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FOREWORD

Dear readers,

We all live in a highly turbulent world. War in Ukraine and recent military clashes in the Middle East, problems in Africa raise challenges of immense urgency. Climate change has reached the point where fast and effective actions are needed. Efforts are necessary from all layers of society, i.e. politicians and business companies, NGOs, and ordinary people.

In this context, pulled international efforts may be instrumental in revealing tensions between institutions and society, business and society issues, and environmental attitudes. Good practices and suggested solutions are not less important than the revelation of the problems. Therefore, international journals focusing on issues regions encounter in their development have played a more critical role than ever. The new open-access *Insights into Regional Development* issue suggests a unique collection of internationally diverse scientific papers devoted to discussing and offering novel ideas in critical areas.

Let us all look for the best solutions, leading to the peaceful and sustainable development of all countries, regions, and our planet.

With my respectful greetings,

Dr. Alminas MAČIULIS

Deputy Chancellor of The

Government of the Republic of Lithuania





SKILLS DEVELOPMENT FOR IMPROVED EMPLOYEE PERFORMANCE IN SOUTH AFRICAN MUNICIPALITIES

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Abstract. This study explores skills development for improved employee performance in South African municipalities. This study was motivated by the need to expedite local government service delivery, hampered by municipal employees' poor capacity and skills over the years. Many municipalities need help to fulfil their service delivery obligations because of the requisite skills' scarcity, absence, and shortage. The study explores the skills development of municipal employees (focus) in South African municipalities (locus). It does not focus on one chosen municipality but looks at the situation holistically from a broader perspective. The study aims to find answers to the research question: what are the causes of skills shortage on employee performance in South African municipalities? A qualitative desktop study was adopted to find answers to the guiding question, and various secondary documents were analysed to gather information. The human capital theory was used as a framework for the study. The findings show that most local government employees' skills are outside the dictates of the current era. The study recommends interventions, among other things, improving local government skills development funding, adequately implementing monitoring and evaluation practices, developing soft skills for the current fourth industrial revolution era, and performing regular municipal skills audits.

Keywords: employee performance; the fourth industrial revolution; local government; service delivery; skills development; South Africa.

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1. Introduction

This study centres on skills development for improved employee performance in South African local government. Such is hinged on the need to train and develop human capital capable of improving public service delivery by municipalities. Municipalities are the local sphere of government nearest to the people and tasked with developing local communities and delivering goods and services for improved living standards. The local sphere of government is established in Section 152(1), Chapter 7 of the Constitution of the Republic of South Africa (1996). It has various aims, which include providing a democratic and accountable government for local communities; ensuring the provision of services to communities in a sustainable manner; promoting social and economic development; promoting a safe and healthy environment; and encouraging the involvement of communities and

community organisations in local government matters (Republic of South Africa (RSA) 1996:77). Furthermore, Section 152(2) of the RSA (1996) Constitution obligates municipalities to strive, within their financial and administrative capacity, to achieve the preceding objectives. This study notes that for the above aims of local government to be achieved, municipality employees require a specific set of skills. Therefore, this study discusses skills development's meaning and implications for employee performance. Also, Munzhedzi (2021:213) notes that attaining the various goals of local government requires competent human capital with the requisite skills to undertake the various tasks and duties. Furthermore, there is a solid link between the availability of skilled human capital and the timely delivery of quality public goods and services in local governments (Maphumulo & Bhengu 2019:7). Therefore, for the government to deliver on its constitutional mandate, there is an urgent need to sustainably strengthen human resources regarding the quantity and quality of capable municipal employees.

This study uses a qualitative research approach. Denzin and Lincoln (2005:7) state, "qualitative research is interdisciplinary, transdisciplinary, and spreads across humanities, the social sciences, and the physical sciences". Therefore, "qualitative research could be seen as an umbrella term for different approaches, with each having its theoretical background, methodological principles and aims" (Auriacombe 2009:97), and "it emphasises the careful and detailed description of social practice" as cited in Nyikadzino & Vyas-Doorgapersad (2020:235); Mothabi & Vyas-Doorgapersad (2022:367) and Mutandwa & Vyas-Doorgapersad (2023:28). The 'insider's perspective' that emerges from qualitative researchers allows them to find the best way to interact with their research environments, thus allowing for flexibility and pushing research findings towards validity and believability (Patton, Hong, Patel & Kral 2017:8). The data is collected through literature review. A literature review "surveys books, scholarly articles, and other sources relevant to a particular issue, area of research, or theory. It provides a description, summary, and critical evaluation of these works concerning the research problem investigated" (Labaree 2009:1, cited in Ncamphalala 2019:16-17). The data was analysed through conceptual analysis. The "goal of using conceptual analysis as a method of inquiry into a given field of interest is to improve our understanding of how particular concepts are (or could be) used for communicating ideas about that field" (Furner 2006:233). It is also emphasized by Maxwell (2005) whose opinions are cited in Maile & Vyas-Doorgapersad (2022:83) and Vyas-Doorgapersad (2023:456), stressing that a conceptual analysis refers to the process of developing the empirical study's conceptual framework. The study employs conceptual analysis to draw the meaning of concepts related to skills development to see how they influence the performance of municipalities.

The study looks at the human capital theory and its applicability to this study. Understanding the approach used in this study depends on the initial and overall understanding of the phrase 'human capital'. Drucker (1999), cited in Annett (2019:16), states that human capital is increasingly considered the company's most asset. This implies that public and private organisations must give special attention to this resource since it significantly affects attaining their predetermined goals. By conceptualisation, Boon, Eckardt, Lepak and Boselie (2018:35) regard human capital as a phrase that refers to a blend of individual aptitudes such as knowledge, skills and capabilities of individuals with economic value to an organisation. Kucharcikova (2011:65) argues that the scope of human capital includes natural ability, innate and acquired skills, knowledge, attitudes, experience, talent, and inventiveness. These can further lead to an entity creating a good rapport with its stakeholders, building a good reputation in the short, medium, and long term.

2. Frameworks on skills development and employee performance

Skills refer to abilities for improved job performance as seen in the undertaking of an organised sequence of activities that are critical to the achievement of the predetermined goals of an organisation (Bartman & Bruijn 2011:127). The said organisation includes public entities such as the municipalities in South Africa, which comprise the local sphere of government. For this study, skills are critical to the effective functioning of municipalities because these are the centres of community development and public service delivery. From another

angle, skills denote the knowledge about how to do something, 'know-how' (Bolisani & Bratianu 2018:11). Therefore, skills effectively equip employees with the expertise and knowledge to undertake various organisational tasks. In the context of this study, skills can include an understanding of people-centred public or municipal service delivery.

Since 1994, South Africa has been confronted by a skills crisis. Skills development has been acknowledged as a critical component for its transformation (Tshilongamulenzhe 2012:30), leaving the state requiring a government-led skills revolution that can bring socio-economic transformation (Plant & Padotan 2017:35). Further to this, the scarcity and shortage of critical skills in South Africa correspondingly imply that there is the absence of competent public servants and key officials in all sectors of the economy (Plant & Padotan 2017:44). Kroukamp (2002:455) observes that the skills scarcity dilemma in South Africa is worsened by the half-hearted commitment by public officials and policy implementers to address the problem effectively, leading to its persistence. According to Matlala and Uwizeyimana (2020:2), the local sphere of government is not immune to this skills deficit, which has left municipalities in a quandary, with audit opinions from the Auditor General indicating that skills such as financial management are in short supply. Therefore, there is a need to use skills training and development interventions to equip local government with all the skills lacking. This is because municipalities are the centre of critical processes leading to community development and the post-1994 transformation agenda.

There are three central aspects to the skills debate in South Africa, as established by labour economists. First, skills shortages denote the acute absence of qualified labour to fill vacant positions (Hakansson & Bejakovic 2020:8). Second, skills mismatches occur when individuals seeking employment do not have the skills required for the vacant positions (Hakansson & Bejakovic 2020:8). Third, Taylor (2018:34) notes that there is information asymmetry that happens when potential employees or employers do not have information that could improve the matching of skills and available vacancies. The ability of employees to function and execute duties and responsibilities is related to their competencies and capacity to carry out those tasks. This capacity includes individual and organisational aspects, which means that organisations must create an enabling environment for employees' productivity and performance.

The skills development process is linked to the upskilling of individuals to improve them and ensure that the job-to-individual match is enhanced. Attaining such a balance is dependent on human capital skill sets being updated regularly using both informal and formal processes or interventions. In the case of municipalities, there is a need to ensure that the skills deficits that the post-1994 local government sphere faces are addressed through skills development and other related interventions. One such intervention is the training and development of local government employees through the Local Government Sector Education and Training Authority (LGSETA) (Turner, Halabi, Sartorius & Arendse 2013:2). In the process of skills development, there is a marked improvement required in the area of education and knowledge of those that will be on the receiving end of such training.

Furthermore, the study notes that optimal public service delivery depends entirely on the ability of those tasked with service delivery to conduct their community development tasks. The study argues that the transformative agenda of local government is directly credited to the ability of employers and employees to perform optimally. The study discusses the definition and implications of this concept hereafter. Iskamto (2021:143) defines performance as the "result of the work of an employee in carrying out the tasks assigned to him in accordance with his responsibilities and roles based on skills, experience, and sincerity as well as time accompanied by quality and quantity according to the rules laid down" (Iskamto 2021:143). Armstrong and Taylor (2020:136) note that as a concept performance "covers both what has been achieved and how it has been achieved". Performance "has to rely extensively on data-informed qualitative assessments of organisational capability or effectiveness in the pursuance of its set objectives" (Armstrong 2009:136). Vroom (1964), cited in Armstrong and Taylor (2020:142), notes that "the effects of motivation on performance are dependent on the level of ability of

the employee, and the relationship of ability to performance is dependent on the motivation of the employee.” It is noted that “Vroom also pioneered expectancy theory that, as developed by Porter and Lawler in 1968, proposes that high individual performance depends on high motivation plus possession of the necessary skills and abilities and an appropriate role and understanding of that role” (Armstrong 2009:143). In the same vein, enhancing performance refers to the deliberate act of increasing and augmenting the rate at which one delivers on their targets, that is, improving their output, quality, timeliness, or quantity (Dobre 2013:55). Sandhya and Kumar (2011:1779) argue that the enhancement of performance can be through the upgrading of skills, improved rewards, training and development and human capital interventions related to improving employee loyalty. Thus, South African municipalities have to consistently and constantly strive to keep enhancing their employees' performance by intervening towards improving their skill set. That kind of culture of performance enhancements can ensure that no resources and time are lost to low productivity and poor competencies amongst municipal employees and officials. Such a practice and virtue can improve the productivity of individuals, teams, and the organisation.

Employee performance is central to using skills development as a municipal service delivery intervention. Hermina and Yosepha (2019:71) note that employee performance refers to "the work quality and quantity achieved by an employee in carrying out his function in accordance with the responsibilities given to him." Al Mehrzi and Singh (2016:835) posit that this definitional perspective brings aspects of work standards vital to successfully undertaking work duties and responsibilities. In the municipal setting, these standards encompass the need to ensure public participation, people-centeredness, and the selfless promotion of public interest. According to Brhane and Zewdie (2018:72), the issue of employee performance is the total or aggregate output of individual employees' activities and actions in an organisation.

Moreover, employee performance levels can be described as low, moderate, and high. Low employee performance ratings in municipal settings can be equivalent to wasting resources and taxpayer money, in addition to being harmful to the delivery of public services. Employee performance in an organisation is often evaluated in light of an employee's contributions to accomplishing the organisation's goals.

3. Skills development challenges in South African municipalities

South Africa needs help with critical skills for its local government transformation agenda (Madzivhandila & Musara 2020:262). This scarcity of essential skills in municipalities can be traced back to the state-sanctioned discrimination under apartheid, where different standards of education and service delivery were provided to black people in South Africa (Davids & Esau 2012:83). In the same vein, Mohlala, Phago and Mpehle (2014:217) expand on the preceding by arguing that, transforming municipal management training and development is an essential aspect in government, as municipal management is statutorily mandated to ensure improvement of basic service delivery in the local tier of the South African government. Nonetheless, municipalities need to achieve this clear mandate because of various factors. Chief to these inhibitors is what Nengwekhulu (2009), cited in Mohlala et al. (2014:218), notes as a shortage of quality skills that directly and detrimentally impact, among other things, the managerial capacity in municipalities.

