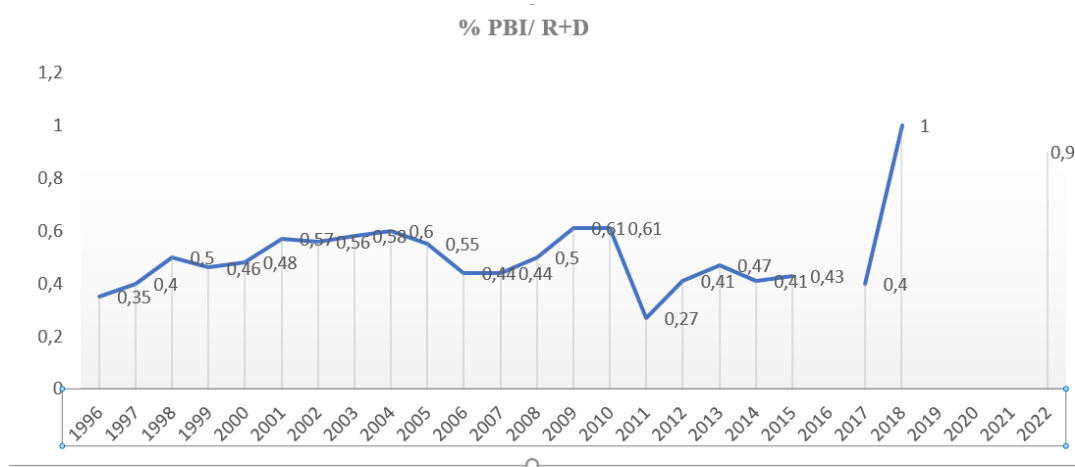
[§] The Cuban pharmaceutical business conglomerate brings together all the country's pharmaceutical production and exclusively biotechnology in Cuba. Acronym in Spanish.

^{**} Centre for Genetic Engineering and Biotechnology. An essential part of BIOCUBAFARMA and one of its nuclei of innovation and results in general.

sustained, a much more malleable solution in the Cuban context as there is a significant business infrastructure establishment with a low occupancy rate if it is taken to the field of research in universities and other actors., there is a less pronounced but similar trend. Since the macroeconomic approach, the correlation between PBI/Science investment is fickle without a clear direction. It can be seen from the data in Graph 3 that although there is an increment until 1 per cent, it shows an oscillation in one case with a sudden decrease that returns the following year to recover and maintain normal levels. It is essential to clarify that index is down, in many of the years reflected, of the Latin America region average.

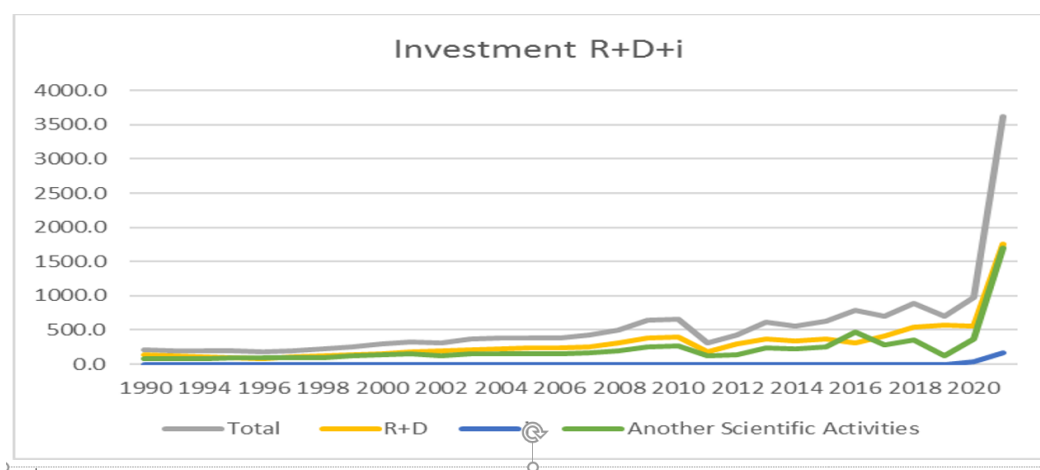


Graph 2. Graph of Cuban Science Financing. Source ONEI Cuba.



Graph 3. PBI/Investment R+D. Source. UNESCO, World Bank, Agustín Lage, Cubadebate, Mipais

Moreover, this graphic demonstrates the crucial need to increase the funds of PBI destined to the R+D+i. If we understand the explanation of graphs 2, 3, and this last graph 4, we will realize that we should raise funds and flow from all kinds of actors in the Cuban economy until this destiny. The necessity of changing the current state of affairs can be understood in broad terms. However, why the Cuban tax system should be one of the change factors? The answer to this question allows developing our hypothesis on this discussion in particular and in all papers.



Graph 4. Investment R+D+i. Source: ONEI

Previous research into the extra fiscal dimension has been consistent with the change in taxpayer behaviour. For example, Elschner (2013, p.213) studying the Impact of European tonnage taxes on the choice of organizational form draws our attention to "... the impact of the tonnage tax on organizational form choice is studied empirically in two steps. First, comparing firms in the maritime sector and other transport industries in 26 European countries, a cross-sectional analysis investigates the likelihood that a firm is incorporated depending on whether and how a tonnage tax regime is applied at a firm's location. The results provide the first evidence that the design of a tonnage tax regime strongly impacts organizational form choice. In particular, the likelihood that a business will incorporate is significantly lower in jurisdictions where a tonnage tax regime for all organizational forms is available than in countries without a special tax regime. In the second step, a panel analysis studies the share of incorporated firms out of all shipping firms in a country over time. This approach makes it possible to identify the change of organizational form patterns in the shipping industry when countries introduce the tonnage tax. The panel analysis results confirm the cross-sectional analysis findings, demonstrating the impact of a tonnage tax on organizational form choice".

In analogue result, Zhu et al. (2020, p.8.), in research on China's Green taxes policy, argued that "with the continuous introduction of the carbon tax and other policies, investors and the public can pay more and more attention to the carbon information of enterprises because it not only reflects the production and operation of a company but also reflects whether the company bears the public image of environmental and social responsibility. As low-carbon power becomes a trend, power companies should strengthen their disclosure of green accounting information so that accounting information users can better evaluate companies and make investment decisions".

The evidence of these works supports the idea that the tax system is a powerful tool to change the behaviour of economic and political actors. Alt, Preston and Sibiet (2010, p.1310) demonstrated that "tax incentives can potentially increase innovation by attracting investment by new firms, either by convincing large multi-national enterprises (MNEs) looking to expand globally to invest R&D resources or by helping small firms to emerge and establish themselves as business entities. Alternatively, tax incentives can fuel greater innovation by leading existing investors to increase their level of spending. In any case, R&D tax incentives provide tax relief to research-intensive companies for undertaking R&D, defined for tax purposes as projects that '[seek] to achieve an advance in overall knowledge or capability in a field of science or technology, not a company's state of knowledge or capability'".

Despite the positive behaviour change in the taxpayer, there is another risk that legislators should warn under penalty of the fiscal objective being undermined a posteriori; in the same work, the cited authors indicate, with extreme clarity, that: "the R&D tax credit provides several lessons, the primary one being that enacting tax policy

can create interest groups and constituencies in favour of that policy. Even when they did not lobby for the policy in the first place, like the large firms in our study, they will lobby for persistence and extensions that allow the policy to drift from its original motivation. Therefore, any potential tax reformer should remember that any new allowances enacted or favourable tax treatments provided to particular groups could prove difficult to remove and may be distorted into something different over time" (Alt et al., 2010, p.34). Since this theoretical position, they used the approach of groups from Mancur Olson to understand the existence and projection of this interest created under any tax policy design.