Davids and Esau (2012:86) advise that, in South Africa, local government entities are not only anticipated to establish and transform institutions, but they must simultaneously invest in human capital in the wake of the various obstacles confronting municipalities and service delivery today. Thakhathi and Kanyane (2019:53) bemoan the enormous investment that municipalities put into skills development for limited returns on that investment, leaving municipalities and other public entities facing the same challenges of poor employee performance or productivity. The study considers that such a lack of transformation frustrates local government service delivery, the site of South Africa's grassroots development.

It is important to note that a municipality must always strive to ensure that universal minimum living standards are attained by putting in place all needed apparatus for effective local community development (Nkhabu 2021:17). These apparatuses include capable and competent human capital. Therefore, it can be claimed that the incapacity of South African towns to increase personnel development and training as a means of improving resident outcomes is an indication of poor local government. Shah (2005:49) further argues that the public service orientation of local government must be visible, and municipalities must ensure that they promote public interest over individual interests. Further to the above, “municipalities must promote public value, which refers to measurable improvements in social outcomes or quality of life” (Moore 1996:25).

Some of the causes of skills shortage on employee performance in South African municipalities are stated below:

3.1. Influences of the Fourth Industrial Revolution (4IR)

Chu, Reynolds, Tavares, Notari and Lee (2021:8) note that the 4IR era requires skills development interventions that, unlike any other period that preceded the contemporary one, are characterised by the ever-growing influence of technologies. According to Tschang and Almirall (2021:647), in the current environment of private and public entities, automation has increasingly taken over the place of the human workforce in tasks that involve routine cognitive and manual input. Therefore, municipalities that need to acknowledge that soft skills are critical for this dynamic world are more likely to fail in delivering on their local government service delivery mandates. Additionally, Sonmez (2015:56) construes that, due to these demands and changes for municipalities, the labour force is now hiring people for jobs that require more analytical thinking, digital skills, and sophisticated communication skills, something that is very different from the times before the emergence of the 4IR. According to the Asian Development Bank (ADB) (2007:15), in the 21st century 4IR local government system, entities must impart skills linking to the broader world challenges that communities face together with the capacity to negotiate the complexities inherent in the contemporary knowledge-driven economy. South African municipalities must move with the times and ensure that they appreciate current trends in skills development and focal areas for employee training for improved municipal performance. According to Trilling and Fadel (2009:74), the 4IR skills that local government entities must consider are three key knowledge domains: innovative and critical thinking, information and digital literacies, and life and career skills. Hence, South African municipalities must catch up by using the many soft skills that can improve their service delivery. They need to embrace these and enhance the efficacy of their training and development interventions for improved community development. This statement is supported by the opinions of Shava & Doorgapersad (2021:142), suggesting that digital innovations can be adopted to accelerate service delivery within the local government sphere. However, institutional readiness and skills are vital to adequately utilise modern digital technologies to realise a change in the 4IR.

Heymans (2006:83) notes that South Africa’s ambitious local government reform programme (which includes employee performance improvement through training and development) requires ambitious management, but more than that, it demands skills. Unfortunately, South Africa’s local government transformation agenda has been affected by the absence of dedicated management capacity to sequence, plan, introduce and drive employee training and capacity building, thereby exposing municipalities to the problem of public or municipal service delivery failure (Heymans 2006:82). Many municipalities are confronting serious capacity limits and institutional shortcomings, which prevent the realisation of political and institutional reforms aimed at effective and efficient service delivery (Vyas-Doorgapersad 2010:44, in Vyas-Doorgapersad & Masibigiri 2022:133). According to Mbandlwa, Dorasamy and Fagbadebo (2020:1647), the Msunduzi Municipality is one of the local government entities affected by the challenges of poor skills in the leadership, i.e., the top management. This is a local municipality where funds are being misspent, the skills development of municipal employees needs to be prioritised, and the service delivery could be better (Mbandlwa et al. 2020:1647). Therefore, this points to the patterns of local entities who deliberately flout procedures and get away with poor employee performance and

overall slow community development. This challenge is rampant in other local government entities, indicating that skills development needs to be embraced and robustly implemented.

In the end, the transformation agenda of the post-1994 government becomes stifled by the absence of good leadership and management skills to promote and intensify the service delivery agenda effectively (Masuku & Jili 2019:1936). Arguably, this agenda requires an 'all hands-on deck' approach through synchronised short-, medium- and long-term approaches to local government and public service skills development (Masuku & Jili 2019:1940). The study deduces that the issue of ready and capacitated leadership for employee skills development in the local government tier is a significant issue hugely determinant on municipalities' abilities to equip the requisite skills for service delivery within living standards. These services include water, sanitation, infrastructure, safety, and other community amenities.

3.2. Status of local government employee performance

This section discusses the sad reality of South African municipal performance. According to damning assessments from the Auditor General of South Africa (AGSA), a financial watchdog monitoring public entity compliance and performance, local government entities lack the necessary capabilities. This section mentions several studies and their damning findings regarding the municipality's performance. For example, in the case of the Msunduzi Municipality in the KwaZulu-Natal Province, the AGSA established that during the 2016/2017 financial year, the entity incurred irregular expenditure, cumulatively R150 million and R11 million in unproductive and wasteful expenditure (Mbandlwa et al. 2020:1650). These humongous figures show losses to the public in South African local government. This study finds this to be absurd and a consequence of poor skill sets in those who make key decisions, and their commitment to skills training is also questionable. This poor decision needs to be better for the municipality's financial condition. Still, within the poor leadership and decision-making, the Msunduzi Municipality had fraudulently awarded tenders to service providers (amongst them, directors and shareholders) who were in the municipality's service, something that the AGSA indicated to be a flagrant disregard of local government laws and guidelines.

Moreover, the 2019/2020 Consolidated Local Government Audit Report by the AGSA laid bare the challenges caused by the absence of a skills development culture in municipalities, such as the Amathole District Municipality (ADM) in the Eastern Cape Province of South Africa. These have mainly been manifested in the financial management practices deemed poor by the AGSA (AGSA 2019/2020). Poor municipal financial management affects effective public service delivery. Regarding the ADM, outstanding creditors represented one-third of the next year's budget of R1.6 billion, which will now be used to pay creditors instead of funding new service delivery priorities (AGSA 2019/2020). In addition, the financial health of the ADM came into the spotlight in the AGSA report for the 2019/20 financial year, which states that the ADM was unable to recover money from consumers for services rendered, which compounded these financial difficulties and resulted in delays in paying their creditors (AGSA 2019/2020:70). The AGSA report (2019/2020:115) indicates that the absence of robust employee skills development practices in South African municipalities leads to them incurring fruitless expenditure and failing to curtail lavish expenditure that left their financial books in the red.

Moreover, the Amathole District Municipality is one of the municipalities that the AGSA has caught wanting in many of the performance shortcomings in the audit report. It is a sign that good governance, effectiveness, efficacy, and economy should be exercised with the due diligence they deserve. A superficial perusal of the AGSA's municipal audit outcomes and recommendations for the 2017/2018 and 2019/2020 financial years, one may perceive that most municipalities in South Africa need to establish workplace skills plans.

A study by Matlala and Uwizeyimana (2020:2) shows that slightly above 299 of the 338 municipalities audited in the 2012/2013 financial year were not awarded clean audit outcomes due to findings around their predetermined objectives by the ASGA. Matlala (2018:66) further observes that these outcomes were chiefly because of the anomalies related to non-compliance with the Public Financial Management Act (No. 1 of 1999) requirements, whereas, for the 2014/2015 local government report by the ASGA, a major finding was that the financial health of 92% of South Africa's 278 municipalities remained troubling and needed to be rectified. Such a large percentage is worrisome for South African local government, which is the core of community development and post-1994 transformation. A study by Mamokhere (2019:376) shows that in 2014 the Greater Tzaneen Local Municipality awarded a company an R38 million road-surfacing tender without following due process for the tender as stipulated in municipal statutes, procedures, and policies. This further proves that employee skills, especially in financial management, are deficient in South African local government. Matlala and Uwizeyimana (2020:8) further note that the AGSA (2017/2018:25) showed that "local government regular expenditure rose to R28.4 billion in the 2016/2017 financial year in contrast to R16.2 billion the previous year, showing an enormous 75% rise."

In addition to the preceding, the same AGSA report states that out of the 257 municipalities audited for the 2017/2018 financial year, a paltry 18 received clean audits, showing deterioration from the 33 municipalities that had received a clean audit in the preceding financial year (Matlala & Uwizeyimana 2020:8). Geldenhuys (2019:19) notes that another shocking example of poor municipal performance and decision refers to the wasteful and fraudulent R208 million payments by the eThekweni Municipality mayor to service providers for services that were never delivered. This study argues that these instances show gross negligence and a disregard for local government regulations, a sign of the lack of skills for municipalities to make good decisions. It should be further stressed that the outgoing synopsis of the various Auditor Generals reveals that local government malpractice indicates a tier of government in 'dire straits' when it comes to championing community development and transformation. This raises the need for robust adoption and implementation of comprehensive employee training and skills development programmes or initiatives as helpful interventions for effective local government service delivery.

Additionally, the recorded wastage of public funds is problematic since these resources could have been used to deliver essential and critical public goods and services to the people of South Africa. As discussed above, the 2017/2018 financial year saw the overall performance of municipalities rapidly decline. In the 2020/2021 and 2021/2022 financial years, the audit outcomes might be worse, especially considering how the COVID-19 pandemic negatively impacted service delivery and the administration of municipal entities in South Africa. This situation gives birth to another exponentially rising challenge in local government: public service delivery protests.

Note that municipalities are tasked with increasing the number and quality of fundamental services provided to residents across the province. Nonetheless, many municipalities are confronting severe capacity limits and institutional shortcomings, which prevent the realisation of political and institutional reforms aimed at effective and efficient service delivery (Vyas-Doorgapersad 2010:44, in Vyas-Doorgapersad & Masibigiri 2022: 133). In the context of the study, the lack of service delivery is "Insufficient municipal capacity due to a scarcity of skills (Chauke 2017:4, in Vyas-Doorgapersad & Masibigiri 2022: 133). This was also cited by Maseko (2018:29, in Kmep & Vyas-Doorgapersad 2020:1) that "shortage of qualified staff in the district and local government; inadequate standards of training and poor coordination between central, district and local levels of government, all of which hamper effective delivery of services", that may result into service delivery protests. According to Mpehle (2012), service delivery protests are the only avenue citizens have to register their displeasure with their government entities. This is because millions of residents in post-apartheid South Africa live under appalling conditions and do not enjoy the fruits of democracy. The chosen few enjoy it through corruption, nepotism and

fraud, among others. Therefore, the constitutional right to protect must be exercised to ring the alarm on the municipal governments (Mphele 2012:224). These protests sometimes turn violent and lead to the loss of public infrastructure or even lives. According to Singh (2019:2), the gross damage to municipal infrastructure during a 2019 public service delivery protest in eThekweni Municipality cost the municipality R3.5 million. In addition, “the death of Andries Tatane in Ficksburg in the Free State Province during a service delivery protests is one of the extreme and possible results of violent service delivery protests in South African local government” (Matebesi 2018:249). This ugly side of the public service delivery protests could be curtailed through the capacitation of municipal employees and the effective, efficient, and economic rendering of municipal services.

The ongoing lousy administration demonstrates these interventions' failure, which makes the connection between public service demonstrations and the municipality's training and development of the failed employees' skills inescapably visible. Most importantly, the local level of government is the best place to lead the way toward addressing the backlogs in public service delivery that have caused broad areas to wallow in poverty, misery, unemployment, and inequality nearly three decades after the end of apartheid. The reasons and discussion on the lack of alignment between municipal employees' skill sets and the demands of the 4IR demonstrate the necessity for efficient solutions to these anomalies. According to this researcher, all municipalities in South Africa need to make sure they devote all available resources to activities that promote efficient local governance through skill development. The audit opinions from the AGSA and other local government overseers can be strengthened significantly through rigorous skill development and local government employee capacity and competency growth. South African towns currently need more public funding due to ineffective leadership and inadequate personnel management methods. Skills development can assist in stopping this waste of resources.

Conclusions

The study explored the challenges that affect skills development as an intervention to address employee performance issues in South African local government. This was done through an exposition of the challenges in board terms where skills scarcity was once again the centre of the argument, where critical human capital competencies were revealed to be deficient.

The study lambasts the need for more return on investment by municipalities where vast sums of money are poured into skills development but with little or no return on the investment, hence a waste of resources. It was further established in the fourth chapter of this dissertation that local communities are finding it extremely difficult to improve their living standards because the people serving in their municipalities need to possess the requisite skill sets. The other impediment impacting skills development that the chapter looked at is the need for more investment in 4IR soft skill sets.