In the Cuban case, the tax design should notice the low innovative gradient of the enterprise community (M. et al., 2021). Creating an approach that allows modifying the cost structure, fostering the FDI, value global chains or any mechanisms to make the R+D+i easier. Of course, conceptual platforms should establish differences between research and development intended to impact technological paradigms that do not have or will immediately have precise applications in goods and services of the innovation that directly becomes transformations in the productive base. There are several interpretative difficulties in comparative cases, Spain, to cite a case in which the law speaks in its differentiation of substantial transformations, forming a legal concept that is difficult to determine (Sánchez & de Haro, 2004). However, in Cuba, there are potentialities on which the projected system must rest and which must constitute one of its clearest bases.

The projected several impacts inside the regime must be supported by the criteria (not excluded):

- ◆ Accounting and factual verifiability of R&D. (There are institutions in Cuba that, under a non-bureaucratic action protocol, can fulfil this purpose, for example, agencies of the Ministry of Science, Technology and the Environment, universities, research centres, science and technology entities, study centres) This criterion serves as the basis for the tax administration's protocol in its verification on the one hand and, on the other, would allow adjusting the tax policy to the national, provincial and municipal development strategy. C1
- ◆ The impact of the R+D+i in the strategic axes and sectors defined in the National Development Plan should be considered indicators. There are some obvious ones given the complexity of the Cuban economic scenario: Transformation of the fossil energy matrix and the path towards clean or renewable energy in production processes or provision of services, the inclusion of national components in the manufacturing industry with the consequent import substitution, export or inclusion in global value chains, endogenous systems development, IFA production in Cuba, food production or transformation, transportation with more rational consumption patterns. C2
- ◆ Creation of developments following local strategies. C3
- ◆ Sustainable changes in technological and productive paradigms. C4
- ◆ Impact on the availability of liquidity in the country and forming part of public-private partnerships C5
- ◆ Once the teleology of the tax regime has been established through the guiding criteria, the impacts must cover various tax categories so that Cuba's entire subjective economic map can benefit from resorting to this behaviour and financing it. As we have said, this regime will become one of the most solid foundations for the government system based on science (1).

$$B_i - M_E - G_{fd} = B_{Lx} T_i = CT_i \quad B + S = CT_L \quad (1)$$

Where:

B_i = taxable basis; M_E = exempt minimum; G_{fd} = deductible tax expenses; B_{Lx} = Credit taxes; T_i = tax rate;

B = payable tax base; S = tax penalty; CT_i = tax liability (uncomplete); B = credit taxes; CT_L = tax liability

Let us assume that the general equation for taxation is the model expression of the impact of the proposed tax regime. Thus, the first impact could be in the conformation of the taxable base, which could consider the non-inclusion of investments in equipment for R+D+i in a prudential period for the execution of the investment. Note that the behaviour described in the investment structure would have a selective incentive for equipment to exceed

the investment in miscellaneous (matter graphed supra) with the effect on the acquisition or growth of technologies. It should be signified by the urgency of the economic situation in Cuba at first; through the budget law, it could be updated, four immediate objectives: investments aimed at generating energy, those that contribute to macroeconomic stability, acquisition and development of technologies with foreign investment and those that are made as part of a public-private alliance and foods production. Out of the taxable basis should be all the investments process that can prove all the exposed criteria. It remains for granted two criteria that, due to their obviousness, have not been reflected in the proposal; first, the calculation must correspond to the tax on the income of the legal entity that in Cuba corresponds to the tax on profits, provided for in article 68 of the current law 113 /2012 Law of the Tax System and second, all these exclusions in the taxable base become inclusions for those who decide not to invest in R+D+i, who must bear the costs of their investment processes with the corresponding tax burden.