The study establishes that the South African municipality employees' skills must be updated and compatible with the 21st-century demands of local government service delivery. The literature review further confirms that the state of local government (public) service delivery is shambolic, as seen in the rampant financial mismanagement in most municipalities, where taxpayers' money could be more economically, effectively, and efficiently used. In the context of this finding, this study notes that the inability of South African local government employees to possess financial management competencies consistently is a massive contributor to losses in community development potential. Furthermore, the study discovered that the rise in service delivery protests that have caused the loss of human life and infrastructure was a testament to the poor employee performance in South African municipalities.

This study proposes the following recommendations for improvement. These recommendations and suggested strategies and interventions can be adopted and implemented by the identified role players to improve skills development continuously in the local sphere of government.

The study recommends pooling funds into a central local government fund for municipal skills training and development. Such a consolidated local government skills development fund can be housed in the Department of Cooperative Government, and such must be a national budget cost item. Such a structure of local government skills development can ensure that funds are available as and when required by municipalities. That will address the shortage of funds for real, wholesome interventions in local government employee skills development. In the same vein, this fund can be the only fund where all contributory levies, budget allocation and donations from other role players are kept for municipal skills development. The management of this fund needs to be legislated, and there must be stringent conditions and procedures for funding to be allocated. However, once due diligence is done, funds must be swift disbursement while the target skill sets are still relevant and impact directly on local government employee performance.

The study also vouches for adopting 4IR soft skills-related skills development practices in South African municipalities. Such a strategy will be implemented through a partnership between local government and the various stakeholders encompassing the LGSETA, tertiary education institutions and community-based organisations to do a feasibility study, diagnose urgent and relevant skill sets, and develop training programmes and the corresponding implementation modalities. This 4IR-related intervention can help municipalities train their employees and improve their competencies on relevant and time-compliant skills that can help the delivery of goods and services in a 21st-century context. This can be further aided by combining such skill development initiatives with an activity-based budgeting practice where funds are allocated only to relevant and urgent activities to avoid blind budgeting that sometimes allocates funds to activities far from critical.

This study ensures that skills development becomes an integral part of local government transformation, highlighting the significance of skills development for employee performance to transform municipal service delivery positively. Secondly, the study explores skills development practices for local government by identifying skills gaps so municipalities can ensure that the persistent challenge of skill scarcity in local government can effectively be addressed.

The study offers a holistic approach to skills development for improved municipality employee performance. Hence interviews do not form part of the study and can be considered a limitation.

Many questions occurred during the study, such as: What are the challenges affecting the efficacy of existing skills development initiatives and programmes in South African municipalities? To improve employee performance, which strategies can be adopted towards effective skills development practice in South African municipalities? Future publications may aim to find answers to these questions and form part of a longitudinal study, contributing to the fields of public management and local governance.

Overall, the scientific novelty of the obtained results expands the existing body of academic knowledge by bringing fresh perspectives to the challenge of poor performance and lack of skills in local government. The findings contribute to ensuring that skills development becomes an integral part of local government transformation, highlighting the significance of skills development for employee performance to positively transform municipal service delivery. Additionally, the findings explore skills development practices for local government by identifying skills gaps so municipalities can ensure that the persistent challenge of skill scarcity in local government can effectively be addressed.

NOTE:

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SOUTH AFRICA'S "TRIPLE CRISIS OF GOVERNANCE" AND SOCIETAL LEADERSHIP VACUUM

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Abstract. This article demonstrates that corruption, illegality and insecurity, which escalated with the ruling African National Congress' (ANC's) deconsecration of South Africa's stateness, are reigning under the grip of the "triple crisis of governance" and societal leadership vacuum. It argues that South Africa's defiled stateness has allowed for the ceding of public/state power and authority to non-state actors, intolerance of state-society subsidiarity, abuse of state power, industrial-scale corruption and persecution of whistleblowers. The article cites tales of persecution and killing of whistleblowers and the extraordinarily high proportion of public distrust of key state institutions and the political system that created an ominous societal leadership vacuum as indicators of the "triple crisis of governance" and deconsecrated stateness. It holds that political party state governance is not absolute; instead, it is "relational" and "situational," requiring citizenry legitimacy and public trust, which are vested with state-society subsidiarity, without which control of public/state power and authority would be impossible outside the use of force, violence or fraudulent means. This article concludes that having ceded public/state power and authority to non-state actors and deconsecrating stateness, the ANC allowed for the consolidation of an ominous societal leadership vacuum under which the South African democratic experiment would not endure. Therefore, the ANC's solace about lost votes not accruing to opposition parties is delusional because an increasing majority of South Africans are now willing to forego electoral democracy and to settle for an unelected but effective government that guarantees security, legality, rule of law and accountability. This article recommends that institutions of society embark on nationwide campaigns to sanctify South Africa's stateness and counter the phenomenon of defiled statehood by reinvigorating the vibrancy of citizenship in the democratic experiment.

Keywords: governance; democratic experiment; stateness; state-society subsidiarity; deconsecration; corruption; whistleblowing; democracy

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1. Introduction

The "triple crisis of governance" manifests when the state lacks accountability and the rule of law amidst leaderless civil conflicts and economic crises, as well as deconsecration of stateness, characterised by insecurity, illegality and instability (Kew, 2005; Diamond, 2005; van Wyk, 2007; White & Larmer, 2014; Schubert, 2015;

Alexander, McGregor & Tendi, 2017; Witz, Minkley & Rassool, 2017; Dallywater, Saunders & Fonseca, 2019; Kumagai & Iorio, 2019; Alexander *et al.*, 2020). In a democratic South Africa, the ruling ANC has brazenly ceded public/state power and authority to non-state actors in a phenomenon denoted state capture (Farooqi, Abud & Ahmed, 2017; Mojapelo & Faku, 2019; Wiener, 2020; Calland & Sithole, 2021; Muller, 2021; Mojapelo, 2022), thereby consecrating corruption, illegality, insecurity and defiling of the country's stateness. The ANC's mysterious narrative that the recent haemorrhaging of votes is not a problem because they are not lost to opposition parties demonstrates that the ruling party is eluded by the "triple crisis of governance" and consolidation of societal leadership vacuum, which are directly linked to deconsecration of South Africa's stateness. South Africa's exercise of public/state power and authority required the exertion of the supremacy of the rule of law, ethical and moral leadership, transparency, accountability, inclusivity and constitutional fidelity (Wiener, 2020; Calland & Sithole, 2021), which rest on the principle of state-society subsidiarity for legitimacy. Instead, the ANC government created the "triple crisis of governance" through brazen abuse of state power, enabling systematic industrial-scale corruption, insecurity, illegality and impunity, and deconsecration of South Africa's stateness. Hence, the history of South Africa's democratic experiment is riddled with egregious constitutional infidelity than fidelity (Wiener, 2020; Calland & Sithole, 2021), wherein the "normative core" of the principle of state-society subsidiarity has been defiled. Looting of state resources and deconsecration of stateness was enabled by, among other things, decimating key state organs such as the National Prosecution Authority (NPA), the Hawks, Special Investigative Unit (SIU) and the South African Revenue Services (SARS) (Wiener, 2020; Calland & Sithole, 2021; Mojapelo, 2022). The "triple crisis of governance", corruption, whistleblower persecution, defiling state-society subsidiarity and deconsecration of stateness, eroded public trust and created an ominous societal leadership vacuum. South Africa's democratic experiment is now characterised by brazen criminality, corruption, murder and lawlessness amidst severe public distrust in institutions such as the police, army, courts of law, Electoral Commission, religious and traditional leadership, and political parties, and an increasing majority of citizens willing to forego the right to democratic election in favour of an unelected but effective government.

The societal leadership lost by the ANC, opposition parties and state institutions remain unaccounted for by any credible institutions. The "path-breaking" civil society vitality and public trust, which are "relational" and "situational" (Putnam, 1993), are unaccounted for by any credible societal institution, thereby raising concerns about a potential societal leadership vacuum that could explain the violent civil unrest and destruction of infrastructure in July 2021. The ANC's governance paralysis has allowed party elites to elicit private personal corrupt and fraudulent gains by desanctifying state-society subsidiarity and defiling South Africa's stateness (Wiener, 2020; Muller, 2021). The "triple crisis of governance" has decimated the credibility of the democratic experiment and eroded public confidence in the institutions of the state and democracy. By 2021 an increasing proportion of South Africans no longer trusted the ANC or any other credible societal institution (Moosa & Hofmeyr, 2021; Muller, 2021), creating a harmful societal leadership vacuum. Political systems require public legitimacy to ensure that structures, processes and systems of state institutions would have widespread support arising out of public trust and state-society subsidiarity. With industrial-scale corruption (Frohlich, 2022; Mojapelo, 2022; Wright, 2022) and consolidation of societal leadership vacuum, South Africa's democratic experiment will not endure (Kumagai & Iorio, 2019). This article argues that South Africa has reached the "triple crisis of governance" where the principle of state-society subsidiarity is undermined, stateness deconsecrated, and societal leadership legitimacy of the ruling ANC, opposition parties, and state institutions eroded, resulting in rampant corruption and whistleblowers' persecution.

2. Stateness, democratic experimentation, and the "Triple Crisis of Governance" in Africa

The African state is an imposition of an alien state and structures. The European state, institutions and authority have been transplanted on Africa, and this phenomenon involved subjugation and subversion, which made liberation elusive in what Basil Davidson characterised as "the black man's burden" and "curse" (cited in van

Wyk, 2007). This “great transplantation” allowed for the manifestation of “the politics of inclusion/exclusion” which explains the collapse of the imposed state in Africa (Osabu-Kle, 2000: 37). Hence, Africa’s democratisation drives of the 1980s, 1990s and the 21st century have continued to be punctuated by state violence against the pro-democracy movements, coups and suspensions of constitutions (Osabu-Kle, 2000; Diamond, 2005; Kew, 2005; Mamdani, 2005; Okuko, 2006; van Wyk, 2007). Inevitably, access to public/state power and authority under the democratic experiment in Africa has uniformly degenerated into the ruling party deconsecrating stateness. Generally, African leaders have attempted unsuccessfully to reconfigure the African states following a liberation struggle political culture incompatible with the principles undergirding the democratic experiment. In the process, the status of the state as “the principal, sovereign, authoritative and legitimate actor” in the exercise of “public/state authority” is changed. Power is ultimately ceded and exercised, “both *de jure* and *de facto*,” by non-state actors (van Wyk, 2007: 9). These eventualities establish an environment wherein the state’s authority is challenged, and state institutions collapse as “powerful informal/illicit” leadership proliferate to overshadow the “formal” political leadership (van Wyk, 2007: 9). Non-state “informal/illicit” leadership tends to further usurp the existing power vacuum, exacerbating state failure/collapse and incrementally defiling stateness (Osabu-Kle, 2000; Diamond, 2005; Kew, 2005; Mamdani, 2005; Okuko, 2006; van Wyk, 2007). State failure/collapse is a continuum rather than an end-point; hence, a collapsing/failing state is conceptually an epiphenomenal concurrency of a collapsed/failed state. In South Africa, non-state private actors to which the ruling ANC ceded public/state power and authority usurped further power vacuum, created as the state and its institutions were incrementally defiled by “informal/illicit” non-state leadership. When “public/state authority” is undermined, a power vacuum is created, and private non-state actors assume such public/state space with the consent of ruling party-political leaders (Osabu-Kle, 2000; Diamond, 2005; Kew, 2005; Mamdani, 2005; Okuko, 2006; van Wyk, 2007), and an ominous societal leadership vacuum forms as the state-society subsidiarity is desanctified.