Concerning the exempt minimum, two additional variables must come into play; the law contemplates several special tax regimes with extra fiscal purposes as crucial as the one intended to protect, inducing the behaviours declared by the taxpayers. For this reason, a system of weighting rules must be considered to avoid tax avoidance or deviation from the desired tax impacts with the policy. For example, the law raises in its title V a special regime for the agricultural system, favouring something that the Cuban economy has been suffering from, which is the low production of food and the high imported content of the food basket. Considering the diagnosis that ECLAC made in 2020 (CEPAL, 2020), there was a gross drop in the agricultural sector in 2020, year 1 of the COVID-19 pandemic in Cuba of 23.7%. Suppose the proposal outlined in this paper is approved. In that case, both tax regimes must coexist with weighting rules that achieve effective production and realization of production in agriculture. In the case of the R+D+i regime, it must focus on the change of technologies and the prize for it, v. gr. alternative irrigation systems that reduce water consumption, use of pesticides and fertilizers that favour national developments, as well as the introduction of more resistant species obtained thanks to scientific development. We apply an Occamian razor to the issue of genetically modified or transgenic organisms, as it is a marginal issue to the exhibition and the Cuban reality concerning the scarcity and price inflation of agricultural products (Castellanos, 2022; García & Molina, 2023; Hernández et al., 2022). These principles will interact, with adjustments and empowerment, to specify rules in the text of the law for other similar regimes in competition and application. For all these reasons, the minimum exemption will have to be built under these rules, and a single minimum exemption must be renounced, as is the current criteria of the law and its legal orbit.

For years there has been much ado on the deductible tax expenses. In a matter of R&D, there is a consensus; the differences of opinion are located in the best way law makes them. Indeed, considering deductible expenses as a tax incentive results from political decision-makers needing a more significant innovative effort from economic actors, hoping that the growth of R&D inside economic actors be translated into considerable wealth and welfare.

On this peculiar teleology, Jacquet & Robin (2023, p.23) suggested that "the rationale is that innovation-induced economic growth will increase wealth, employment and well-being. EU policymakers are therefore searching for the conditions that are more likely to make firms increase their innovation effort. A widespread recommendation consists in creating the conditions of increased competition between firms (or "letting the market decide"), as the increased competitive pressure would supposedly lead firms to innovate to survive or to gain advantages over their competitors".

On the obverse side of the coin, the market failure, as a kind of Arrow precaution (Arrow, 1962), is the opposite explanation of the optimism of the EU policymakers. The character of the public good of the innovation (beyond what is protected by industrial and intellectual property rights) and the little certainty of the investment processes that have innovation as their centre make companies and banks under the deregulated market, they do not tend to develop R&D as a source of growth, quite the contrary. Those circumstances - as a model, explain the market failure in promoting R&D without the required mechanisms of encouragement. This is why incentives such as

deductible expenses adjust for likely market failures. One of the most important mechanisms is the called tax super deduction consisting of vital tax deductions after evidencing expenses in R+D+i; several researches show that economic actors from countries where a super deduction is available are more motivated to spend money in R&D (Makeeva et al., 2019). In the case of a taxable base reduction of more than 100 per cent of the R&D demonstrated expenses, the research and development intensity are higher. Literature has concluded that super-deduction will boost R&D investment across Europe, which is assumed to be more conducive to innovation, and, ultimately, more growth. There is evidence of up to 200% in these deductions in cases such as Brazil; other countries with this technique are Slovakia, China, Greece, Hungary, India, Latvia, Lithuania, Malaysia, Poland, Romania, Russia, Singapore, South Africa, Türkiye and United Kingdom (Bočková & Pakšiová, 2022; Jančíčková & Pakšiová, 2022; Makeeva et al., 2019; Noked, 2019; Tufetulov et al., 2015).

Politicians and academic sectors would widely discuss the relevance of the super deduction technique inside the Cuban tax scenario because of the budgetary deficit. Only this year's (2023) estimated deficit was 24% of the expected fiscal income. Any tax renounces will have many critics scheduled in Cuba's context, even if they have lofty purposes such as growing R+D inside economic actors. More than once, the Cuban Public Financial Administration has fronted to severe liquidity issues, often, the liquidity gaps are a reality inside budget realization, and this permanent anxiety state becomes very difficult the agreement on the super deduction institution. However, R+I could construct a *modus vivendi* between collection finality and extra fiscal goals. A progressive introduction should be reserved for the more significant investments in decisive fields of the national economy. The strategic axes, defined under government policy rules, are the perfect primary field of experimentation under the caution established by the base criteria proposed by this paper. The super deduction application process could consider even a progressive scale of marginal sections of the investment.

On the question of super deductible expenses, Tao et al. study found that they should be adjusted to the industries classification because the impact inside the economic cycle is very different between several kinds of industries. The ongoing classification by Economy Ministry could be the ideal platform for fine-tuning this part of the tax technique implementation. Contrary to expectations, this cited research demonstrated that policies should focus on SMEs and be more inclusive. A cash credit policy should be adopted for SMEs instead of a deferred credit policy. For startup-technology-based SMEs, a higher super-deduction rate should be available (Qian et al., 2022). On this point, the Cuban SMEs dedicated the majority to reselling and not to the production or any transformation of the goods could be halted. The last end, the super deduction, should establish innovative chains between a vast part of Cuban economic actors.

Hence, it is likely hypothesized that the taxable basis converted into payable tax base was influenced by a system of credit taxes originating in the operation of exempt minimum and deductible tax expenses. The highlight, without doubt, would settle around of tax rate. In Cuba, one of the principles of a tax system is the progressiveness of the tax structure, expressed in a rate aliquot or proportional, progressive rates by steps or fixed rates. Therefore, such tax rates are likely configuring a model for a particular tax regime on R+D+i. Thus, in the tax rate on income taxes or profit taxes, there can be a marked difference between the behaviour toward R+D+i and others to anyone who does not invest in R+D+i. Those companies that run risks developing technologies must be rewarded in tax rates in the several steps of the scale. Another issue that should be revised is the tax burden and the benefits of the researchers. Today, there is a dichotomy between the spirit of the original law when in the 300 c) excluded of the taxable basis, the incomes originated in other funds different to the salaries for the Special Tax Contribution from the workers to the Social Security. It is comprehensible that when the law was announced, there was no possibility that research projects could pay the researchers. This reality changed 180 degrees when making these payments under the Science Ministry administrative order was possible. The law stipulation should have been reviewed; thus, an administrative order by Finance and Prices Ministry was indicated to include all the payroll incomes. This administrative order, 310/2020, was since juridical approach highly contradictory because for this imperative was essential the derogation of 300 c). This point of view, also contradictory, was ratified in

the administrative order 41/2023. In general, researchers and innovators should be benefited from their tax burden.

Another example of things this particular tax regime should change is the approach to tax benefits. When we directed the foundational group of the Oriente University Interface Society, we noticed that other enterprises or economic actors generally did not benefit from investing in the technologies or science products transferred from the university until the companies or businesses. The exemption only can be applied by technological parks, foundations or Interface Societies; this needs to be corrected from the reward focus. All the participants in the innovative chain should be rewarded with rules that support the risks taken in the investment. With this vision, economic actors will be encouraged to participate in innovation.

Sectors and actors should measure the tax progressivity. Due to this, in recent years, researchers have investigated various approaches to understand the real impact. In the case of progressive tax regulation on carbon in China, Zhan has pointed out that although manufacturers are impacted by tax progressivity, they adopt measures that are convenient for them, explained in the study with the Nash equilibrium methodology; for this reason, "to guarantee that carbon emissions do not exceed the cut-off value, when the high-level carbon tax is increased, the manufacturer significantly improves the reduction level and increases the production quantity moderately; conversely, when the cut-off value is increased, the manufacturer drastically reduces the reduction level and slightly decreases the quantity of production" (Zhang et al., 2021), this behaviour explains why it is crucial to determine the impacts of the proposed tax regime since it is the only way to avoid falsifiable results and the consequent tax evasion. In June of 2023, Ferriere et al. pointed to some of how they should design the progressivity; for example argued that transfers allow for more progressive average than marginal tax and transfer rates, achieving redistribution while preserving efficiency; transfers should be larger than currently in the United States and financed with moderate income tax progressivity (Ferriere et al., 2021, 2023; Forscher et al., 2023), those approaches should be superposed before the cash needs that as the sword of Damocles hangs over Cuban Tax System.