Contemporary African states consist of “inherited state structures” designed through and for coercion and authoritarianism as well as centralisation of power for control in the army, police and bureaucracy (Diamond, 2005; Kew, 2005; Mamdani, 2005; van Wyk, 2007; Sapire, 2009; White & Larmer, 2014; Alexander, McGregor & Tendi, 2017; Dallywater, Saunders, & Fonseca, 2019; Alexander, Israel, Larmer & De Oliveira, 2020). Commonly, African states are an artificial imposition (Diamond, 2005; Kew, 2005; Mamdani, 2005; van Wyk, 2007; Sapire, 2009; White & Larmer, 2014; Alexander, McGregor & Tendi, 2017; Dallywater, Saunders, & Fonseca, 2019; Alexander, Israel, Larmer & De Oliveira, 2020) which are not amenable to the exercise of state-society subsidiarity and participatory democratic experimentation. With negligible exception, liberation and independence political culture in Africa has encapsulated authoritarian patterns of state governance wherein political contestations became levers for access to control of the state authority and resources for corruption, self-enrichment and abuse of power for elimination of opponents (Diamond, 2005; Kew, 2005; Mamdani, 2005; van Wyk, 2007; Sapire, 2009; White & Larmer, 2014; Alexander, McGregor & Tendi, 2017; Dallywater, Saunders, & Fonseca, 2019; Alexander, Israel, Larmer & De Oliveira, 2020). For these conditions to hold, African state governance degenerated into the “triple crisis” of insecurity, illegality and socio-economic conflicts wherein stateness was generally deconsecrated. This article asserts that a “democratic” South Africa is not an exception to the African norm. The ANC inherited an imposed state; and, under the democratic experiment, the elusive colonial-style authoritarianism subverted the democratic state governance. The state’s bureaucratic authority and the quality of its administration have deteriorated exponentially in recent years (Calland & Sithole, 2021; BTI, 2022), thereby decimating South Africa’s stateness. State capture testimonies and assassination of whistleblowers demonstrate that the brazen elite corruption is no longer just systematic but reflects “the shadow state or ... a parallel state” (Narsiah, 2022: 186). Revelations that the ANC’s state governance was instrumental in the process of relinquishing control of public/state power and authority to non-state actors such as the Gupta family, Bains & Company and Bosasa, among others, to establish an enduring para-state framework that would weaken state institutions and deconsecrate stateness, and normalise industrial-scale corruption and killings, are ominous

indicators of a consolidated shadow state. The latter is possible where the societal leadership vacuum is consolidated.

Stateness entails the provision of security, order, legality and stability, among other basic rights and necessities, to the public. Therefore, state governance invokes the exercise of control of public/state power and authority by the ruling party to ensure that stateness is realised pragmatically among the citizenry. Stateness, just like the exercise of power and authority, is not absolute; instead, the public imbues political systems and state institutions with legitimacy, confidence and trust for the exercise of statehood (Diamond, 2005; Kew, 2005; Mamdani, 2005; van Wyk, 2007). That is, stateness and state-society subsidiarity are mutually formative of each other; hence, "where the state is unable to provide basic services and security," the notion of "failed/fragile state" tends to be invoked and applied (Kew, 2005: 150; van Wyk, 2007: 7). Where conditions of state's "structure, authority, power, law and political order fall apart," the "triple crisis of governance" manifests, and the state will lack accountability, fail to uphold the rule of law, be unable to resolve social conflicts and economic crisis (Diamond, 2005: 13; van Wyk, 2007: 7). To this end, Mamdani's (2005: 266) argument that "It is not just any state that is collapsing, it is specifically the colonial state in Africa that is collapsing," is pertinent because South Africa's state, which was inherited by the ruling ANC in 1994, is collapsing and/or failing, taking with it the democratic experiment. This article holds that South Africa has never established its nuance democratic state in 1994; instead, it is the artificially imposed state and the colonial apartheid state structures of authoritarianism that are collapsing and/or failing.

Once public/state power and authority are vested in non-state actors, the nation-state institution ceases to serve the interests of the public; and, the democratic experiment fails because state-society subsidiarity is undermined and stateness is deconsecrated, allowing for insecurity, illegality and socio-economic conflicts. As the leader of state institutions and, by self-proclamation, that of society, the ANC has failed to take accountability for the governance crisis and abuse of state power and authority, evident over the past two decades as vividly exposed through state capture testimonies. This article argues that the ANC's dominion and control of public/state power and authority has suppressed constitutionalism and democratic freedoms for the majority of previously disadvantaged South Africans (Narsiah, 2022) by creating the "triple crisis of governance" where insecurity, illegality and socio-economic conflicts are predominant, whilst stateness is incrementally deconsecrated. In the past two decades, South Africa's state-owned enterprises (SOEs), such as ESKOM, Denel, Vhenda Building Society (VBS), South African Broadcasting Corporation (SABC) and a host of municipalities, have been notorious for scandalous illicit activities, including fraud, maladministration, corruption and tender rigging (Mojapelo, 2022). A few brave, honest and patriotic employees of SOEs, municipalities and other state institutions, decided to risk it all and blew the whistle by exposing graft, looting, political interference, corruption, nepotism, fraud and siphoning of funds (Farooqi, Abud & Ahmed 2017; Mojapelo, 2022), were systematically persecuted or eliminated. The brazen killing of whistleblowers in South Africa raises vexed questions whether the democratic experiment has degenerated into a "mafia state" where crime, corruption, violence and illegality rule. The South African democratic experiment is 28 years on, synonymous with rampant "corruption, looting and fraud, theft," nepotism and maladministration in both the private and public sectors (Mojapelo, 2022: 5). Potential whistleblowers fear alienation, threats, career limitation, intimidation, loss of income, dismissal and bullying (Mojapelo, 2022), which can only describe a state where the "triple crisis of governance" holds and stateness deconsecrated.

3. Corruption and persecution of whistleblowers in South Africa

Whistleblowers in South Africa are faced with a severe quagmire wherein they are harassed, victimised, chastised, dismissed from their jobs, purged, persecuted and, in other cases, assassinated (Carson & Mota-Prado 2016; Mojapelo, 2022). Indeed, whistleblowing involves both selfish (*egotistic*) and unselfish (*altruistic*) acts on the side of the whistleblower, and it has become a dangerous act in a democratic South Africa (Halpin & Dundon,

2017; Mojapelo, 2022). The Judicial Commission of Inquiry into Allegations of State Capture has revealed the rot, especially at the SOEs, and the ineffectiveness of the bureaucratic administration and dysfunctional state institutions (Calland & Sithole, 2021; BTI, 2022). SOEs, such as the national rail agency (Prasa), Transnet, Eskom, the national airline (SAA) and Denel, have been in financial turmoil due to industrial-scale corruption and mismanagement (Calland & Sithole, 2021; BTI, 2022). The South African Revenue Service (SARS) was also neglected for years to facilitate its capture, corruption and a culture of impunity (Calland & Sithole, 2021; BTI, 2022). Corruption, as measured through the Corruption Perception Index (CPI) as well as in terms of the sheer amount of resources involved, is endemic among African countries (Imiera, 2020, cited in Mojapelo, 2022: 5). In 2019, the South African Broadcasting Corporation (SABC) reported that president Ramaphosa told the *Financial Times* Africa Summit in London that South Africa had lost over R1 trillion to corruption (cited in Mojapelo, 2022: 5). In terms of the CPI, South Africa is ranked 70 out of 180 countries (Frohlich, 2022). The South African Chapter of Transparency International, Corruption Watch, reports that 5 094 allegations of local government corruption were submitted during 2012-2020 (Wright, 2022).

Whereas not the worst in the world, whistleblowing is in most of Africa tantamount to "death penalty" (Mosimann-Barbier, 2014; Open Democracy Advice Centre (ODAC), 2015; Farooqi, Abud & Ahmed, 2017; Halpin & Dundon, 2017; Nel, Forster & Thesnaar, 2020; Wiener, 2020; Gavin, 2021; Frohlich, 2022; Jansen, 2022; Mojapelo, 2022; Wright, 2022). Whistleblowing "is a way of challenging power, an assertion of belief in legality and morality" (Wiener, 2020: 10). Indeed, telling "truth to power," legality and morality have been scarce commodities for most of Africa. Clarke (2021) states that whistleblowers speak "truth to power about corruption," and, with "no defence against truth," power retaliates and attacks whistleblowers with brutality and impunity. Soopramanien Kisten of Mauritius was burnt to death in October 2020 for exposing government Covid-19 corruption (Frohlich, 2022). Gradi Koko Lobanga and Navy Malela, following their July 2020 expose of the international money laundering network between the Democratic Republic of Congo (DRC), Europe and Israel through their former employer, Afriland First Bank, were instead "sentenced to death in absentia" in the DRC on account that they violated bank secrecy laws as an organised gang "stealing documents ... forgeries and defamatory denunciation" (Frohlich, 2022). Whistleblowers know, in advance, the calamitous consequences that would befall them; hence, whistleblowing entails a degree of moral courage (Wiener, 2020; Clarke, 2021) because fate seems always to be predetermined. But governments have done little more than lip-servicing the plight of whistleblowers. The United Nations Organisation on Drug and Crime (UNODC) has reported that of the 54 African countries, only seven (7) have promulgated laws, which are inadequate in many respects. The Platform for the Protection of Whistleblowers in Africa (PPLAAF) is inadequate because it covers state officials only (Frohlich, 2022), leaving the majority of whistleblowers to their own devices. Existing legislation is inadequate and, in some cases, defective. Whilst persecution of whistleblowers rages on and corruption ravages Africa, governments have continued to be despondent and paralysed. Whereas Ghana has "the strongest whistleblower laws" in Africa, it does not accord reporting anonymity nor protection against retaliation attempts, whilst Nigeria "has virtually no" whistleblowing law (Frohlich, 2022). South Africa, whose democratic experiment is touted as a beacon of hope for Africa, has been embroiled in industrial-scale corruption, persecution, and execution-style murder of whistleblowers.

Gavin (2021: n.p.) notes that contemporary South Africa is afflicted by "a toxic combination" of "corruption, cynical politics and high levels of violence," which created fertile conditions for the detrimental treatment and killing of whistleblowers. Wiener (2020) presents a scathing indictment of the state of South Africa, lamenting the treatment of whistleblowers whose life of misery involves ostracism, depression, negative stigma and execution-style murder. South Africa now has a melee of political toxicity and violence (Gavin, 2021) that has imposed an extraordinarily high cost on the governance of the democratic experiment. The July 2021 public unrest has conclusively demonstrated tolerance for violence and disregard for the rule of law among most South Africans (Gavin, 2021). Political anarchists harnessed South Africa's political toxicity, especially the ANC's factional tension and governance paralysis, to resist accountability and transparency. As a ruling party, the ANC is

characterised as "a vast criminal enterprise," under which whistleblowers have suffered severely, whilst evidence is mostly "swept under the carpet" (Wiener, 2020; Gavin, 2021; Jansen, 2022). Whereas corruption and illegality are pervasive in South Africa, and the public is "inured," whistleblowers are often characterised as societal misfits, enduring calamitous and fatal consequences (Wiener, 2020; Gavin, 2021; Jansen, 2022), at the same time as the country is riddled with public anti-corruption protests, mostly violent (Frohlich, 2022; Mojapelo, 2022; Wright, 2022). Contemporary South Africa has a woeful ethical leadership deficit in all life spheres, including the traditional and religious domains. In general, South Africa has treated whistleblowers with utter disdain, an indictment of the integrity of the democratic experiment and the sanctity of its stateness.

ODAC (2015: 1) notes, "When we consider the actual experiences of citizens who blow the whistle in South Africa, it becomes clear that the ambitious constitutional principles that promote transparency are not enough to create a safe environment for those that speak out on wrongdoing." A democratic experiment has to effectively protect whistleblowers because they serve society by uncovering the truth and exposing corruption at significant personal risk (Frohlich, 2022; Mojapelo, 2022; Wright, 2022). In most of Africa, whistleblowers have been ostracised and murdered (Wiener, 2020; Frohlich, 2022). Whistleblowing is a crucial corruption and malfeasance-busting strategy but at a high cost for the whistleblowers. Ordinarily, the provision of legislation to protect whistleblowers has been inadequate and, sometimes, an outright lip servicing exercise. According to Loggerenberg, "No democracy can survive without people who act when they see something going on that is wrong" (cited in Frohlich, 2022: n.p.). The state has to protect citizens so that they may "not be afraid of the consequences ... because fear only creates a breeding ground for more corruption and crime" (Frohlich, 2022: n.p.). According to Williams (cited in Frohlich, 2022: n.p.), state capture whistleblowers in South Africa had "Fear for their physical integrity," "fear of legal action", and fear of being unable to provide for their families, respectively, because "government does not provide protection," existing laws do not cushion them from legal exposure and the "negative stigma" that see companies refusing to employ and secure their livelihoods. Also, the ODAC (2015: 1) concludes that whereas whistleblowers' stories are each unique, they have similarities "that paint a picture of struggle and adversity for people seeking to do the right thing in the public interest," which can be a high-risk act, including being killed.

For South Africa, Wiener (2020) describes Mpumalanga Province as "the centre of whistleblower murder," where Jimmy Mohlala and Sammy Mpatlanyane were shot to death for uncovering corruption in the construction of the 2010 FIFA World Cup Mbombela stadium (Wiener, 2020). Their killing was followed by "a farcical chain of police ineptitude and malpractice," allegedly extending to "the highest levels of the ANC" (Wiener, 2020: 11). Jimmy Mohlala, who was the Mbombela Municipality manager in Mpumalanga Province was shot dead for exposing tender corruption in the 2010 Soccer World Cup stadium (Mojapelo & Faku 2019; Mojapelo, 2022). The murder of whistleblowers is planned and conducted with sheer arrogance by groups of men, as attested to variously by cases involving Babita Deokaran and Sindiso Magaqa (Wiener, 2020; Frohlich, 2022; Jansen, 2022; Mojapelo, 2022). Babita Deokaran, who blew the whistle on corrupt transactions involving Tembisa Hospital multi-million rand contracts in Gauteng Province was brutally shot dead on August 23, 2021 (Gavin, 2021; Wright, 2022). Babita Deokaran was not only a whistleblower but also a witness in the SIU investigation regarding corruption and irregular procurement in the Gauteng Department of Health (Gavin, 2021; Wright, 2022). Sindiso Magaqa, a former ANC Youth League secretary and ward councillor in KwaZulu-Natal, was shot multiple times in July 2017 and died later from stomach pain, allegedly because of uncovering corruption in the uMzimkhulu Municipality for the renovations of a town hall (Jansen, 2022; Mojapelo, 2022). Exposures of corruption in the Free State Province Vrede Estina Dairy Farm saw a Department of Agriculture civil servant, Moses Tshake, suffering a gruesome death when he was kidnapped, tortured and towed behind a car to death, a price he paid for doing a diligent job and being patriotic (Wiener, 2020). A councillor, Moss Phakoe, of Bojanala Platinum District Municipality, North West Province, was shot dead in 2009 after he had exposed corruption perpetrated by other councillors and officials in the municipality (Wiener, 2020; Wright, 2022). Following Moss

Phakoe's killing, police work was shoddy, dockets disappeared, and his ally in exposing corruption is now condemned to misery (Wiener, 2020; Wright, 2022).

Whereas President Ramaphosa hailed Babita Deokaran as "a hero and a patriot" (Gavin, 2021), his government has not done enough to halt the terrorisation and brutal killing of whistleblowers, some of whom have now self-exiled. Those lucky not to be killed suffer profusely and, sometimes, with long-lasting calamitous life consequences. Athol Williams, who blew the whistle on state capture in 2021, was forced to flee the country, fearing for his life (Frohlich, 2022). An anti-corruption activist, Thabiso Zulu, in kwaZulu-Natal Province was ambushed and shot in the arm after exposing corruption, tender rigging and price inflation by high-profile politicians in uMzimkhulu Municipality; and, he has accepted that he will not come out of this situation alive (Clarke, 2021; Jansen, 2022; Mojapelo, 2022). According to Thabiso Zulu, South African whistleblowers are awaited by "prison, death or self-imposed exile" (cited in Clarke, 2021). Cynthia Stimpel and Themba Maseko at the SAA and Government Communications Information System (GCIS), respectively, experienced calamitous lives following their exposure or prevention of corruption. Themba Maseko was a Director General at the GCIS. He refused to allow the allocation of government media buying budget contract worth R600 million to the Gupta newspaper, the New Age (TNA). He was dismissed, and he suffered a calamitous life (Buckland & Willis, 2012, cited in Mojapelo, 2022: 10). Having exposed corruption and illicit transactions at the SAA, Cynthia Stimpel lost her job and was subjected to "a tough time" (Frohlich, 2022; Mojapelo, 2022). Mosilo Mothepu, a former Trillian Financial Advisory Chief Executive Officer, revealed that Trillian secured R1.6 billion in contracts through insider and commercially sensitive information from Transnet and Eskom, among other SOEs. She paid a heavy price of disciplinary hearings, dismissal, an arduous legal battle and a bill worth R1.4 million, bankruptcy, unemployment during 2016-2018, and ominous threats (Mojapelo, 2022). To achieve an ethical and moral society, each citizen must be involved; to endure, the democratic experiment needs whistleblowers to deter and uncover corruption. The state must provide security and ensure that society may not be ruled by fear. In constitutional infidelity, industrial-scale corruption, escalation in public distrust in state institutions, deconsecration of stateness and desanctifying state-society subsidiarity described above, the South African democratic experiment cannot endure.

4. Public distrust, state-society subsidiarity and the democratic experiment

Public trust and democratic state governance are driven by similar principles, attributes and values (Alkon & Urpelainen, 2018; Brankovic, 2019; Festenstein, 2020), which subsume under generic state-society subsidiarity relations. If state-society subsidiarity relations are defiled, public distrust will escalate, and an ominous societal leadership vacuum will form.

4.1 State-society subsidiarity relations

Governance of democratic experiments and state-society subsidiarity relations are contestable because they are connected through public trust, simultaneously subjective and objective, as well as symbolic and instrumental value. Whereas public trust is a resource for the legitimacy and stability of public institutions, it is both an outcome-based and process-based phenomenon, which is crucial in creating opportunities for the sustainability of democratic experiments (Alkon & Urpelainen, 2018; Festenstein, 2020). In addition, inclusive decision-making processes and democratic governance generate and strengthen public trust in ways that mediate risky public behaviour through state-society subsidiarity. Public value of the citizenry's trust resides in the legitimacy of institutions, allowing for vibrant citizen engagement and societal partnerships. Thus, principles that subsume under state-society subsidiarity constitute the foundations for effective governance because the former involves "sharing of powers between" different levels of public/state authority in order "to guarantee a degree of independence" at all scales (Alkon & Urpelainen, 2018; Festenstein, 2020). By its nature, democratic governance turns on state-society subsidiarity relations, sound policymaking, leaving no one behind or outside the process, and non-discriminatory vibrant citizen engagement (Alkon & Urpelainen, 2018; Festenstein, 2020).

With public trust, state-society subsidiarity is impossible when dysfunctional institutions breed public distrust that extends to political systems (Alkon & Urpelainen, 2018; Festenstein, 2020). Hence, democratic governance invokes the treatment of all citizens fairly and justly, respecting and upholding human rights and the rule of law, creating opportunities for access to public goods and services as well as allowing for unhindered citizens engagement (Putman, 1993; Putman, Leonardi & Nanetti, 1993), which do not hold where corruption is rampant, and whistleblowers are brutally killed. Also, social cohesion is necessary in state-society subsidiarity for collective decision-making, especially within heterogeneous societies, because it connects to equality of opportunity, inclusivity, the rule of law, order, stability, transparency and accountability (Alkon & Urpelainen, 2018; Festenstein, 2020). On the converse, corruption, illegality and dysfunctional public institutions desanctify state-society subsidiarity and cause public distrust and despondence (Putman, 1993; Putman, Leonardi & Nanetti, 1993; Brankovic, 2019). A democratic experiment cannot endure under these conditions of public violence and crime, corruption, the assassination of whistleblowers, deconsecrated stateness and defiled state-society subsidiarity. This article asserts that the ANC has, in 28 years, failed the state-society subsidiarity test by creating the "triple crisis of governance," which imbued public distrust of state institutions, political systems and the democratic experiment itself amidst insecurity, illegality and instability. Unsurprisingly, an increasing majority of South Africans who qualify to vote have yet to register in recent elections (IEC, 2019, 2021; Calland & Sithole, 2021; BTI, 2022).

4.2. Public distrust in South Africa's democratic experiment, societal leadership vacuum and deconsecrated stateness

Public trust in state and democracy-supporting institutions has been eroded to the lowest historical levels. Where evidence of executive abuse of power emerged, the ANC-dominated legislature failed to exercise effective oversight because public representatives are beholden to their political parties than to the country, pitting self-interested personal career ambitions with conscience and personal convictions (Wiener, 2020; Calland & Sithole, 2021; BTI, 2022; Wright, 2022). In May/June 2021, Afrobarometer surveyed to determine the level of public trust in societal institutions, including parliament, courts of law, police, religious and traditional leaders and political parties, among others, which revealed that confidence in these institutions has generally declined to its historic lows. Public trust in the local councils, opposition parties, police, the ANC, provincial premiers and parliament was below 30% (Moosa & Hofmeyr, 2021). Public trust in traditional leaders, Electoral Commission of South Africa, the presidency and SARS was between 31% and 40%. For religious leaders, the Public Protector, courts of law and the army were between 42% and 49%. There is a significant public trust deficit, and an increasing majority of South Africans have lost confidence in these democracy-supporting institutions, undermining the vibrancy of citizen engagement. To this extent, state-society subsidiarity relations have been eroded, and the democratic experiment defiled.

Whereas the judiciary remained highly effective and independent, an increasing majority of the public distrusted it. South African citizens are granted extensive civil rights. Still, in too many cases these rights are not sufficiently respected, especially in regard to basic rights such as access to water, electricity, education and physical integrity, and access to justice through courts of law is extraordinarily expensive (Calland & Sithole, 2021; BTI, 2022). Public trust in the Office of the Public Protector too has collapsed drastically (Calland & Sithole, 2021; BTI, 2022). The ANC's vote share in national elections has declined from its peak of 70% in 2004, as citizens have become increasingly frustrated with rampant corruption and the ruling party's governance paralysis (Wiener, 2020; Calland & Sithole, 2021; BTI, 2022). Although most voters continued their support of the ruling ANC, which won its sixth successive free and fair election, its majority declined from 62% in 2014 to 58% in 2019, which is its lowest-ever vote share (Calland & Sithole, 2021; BTI, 2022). Inevitably, the legitimacy and authority of the state are under questioning, especially as corruption is accompanied by public insecurity and the killing of whistleblowers. One of the major concerns arising from the 2019 elections was the decreasing voter turnout, as only 66% of registered voters cast their ballots compared to 74% in 2014 (IEC, 2019; Calland & Sithole, 2021; BTI, 2022). Aside from registered voters choosing to stay away, millions of South Africans are not registered on

the voters' roll and therefore ineligible to vote; and, taking these non-registered voters into account, the voter turnout drops to 49% (IEC, 2019; Calland & Sithole, 2021; BTI, 2022). South Africa is widely regarded as one of the most successful democracies in Africa, but public confidence in the democratic experiment has declined significantly, as demonstrated above. Instead of voting for opposition parties, many voters elected to not participate in the elections at all (IEC, 2019, 2021; Calland & Sithole, 2021; BTI, 2022), primarily because of the distrust in democracy-supporting institutions.

Conversely, an increasing majority of South Africans distrust these institutions of the democratic experiment, especially the police, local councils, opposition parties and the ANC, followed by the provincial premiers, the presidency, Electoral Commission, courts of law, SARS, religious leaders, Public Protector, the army and traditional leaders (Moosa & Hofmeyr, 2021). Public trust in the ANC dropped drastically between 2011 and 2015; it has since never recovered as it reached its lowest in 2021 (Moosa & Hofmeyr, 2021). For opposition parties, public trust has always been below that of the ANC during the democratic experiment. In 2006, public trust in the ANC was at its highest (62%), and it dropped to 50% in 2008, recovered to 61% in 2011, and declined drastically to 27% between 2011 and 2021 (Moosa & Hofmeyr, 2021). The South African public has historically had confidence in the national liberation movement since at least the 1950s. The distrust of the ruling party of about 73% in 2021, as estimated from the Afrobarometer survey, is unprecedented and concerning because it points to the consolidation of an ominous societal leadership vacuum which opposition parties or any other credible institution have not usurped. Despite the hyperbolic campaigns around "Thuma Mina" and "Ramaphoria" since 2017, public trust in the ANC dropped from 43% in 2015 to 38% in 2018, reaching a historic low of 27% in 2021. The inability of the ANC to significantly recover public trust, even after the December 2017 national elective conference that installed a new president who took over control of the state presidency in early 2018, demonstrates that the underlying factors are systemic and institutional rather than personality traits. Consolidating the societal leadership vacuum means that the July 2021 civil unrest, destruction of infrastructure and looting could be a function of a shadowy leadership, if not a leaderless uprising. That this societal leadership vacuum will be consolidated is unquestionable because, in 2021, Afrobarometer showed high public distrust in almost all democracy-supporting institutions, except for the broadcasters. As a momentous Phala Phala Farm scandal is already desanctifying the Ramaphosa presidency, there is no hope of the ANC reclaiming, reducing or de-intensifying the societal leadership vacuum.