On the credit taxes, Makeeva, Murashkina & Mikhaleva have argued that "the R&D tax credit program is a program that allows the subtraction of an amount of money directly from tax liability. The sum of subtracted money depends on the amount of R&D expense. The majority of countries allow a decrease in the tax paid by 5-35 per cent for R&D expenses of that year, while some of the regulations can enable cutting up to 50 per cent of R&D" (Makeeva et al., 2019, p.25)

The representation of a special tax regime should reflect all the issues explained before, as Diagram 1 shows:

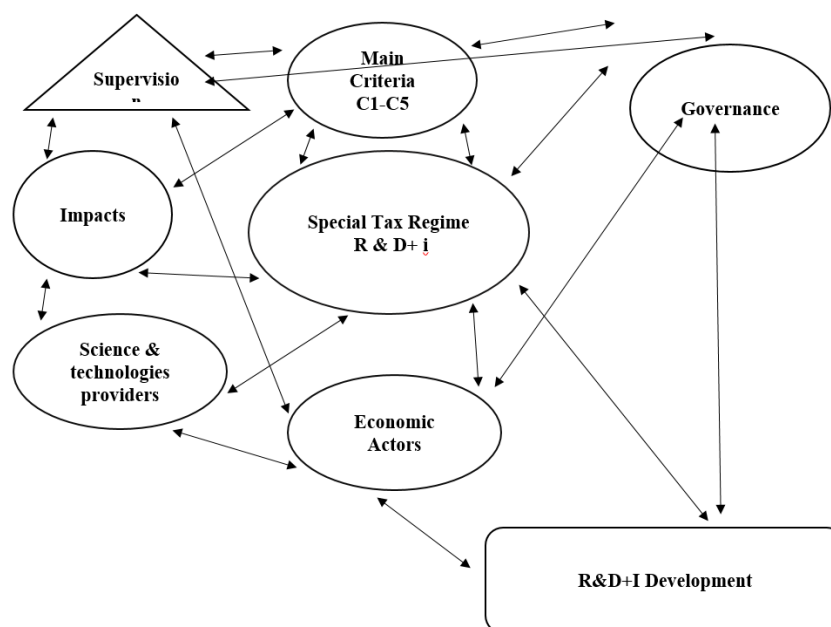


Diagram 1. A special tax regime

The exposed diagram condenses the variables we explained in detail for each category in the general taxation equation. As it is possible to notice, all the categories are closely interrelated, and the criteria outlined play a role in the guiding lines in the elaboration and evaluation of the proposed tax regime. This is not an exclusive proposal; it is original at the dawn of drafting the new tax law.

Concluding Remarks

In the present paper, we established the fundamental reasons that allow us to justify the need for a particular tax regime for the R&D activity, not only from a prospective and *de lege ferenda* approach but also from the peculiar circumstances of the Cuban economic scenario. Fulfilling the objective outlined in this article, we established the master lines, called criteria that should preside over the creation and measurement of the impacts of the proposed tax regime. In the same way, proposals were made for configuring important categories of tax design, such as the taxable base, the minimum exemption, tax-deductible expenses, and the tax rate and tax benefits. The reward approach to economic actors constitutes an objective goal that was argued throughout the analysis made in this investigation. In short, it is a proposal that forms a powerful tool to guide Cuba toward economic recovery and growth.

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