In the same manner, as public distrust in democracy-supporting institutions has increased from 2006 to 2021, the proportion of South Africans who have expressed a willingness to forego electoral democracy has risen from 57% in 2006 to 65% in 2008, declining to 63% in 2011, remaining at 62% in 2015 and 2018, to 67% in 2021 (Moosa & Hofmeyr, 2021). During the same period, South Africans unwilling to forego electoral democracy dropped from 35% in 2006 to 29% in 2008. It recovered to 33% in 2011 and 35% in 2015 and 2018, to a historic low of 30% in 2021 (Moosa & Hofmeyr, 2021). The last defence of the democratic experiment and governance has virtually collapsed because public confidence and trust on which it turns, and source legitimacy and support, have been decimated. An increasing majority of South Africans perceive and/or experience no public value in the democratic experiment and governance, and this societal character is, in the context of a consolidated societal leadership vacuum, an ominous sign for the nation-state. The July 2021 civil unrest, political upheaval, public violence and destruction of infrastructure amidst state institutions' paralysis is not an epiphenomenal concurrence of an angry public. Deconsecrated stateness in the context of such a significant majority of the public willing to forego electoral democracy amidst a yawning public distrust of democracy-supporting institutions means that the most profound defences of democracy, the state-society subsidiarity relations, is decimated and that South Africa's democratic experiment may not endure.

Underlying the ANC's internal strife, fragmentary factionalism and simmering tensions, there has been "a willingness to use political violence" (Muller, 2021: 2). The optics of leaderless civil unrest, political violence, destruction of infrastructure and rampant looting are ominous. It is worrying that an increasing majority of South

Africans have expressed their willingness to forego electoral democracy in favour of being ruled by an unelected but influential government if security, legality, stability, service delivery and prosperity are guaranteed. As already stated above, 67% and 30% of South Africans registered a willingness and unwillingness, respectively, to forego their rights to electoral democracy in favour of an unelected but effective government in May/June 2021 (Moosa & Hofmeyr, 2021). Understood in the context of the majority of South Africans who are tolerant of violence, this 67% of people willing to forego electoral democracy, together with the unreasonable July 2021 public violence and the daily brutal gender-based violence, suggest a void of societal leadership. An increasing majority of South Africans perceive no value in the democratic experiment, and the consolidation of the societal leadership vacuum while state institutions remain paralysed means that future violent civil unrest cannot be discounted. South Africa's democratic experiment cannot endure under these circumstances of deconsecrated stateness. The last lines of defence of the democratic experiment, which are a public trust, state-society subsidiarity relations and stateness, have been defiled and breached. The ANC's hope that public confidence could be recovered through party renewal commitments whilst ignoring the locus of the forces of their erosion in defiled stateness, dysfunctional state institutions, the "triple crisis of governance," insecurity, illegality, impunity, factional tensions, industrial-scale corruption and murder of whistleblowers, is a pipe dream. South Africa is under the "triple crisis of governance" public insecurity, tolerance of violence, lawlessness, social conflicts and economic crisis, intolerance of state-society subsidiarity and deconsecrated stateness.

5. Conclusions and Recommendations

This article explored concepts of the "triple crisis of governance" and the state-society subsidiarity relations to demonstrate that the ANC has defaulted on its liberation struggle promise by ceding public/state power and authority to non-state actors, thereby normalising corruption, illegality, insecurity and deconsecration of stateness. The ANC's state governance failures have created extraordinarily high public distrust, manifestly affecting critical institutions of the state, religion and politics, creating an ominous societal leadership vacuum. To this extent, an increasing majority of South Africans are willing to forego their right to electoral democracy in favour of an unelected but effective government that would guarantee security, the rule of law, stability, service delivery and prosperity. The article argued that South Africa's democratic experiment is in the grip of the "triple crisis of governance," signified by the blatant defiling of stateness, abuse of state power, intolerance of state-society subsidiarity, industrial-scale corruption and persecution of whistleblowers. It has cited cases of persecution and killing of whistleblowers in the face of elite industrial-scale corruption, the ANC's state governance paralysis and the deconsecration of South Africa's stateness. The ANC has mysteriously initiated a deviant narrative that points to solace because opposition parties did not necessarily take up the votes they had lost in recent elections. This solace about lost votes misses the point that an increasing majority of South Africans, especially those constituting the ANC's constituencies, are now willing to forego electoral democracy and settle for an unelected but effective government in the context of tolerance of public violence, deconsecrated stateness and public distrust of democracy-supporting institutions. This article has asserted that political party state governance is "relational" and "situational," requiring citizenry legitimacy and public trust, without which control of public/state power and authority would be impossible outside the use of force, violence or fraudulent means. It concludes that having ceded public/state power and authority to non-state actors and deconsecrating stateness, the ruling ANC created a societal leadership vacuum that normalised the "triple crisis of governance," industrial-scale corruption and elite criminality within the South African democratic experiment. The article recommends that institutions of society embark on nationwide campaigns that would sanctify South Africa's stateness to counter the phenomenon of a defiled statehood and reinvigorate vibrancy of citizenship and civic duty to recover public confidence and trust in the democratic experiment.

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ASSESSING THE PREVALENCE OF UNETHICAL BEHAVIOUR IN THE SOUTH AFRICAN POLICE SERVICE*

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Abstract. States have always used their law enforcement and security organs to ensure that communities are peaceful, liveable and tranquil. These include the police services such as the South African Police Service (SAPS), which serves the same function in the local contexts. In pursuing its mandate, the SAPS uses preventative and curative strategies to establish community peace and calm. These are ensured through various policy and statutory prescriptions, including the Constitution and Code of Conduct. The study uses Adam Smith's theory of Moral Sentiments to unpack and assess unethical conduct within the SAPS. Using the qualitative methodological approach, hinged on an interpretive research philosophy, the study gathered data from written documents. The collected data was analysed using content and thematic analysis techniques. The study established that upholding ethical and professional conduct by police officers within the crime prevention mandate of the SAPS remains problematic. SAPS encountered challenges like police corruption, bribery, illegal protection, and extortion. The study thus makes various recommendations, including a professionalised recruitment process for the SAPS.

Keywords: unethical behaviour; police; misdemeanours; South African police service; professionalization

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JEL Classification: D64, D71, D73

1. Introduction

Society can only exist with a police service. Bradford, Huq, Jackson and Roberts (2014:248) note that, principally in society, police departments are essential because of their mandate, which is two-pronged, and expressed as 'serving and protecting', which are relevant to community well-being. Locally, the South African Police Service (SAPS) is a vital public entity in the entire Republic since it legitimately enforces laws and engages in crime prevention towards a peaceful and progressive society. Therefore, every member of the SAPS should collectively serve and protect communities in line with such an obligation, something they should always uphold

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subconsciously. Perry and Potgieter (2013:109) observe that South Africa is globally renowned for being a crime hotspot, indicating the humongous challenge that the government faces to ensure peace, safety and order. Furthermore, amidst the high prevalence rate of crime in the community, the SAPS is at the centre of creating and fully maintaining peace, security and order in all communities.

The crime itself is detrimental to human security because it unsettles people and, at times, leads to loss of life (Rahmah, Himam, Riyono & Nurchayo, 2021:123; Roberts, 2013:52). This manuscript notes that there are no other important law enforcement agencies in any state other than its police. Hoeyi and Makgari (2021:374) note that, amidst the need for professional police services in the local context, the police practices of the SAPS have been blighted by numerous challenges. Key to these impediments is the scourge of corruption and cognate unprofessional behaviours by serving members of the police services. Scholars like Kim (2023:1337), Lamb (2021:101), Govender and Pillay (2022:43), and Barker (2011:28) claim that, in all states, there is a requirement for police officers to serve within the confines of professional and ethical behaviour.

In the same vein, Kaptein (2011:845) adds that ethics furthermore shape what society accepts as condonable manners and intolerable conduct. Locally, these are mainly derived from the stipulations of Section 195 of the Constitution of the Republic of South Africa (1996) (Mamokhere, Musitha & Netshidzivhani, 2021:7). Maweni and Steyn (2021:56) additionally construe that intolerable conduct manifests itself in the policing space as corruption, maladministration, unprofessional behaviour, fraud, absenteeism, and agenda-pushing that seek to prioritise personal rather than public gain. This dents both the preventative and curative role of the police in South Africa.

The study acknowledges the significance of crime prevention as a vital cog in maintaining and creating liveable communities. Nonetheless, according to Grobler (2011:13), this is one domain in the SAPS affected by unethical behaviour. The patterns of behaviour that affect the effective delivery of policing service by the SAPS include unprofessional conduct by police officers, police corruption, fraud, lack of police-community synergies, bribery and conspiracies involving some rogue police officers and criminal cartels culminating in the evasion of arrest and the sharing of the loot (Goutte, Peran & Porcher, 2022; Basdeo, 2010:390). South African police service officers have been muddled in high-level corruption, some with politicians involved in the past decades (Hatungimana, 2022:8; Bradford et al., 2014:251). There is also a blatant disregard for professional behaviour dictates in the SAPS. Disoloane (2012) observed a largely deliberate contempt of stipulations in the code of ethics and other related statutes, thereby creating a high prevalence rate of unethical behaviour in the public sector. Thus, unethical conduct in the SAPS is a huge disservice to the communities, many persistently falling victim to petty and heinous crimes. Additionally, unprofessional police officers will not effectively drive the crime prevention agenda of the SAPS, negatively affecting all efforts to create a good image of the country to stakeholders.

2. Research Methodology

This paper is based on a literature study, which is a non-empirical study of existing literature. This qualitative approach under the interpretivism paradigm relied on the desktop study of secondary literature. Data was gathered from the existing records (e.g. journal articles, book chapters, books, government publications, newspapers, and internal documents) on the prevalence of unethical behaviour in the SAPS's crime prevention environment. Data was analysed using thematic content analysis.

Theoretical Framework. This study uses the Theory of Moral Sentiments (TMS) by Adam Smith to understand the theoretical underpinnings of unethical behaviour in the SAPS's crime prevention environment. The TMS centres on how morality and virtue impact how one behaves and interacts with others in different societal (or organisational) settings (Haakonssen, 2004: vii). In 1970, Adam Smith postulated that "how selfish soever man

may be supposed, there are some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it except the pleasure of seeing it" (Haakonssen, 2004:11). According to Beckett and Taylor (2019:42), within society, all patterns of human behaviour are significantly shaped by nature, history and empathy for others with whom one co-exists. Furthermore, Mullins (2016:522) writes that the TMS describes how individual interests drive the desire to push a particular agenda in humans; hence the need to make more profit and achieve personal gain cannot be effectively separated from behavioural patterns. Therefore, the TMS explains why and how somebody considers the impact of their action on others and society before they decide on behaving in a given manner. That consideration is anchored on the morality of behaviour; hence, corrupt police officers always know what they will do. Above all, they are conscious that this kind of unethical behaviour is outlawed by their country's societal norms (and laws).

Aim of research. The study seeks to assess the prevalence of unethical behaviour in the South African Police Service (SAPS). In the process, the study will explore the causes and the manifestation of unethical behaviour in the SAPS. The study is organised as follows: The study captures the introduction and background of the study, and then the methodology follows. The study explores the research aim and the conceptual and theoretical frameworks. This section discusses the extensive literature review on conceptualising unethical behaviour in the SAPS and police misdemeanours.

Additionally, the Theory of Moral Sentiments, which serves as the study's theoretical framework, was discussed. The analysis also proceeds to present and discuss the research findings. The conclusions and recommendations then follow the discussion of results.

3. Study of Unethical Behaviour in the South African Police Services

The subject of ethical (unethical) behaviour is critical to this manuscript. Mullins (2016:517) defines ethics as the study of morality, i.e. practices and activities that are considered to be paramount right or wrong, together with the rules that govern those activities and the values to which those activities relate. The study deduces that the consequences of unethical behaviour are so dire that police unethical behaviour must not be condoned under whatever circumstances. Overall, it leads to a lost trust in the police services and the wastage of public funds. According to Lamb (2021:92) there are low levels of public confidence in the SA police. In short, this is the type of conduct considered unacceptable and wrong in a particular setting or community. Munzhedzi (2016:198) noted that unethical behaviour is seen in its divergent styles, which incorporate, among other things, nepotism, corruption, financial misconduct, fraud, expenditure, tender malpractices, sexual harassment, political interference, and favouritism. Accordingly, Govender and Pillay (2022:40) assert that high crime rates, use of violence by criminals, police brutality, corruption, rape by police officials and other forms of criminal misconduct against the police, including the centralisation of specific specialised functions of policing, which was equivalent to taking away policing from the people at police station level, are some of the allegations which affect the image of the police as a legitimate organisation. For this study, unethical behaviour in the SAPS' crime prevention environment is all actions by the police that affect effective policing, including police corruption.

For Stansbury and Stansbury (2005:iii), the environmental context of police corruption needs to be understood from a societal code perspective where no single society or community can condone the personal enrichment of the custodians of law from some unscrupulous activities like bribery, extortion or maleficence. Police corruption is a 'cancer' in the societies in which it is rampant. Police corruption is a form of unethical behaviour by the police involving "any action or omission, a promise of any action or omission, or any attempt of action or omission committed by a police officer or a group of police officers" (Hatungimana, 2022:5; Kempe, 2016:5). Therefore, police corruption goes against the idea that the organs of the state are maned by public servants who seek to promote public good and welfare in a selfless character, attitude and manner (Gans-Morse, Kalgin,

Klimenko, Vorobyev & Yakovlev, 2019:15). Any action that prejudices public good over personal gain is terrible for societal development.

According to Miller (2016:24), the issue of police misconduct is fundamentally a moral, as opposed to a legal, phenomenon. This implies that corruption happens when one breaches their moral-ethical code in the omission or commission of an unethical pattern of behaviour (Miller, 2016:24). Also, Reisig and Kane (2014:304) note that “members of the police services could engage in misconduct by doing something they are not supposed to do, such as releasing information about an upcoming drug house raid to the drug dealer, verbally harassing members of the public, planting evidence on a person, or giving a false testimony”. In addition to the preceding, police officers could commit unethical conduct by failing to do something they are supposed to do, such as by accepting a bribe in exchange for not issuing a speeding ticket to a person caught running a red light or by not executing an arrest warrant on a known drug dealer (Rahmah *et al.*, 2021:125; Reisig & Kane, 2014:301).

In addition, Kempe (2016:4) notes that police corruption, in most cases, seems to be pervasive and generally reflects the failure of state institutions to curb such bribery. In addition, the underlying factor in this is the ill of police corruption is another form of police misconduct or unethical behaviour (Reisig & Kane, 2014:307; Goutte *et al.*, 2022:12). In addition, Porter and Prenzler (2012:10) posit that another consequence of rampant police misconduct and corruption manifests itself as the ‘miscarriages of justice’, which is when the police service deliberately sabotage and fail to prosecute offenders and innocent people are wrongfully convicted. Kratcoski (2018:15) posits that dishonesty, deception, bribery and forgery are some of the everyday corruption forms that currently affect the functioning of governments across the world, especially in developing countries. Furthermore, corruption may involve the commission of various acts defined as criminal, such as bribery, extortion, graft, embezzlement, and multiple forms of fraud (Chilunjika, 2022; Chilunjika, 2021; Kratcoski & Edelbacher, 2018:3). Therefore, in the context of police misconduct, this study deduces that these are the same kinds of the many acts of unethical behaviour that has blighted the operations of the SAPS’s crime prevention environment in South Africa. Acts such as patronage or influence peddling are widely practised by many who hold political offices (Kim, 2023:1335; Chilunjika, 2018; Kratcoski & Edelbacher, 2018:3).

Unethical behaviour as a police challenge also needs an equal commitment from the political and administrative leadership. This is because it is the responsibility of the police leadership to ensure that the entire police service upholds a high standard of professionalism, ethical behaviour, integrity, and performance standards (Maweni & Steyn, 2021:39; Isenberg, 2010:37). Moreover, if there is a political tussle between the government and a police services leader on policies that violate the integrity of the policing, the police leader should resign in principle (Lamb, 2021:94; Isenberg, 2010:107). Furthermore, the existence of police unethical behaviour and other forms of police malpractice can be a testament to the failure in leadership on the part of the police (Isenberg, 2010:xxi). From another angle, although police corruption can be regarded as police misconduct, the corruption of any police service is unique from other forms of police misconduct because of its principal motivation, which is brazenly to seek the attainment of personal, private, or organisational gain or advantage (Kim, 2023:1339; Kempe, 2016:6). Moreover, the need to attain some selfish self-enrichment makes the temptation of being corrupt high amongst police officers who earn poor salaries.

3.1. Police Misdemeanours

In the case of the SAPS, this manuscript makes use of Newham and Faull (2011)’s population of police misdemeanours, which includes the following. Firstly, corruption of authority which is when a police officer gets a type of material gain under their official rank in the police without flouting any laid-down rules or laws (this included free drinks, an invitation for meals or being unfairly favoured when a service is being rendered) (Newham & Faull, 2011:6). Secondly, internal payoffs, which are the abuse of perquisites that are ordinarily available to other police officers, such as assigning tasks or shifts, promotions or leave approval. These can be barter-traded, bought or sold, which is unprofessional (Newham & Faull, 2011:6). Thirdly, kickbacks are the

getting of cash or goods or services by police officers in return for a police service rendered to individuals or corporates. These may include a police officer demanding a portion of the contract from a contractor in return for them being selected amongst other competitors to offer a service (Newham & Faull, 2011:6). This is misconduct in the realm of supply chain management practices.

Fourthly it manifests in cunning theft, which involves a police officer or official stealing from arrested suspects, crime or accident victims, or crime scenes. This form of behaviour significantly damages police integrity (Newham & Faull, 2011:6). Fifthly, there is the challenge of shakedowns, when a police officer or official accepts a bribe from law violators when they want to evade arrest. Additionally, it encompasses the failure of the police officer to confiscate contraband or search premises (Govender & Pillay, 2022:45; Newham & Faull, 2011:6). Sixthly, there are illegal protections which happen when a police officer cushions those undertaking illicit activities in return for cash or goods or services. These activities may include unlawful drug trade, illegal sex workers (brothels), illegal selling of liquor in taverns, or illegal gambling (Newham & Faull, 2011:6). Seventhly, there is ‘fixing’ which takes place when the police services deliberately undermine criminal investigations through sabotage by failing to collect evidence or making dockets ‘varnish’ (Newham & Faull, 2011:6). Eighthly, there is the planting of evidence, when officers deliberately tamper with evidence to increase the sentence and secure a conviction of offenders (Newham & Faull, 2011:6). Lastly, there are direct criminal activities. These are acts of officers abusing their power to commit a crime on a person or property that the police (officer) knows of. These crimes include, among other things, armed robbery, theft, rape or murder (Newham & Faull, 2011:6). From the preceding conceptualisation of unethical behaviour, the study comprehends myriad forms of misconduct, predominated mainly by corruption. This is detrimental to policing, especially since this service is critical for national and community safety and security.

3.2. Causes of Unethical Behaviour in the Police Services

Newham and Faull (2011:11) write that some of the personal push factors that lead officers to behave unethically are greed, inability to manage their finances, a history of violent crime, involvement in narcotics and the lack of a foul-proof police recruitment process that filters those with a high propensity of crime. While at an organisational level, Westmarland and Conway (2020:389) construe that the prevalence of unethical behaviour has been attributed to the ‘silence code’ where a police officer would instead choose to keep their job rather than be tagged as a snitch and later face retribution from their corrupt bosses. In a country where there is endemic police corruption, the whistle-blowers often find themselves thrown to the deep end and are punished in various ways (Kim, 2023:1340; Goutte et al., 2022:10; Kratcoski & Edelbacher, 2018:5). These retributions including among other things, being skipped for promotion and *per diems*, constructive dismissals after an expose of unprofessional activities in the police, government, corporations of state entities, further denting efforts towards a professionally-upright public service (Kratcoski & Edelbacher, 2018:5).

In South Africa, this quagmire hugely affects how, for example, the Directorate for Priority Crime Investigation (DPCI) can investigate police corruption cases because police officers choose to be silent rather than be at loggerheads with colleagues or their supervisors (Newham & Faull, 2011:11). An example that this study gives relates to the late former SAPS boss Jackie Selebi who was fiercely defended by several of his colleagues and subordinates during his trial that later secured a conviction and a custodial jail term. Selebi’s trial ran between 2008 to 2010 when he was eventually jailed for a fair 15-year jail term (Budhram & Geldenhuys, 2018:26). The study acknowledge the complexity of detecting, prosecuting and securing conviction for police corruption, especially given that a high-ranked police service official is charged. Similarly, the high prevalence rate of corruption in the police at the higher echelons coupled with government-wide corruption may not only undermine trust in the process but furthermore weakens its ability to authorise the activities and status of the police in the present and future (Bradford et al., 2014:253).

There are also social or societal causes of police misconduct. Foremost, these are influences that promote police misconduct, described as a social culture closed to external scrutiny and hostile to those who report misconduct (Porter & Prenzler, 2014:11). Further social influences include promotion of a culture that is supportive of police service members who engage in transgression (or those who do the so-called ‘turn a blind eye’); officers who do not uphold ethical behavioural patterns; and external influences from associations with criminal cartels, informants, or others who may encourage inappropriate behaviour in members (Porter & Prenzler, 2014:11). For Kratcoski and Edelbacher (2018:4), there are high chances that those employed in any public to engage in misconduct since it is usually used to return control and power in society. For instance, in a community where there are weak controls and enforcement of the laws on corruption, contempt of the rules by those engaging in corrupt acts may occur if there is a lack of investigative reporting by the media on known cases of corruption (Kratcoski & Edelbacher, 2018:4).

In addition, this study takes note of scenarios where police and judicial officials are not practically independent from the political control of their operations. Still, under the unregulated influence of some illegitimate groups, corruption is likely to be widespread and accepted by the people as something almost impossible to eliminate (Kratcoski & Edelbacher, 2018:4). Bruce (2014:54) noted that South Africa’s war on unethical behaviour is tainted by how the executive branch of government interferes with the independent functioning of anti-corruption units. An example is how the then president Jacob Zuma had a tussle in and out of courts of law relating to the Nkandla residence upgrades investigation that Thuli Madonsela, the then public protector, was probing (Bruce, 2014:55). The moving of the State Security Ministry which saw it being currently falling within the Presidency by President Cyril Ramaphosa after the July 2021 ‘Free Jacob Zuma’ riots and insurrection is another sign how power, lack of independent officers can affect the elimination of unethical behaviour in public entities (Shumba, Trinos & Gopal, 2023; Duncan, 2023).

Organised criminal syndicates are also another cause of police misconduct. According to Crocker, Webb, Skidmore, Garner, Gill & Graham (2019:438), this, in modern-day phraseology, is termed organised crime, where the police are part of the organised syndicates of crime who do not fear the long arm of the law can one-day catch-up on them and hence continue to commit their crimes with impunity. Organised (police) crime has been defined by Kratcoski and Edelbacher (2018:31) as the profit and power-oriented systematic commission of crimes that are of considerable importance individually or collectively if more than two persons involved cooperate for a longer or an indefinite period. Although this kind of police corruption is complicated, some global conventions and policies outlaw such unethical police behaviours that states can use to draft their local laws to deter these crimes related to the police (Lamb, 2021:98; Crocker et al., 2018:339).

Morris (2019:221) argues that the growth and reliance of many citizens and inhabitants of any developing country on informal jobs is a breeding ground for police corruption. This means that the everyday socio-economic activities that the people will be involved in have a higher chance of being informal and illegal; hence the police can accept bribes and look the other way (Morris, 2019:221). These illegal everyday economic activities include unlawful street vending, the operation of liquor outlets without a licence or illicit pirate taxis and unlawful drug dealing. According to Rajin and Snyman (2020:43), the police looking the other way also include drug peddlers and syndicates who pay up to R10 000 in ‘brown envelopes’ to serve as protection fees, leading to some form of perfect police corruption.

The absence of punitive measures breeds and sustains unprofessionalism. According to Kempe (2016:25), these are practical applications of the deterrence theory to control police corruption. There is a need for an intensified detection, investigation, and punishment of culprits for deliberate misconduct to deter others from engaging in corrupt activities and promote a positive culture of ethics and integrity in the police services (Goutte et al., 2022; Kempe, 2016:25). Furthermore, poor salaries and resources can be a trap for police corruption. In most developing countries, the issue of poor remuneration and the consequent opportunity to make money or extra

income from unethical practices by the officers were identified as the major factors fuelling police corruption, fraud, bribery and unprofessional conduct (Kempe, 2016:10).

Poor training has also been blamed for unethical police conduct. Kempe (2016:9) noted that, in most cases, the police services that have rampant corruption overall have weaknesses in recruitment and training, which subsequently lead some of the recruits to import or easily be initiated into dangerous criminal tendencies that weaken and demoralise the needed confidence in the police or law enforcement agents. Another aspect that needs to be included in police training to minimise police corruption is sensitising recruits and trainers to ethics and human rights issues that are presently absent in police academies and other training institutions (Kempe, 2015:10). For Miller (2016:34), the virtues that need to guide the skilling of police officers include the ability to create and impart onto the police officer among other things, professional expertise, individual autonomy, and internalisation of the moral ends of policing are essential in terms of developing and sustaining the desire on the part of police to do what is right.

3.3. Unethical behaviour in the South African Police Service

Unethical behaviour in the SAPS has been an Achilles heel of the government for a long time. This is credited to how the post-apartheid police service inherited the same malpractices unethically anchored on how the pre-1994 police services were used to suppress citizens on racial lines. Freeman and Mc Donald (2015:27) argue that the SAPS needed to reform after the fall of the apartheid regime for it to gain policing legitimacy. Bradford, Huq, Jackson and Roberts (2014:28) noted that the need to establish legitimacy while effectively overseeing public service is one challenge that the post-1994 police services have grappled with. The pre-1994 SAPS had its mandate and legitimacy shrouded in segregation because its crime control duties were jinxed by its role in maintaining and protecting the regime (Bradford et al., 2014:251). Therefore, the SAPS was affected, in terms of effectiveness, but a concurrent legitimacy and trust deficit, something that it needed to redeem to foster proper ethical and acceptable policing practices (Freeman & Mc Donald, 2015:27).

This historical legacy on policing efficacy, coupled with post-1994 police misconduct cases, has further dented the image of the SAPS and citizens' perception or trust in its preventative and curative role (Spencer, 2020:135). Reports that the SAPS releases on police misconduct are not conclusive but indicate rampant cases of unethical conduct. These are substantiated by citizens' surveys on their experiences with the police services. For instance, an Afrobarometer survey in 2011 revealed that the people in South Africa rate police unethical behaviour prevalence in the SAPS to be worst compared to other state organs. This was shown by 53 per cent of participants in that survey, indicating that the most troubling corruption in the Republic was the bribery, extortion and unethical practices of officers and officials in the SAPS (Wielders, 2013:3). Furthermore, a study by Bradford, Huq, Jackson and Roberts (2014:251) revealed that many citizens had experienced a personal incident with police corruption via petty roadside incidents to significant cases of armed robbery, torture, and sexual harassment at the hands of the SAPS.

According to Kempe (2016:12), the reportage and prevalence of police misconduct in any particular society affect communities' trust in police services. Therefore, people's confidence in SAPS is undermined by many cases of unethical police conduct reported by the SAPS and the media. Porter and Prenzler (2012:9) note that police misconduct undermines the rule of law and often has a catastrophic impact on public attitudes toward the police in any given community. For Newham and Faull (2011:5), the SAPS is a unique case when it comes to the issue of the unethical behaviour of its officers. This is because this is the organ of the state-aligned security that has a monopoly on using force, denies people some freedoms, and has unhindered access to public and private spaces in any society. Therefore, according to Newham and Faull (2011:5), police behaviour and its ethical part are critical to determining the efficacy of the SAPS. This is supported by the postulations of Kempe (2016:8), who argued that at all times, police officers must be to a higher standard of behaviour by society because they are the proper

stewards of the public trust and are empowered to lawfully apply force as well as some rights and statutory privileges as and when required.

In their study, Dlamini and Baloyi (2020:111) established that the SAPS continues to grapple with misconduct despite all officers signing and pledging compliance with the SAPS Code of Conduct of 1997, which regulates the behaviour. This study contends that the engagement in misconduct by officers is a testament to how compliance with the code of conduct is hard to enforce in public service. The manuscript by Freeman and Mc Donald (2015:35) revealed a wide array of challenges that affect the operations of the police services in Khayelitsha (Cape Town). These included, among other things, poor police station performance, overly centralised decision-making and authority within the police services, the lack of consideration for smaller police stations when it comes to resource allocation carried out through a universalised system failing to take into account individual peculiarities (Freeman & Mc Donald, 2015:35).

Further inhibitions to the SAPS's effectiveness included poor police service welfare and support programmes such as counselling (leaving the police to cope with the trauma of high crime on their own), rampant police corruption and unethical practices by especially high-ranked or senior police officers, thus disturbing the police station of entire services' integrity (Freeman & Mc Donald, 2015:35). Freeman and Mc Donald (2015:35) also established in their study that the efficacy of the police services was affected by the militarised and strictly confined organogram that affected the easy flow of feedback and information. The SAPS is challenged by unethical behaviour in its ranks, which affects how it can effectively detect, deter, and control crime in local communities.

4. Conclusions and Recommendations

Police services are critical to any society, and the prevalence of unethical behaviours in the SAPS's crime prevention environment is a cause of great concern. The efficacy of this police service is greatly affected by the high prevalence rates of unprofessional behaviour amongst members of the SAPS. The lack of professionalism and ethical behaviour in the SAPS has led to negative connotations for both citizens and businesses as far as police services efficacy is concerned. Furthermore, this study argued that this prevalence of unethical behaviour is a failure of the police service to uphold Section 195 Basic Values and Principles Governing Public Administration, especially the one on the need to promote and support professional ethics. The study has also argued that police misconduct harms society because the citizens entrust the police with their safety and security. However, the custodians of the law are the ones that break it. Furthermore, these types of police misconduct have affected the fluency of criminal investigations and public confidence in the SAPS's crime prevention activities.

The article also conclusively valued the importance that the crime prevention activities of the SAPS play towards the realisation of the police mandate. Thus, crime prevention has an equally if not hugely important role in modern communities because of the anticipatory role it helps to detect and forecast crimes. Another widely discussed issue in this manuscript is that police have the tools and legal power to use force and detain people, which can be easily abused without concrete checks and balances. Therefore, the SAPS's crime prevention environment has to be served by men and women who are honest stewards of society. Thus, this study concludes that police misconduct cannot be separated from the officers being humans who sometimes struggle with income and managing their salaries as police officers. Employing poorly paid officers is a challenge because they will be susceptible to corruption. Furthermore, other causes of police corruption have been discussed as a history of violent crime (blamed on the lack of rigorous background checks, recruitment and selection of officers).

The crimes that the politically connected and political appointees in the SAPS commit with impunity have come to the spotlight in this study, highlighting how political interference can affect the efficacy of police services. Furthermore, the levels of empowerment and independence of the DPCI have been one challenge that has affected

how the problems of unethical behaviours can be eradicated. The DPCI had become a metaphorical ‘toothless bulldog’ in contrast to its predecessor, the Directorate of Special Operations (DSO), also known as the Scorpions. The DSO has successfully pursued police misconduct cases to maximum efficacy compared to the DPCI. Therefore, the challenge of the increasing dwindling powers and efficacy of the current DPCI is a cause of concern regarding the need to eradicate unethical behaviours in the SAPS' crime prevention environment. Largely, in the professionalisation of the SAPS, the following strategies are proposed:

Firstly, there is a need to establish police counselling and support structures. These are crucial Employee Wellness Interventions. The SAPS must introduce mandatory counselling and other welfare support structures for its employees. These can aid even in the traumatic stress of crime scenes, debt traps and other socio-economic stressors. These services can also provide a reliable cushion for junior officers who will need whistle-blower protection if they have raised the alarm on the unethical conduct of their superiors.

Secondly, there is a need to demilitarise the SAPS. There is a need to do away with the military reporting hierarchy structures and liberalising the flow of information, thus creating some form of an ‘open door’ policy in the SAPS. Such a strategy can make a leaner organogram that creates, promotes, generates, and utilises feedback. It will be more accessible for the top management of the police services to pick in cases where there will be disgruntlement over conditions of services by junior officers, the rise in emotional trauma affecting motivation and other cases that need to be attended to restore police integrity through ethical conduct.

It is recommended to introduce scientific tests on recruiting and promoting officers. The study suggests that the SAPS's selection, recruitment and training processes must be longer, include scientific instruments such as psychometric, and polygraph tests. These can help isolate and grade out the 'bad apples' being let off the hook in the current training, recruitment and selection regime. These tests can look deep down inside a trainee's character rather than relying on some superficial mechanism.

Fourthly, there is a need for robust whistle-blower protection mechanisms. The study proffers the need for a more rigorous whistle-blower protection system that is tailor-made for the SAPS to ensure responsible officers who raise red flags over their bosses or colleagues are given the ample legal protection they deserve. Granting proper and adequate protection can help mitigate the effects of unethical misconduct as a robust deterrent and corrective measure (Chilunjika, 2022; Chilunjika, 2021; Chilunjika, 2018). This whistleblowing is an excellent service to the nation and must be cultivated and maintained.

Fifthly, the political impunity of those serving in the Police Service must end. The SAPS should end political protections and the culture of immunity of the 'top brass' high-ranking officers and political appointees in the police services. Any police officer found guilty and wanting must be investigated and held to account to the furthest extent possible. This begins with the political willingness of the President and Cabinet to end this daring disregard for the laws and codes of the police and the country. If political impunity is completed, the rampant unethical behaviour in the SAPS will be minimised if not eradicated.

Sixthly, the DPCI needs to be made stronger. The DPCI must be capacitated to investigate and prosecute high-profile cases effectively. There is a need for a fully independent priority crime investigator who is not littered with political interference and is fully empowered to pursue any SAPS-related unethical behaviour without fear of favour. If the directorate can be fully capacitated, it will serve as a deterrent to potential criminals in the SAPS and a justice-anchored curative process to bring to book all perpetrators of police misconduct.

The study also recommends that there should be statutory and policy interventions towards eradicating the scourge of unethical behaviour in the SAPS' crime prevention and control environments. These can be through the amendment of existing laws such as the Police Act, the Prevention and Combating of Corrupt Activities Act,

and the enactment of fresh laws that affect various issues. New laws and regulations are needed in areas like strengthening the DPCI, creation of tailor-made police misconduct laws, incentivisation of whistleblowing, the demilitarisation of the SAPS and the regularisation of the informal markets.

Lastly, the conditions of officers' work must be improved. In an economy that has seen steadily rising costs of living, there is also a need to review the remuneration of police officers commensurate with the national cost of living. Furthermore, the SAPS need to ensure that officers work flexible non-strenuous hours to avoid fatigue and other traumatic experiences that may affect the morality of policing. The government must ensure that the income and sustenance of officers are sustainable to prevent the commission of corruption and other petty crimes by police officers. Improving work conditions for the crime prevention environment can ensure that the detection of crime and preventative measures are effective. Work issues such as overtime and other fringe benefits must be used to motivate and reward those working hard. Prudent human capital management and motivation strategies can aid in re-aligning the officers' conduct with the agenda of the police services, thus restoring long-lost trust between them and the communities they serve.

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THE IMPACT OF GENDER INEQUALITY ON ECONOMIC DEVELOPMENT***Ongezwa Ndzabela ^{1*}, Yusuf Lukman ²**^{1*,2} *Walter Sisulu University, South Africa**E-mails:*^{1*} 218144857@mywsu.ac.za (Corresponding author); ² ylukman@wsu.ac.za*Received 9 August 2023; accepted 10 October 2023; published 30 December 2023*

Abstract. Gender inequality in employment remains a significant challenge in many countries, including South Africa. The impact of this inequality on economic development is a topic of increasing interest and concern, with many studies showing a correlation between gender equality and economic growth. This study explores the impact of gender inequality in employment on economic development in South Africa, with a case study of Nyandeni local municipality. The study employs a quantitative, statistical technique to answer the study issues. The article explores the challenges faced by women in the workforce, the impact of gender employment equity policies, and the role of government, businesses, and civil society in addressing gender inequality in employment and promoting economic development within Nyandeni Local Municipality. This research seeks to determine if women's work will provide an extra lever for economic expansion. A fundamental study on women's involvement in economic development describes the position of women in Africa, Asia, and Latin American nations. The theory that frames the accompanying debate focuses on inequalities, growth, gender, and capacities in general, and the influence of gendered disparities on salaries, education, and economic growth. This research aims to reveal a connection between economic development in South Africa and gender equality. As a second objective, the study seeks to determine whether the contribution of women to economic growth provides extra valuable information for economic policymaking. South Africa's gender gap in employment remains despite legislative and legal progress in the battle against gender inequality.

Keywords: a case study; Nyandeni Local Municipality; South Africa; gender inequality; economic development; civil society; equity; economic expansion

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JEL Classifications: O15, O43

1. Introduction

Gender equality is not just a moral problem but also a crucial economic one (IMF, 2017). Despite a sluggish recovery from the COVID-19 epidemic and rising disparities, governments are searching for measures to spur economic growth, alleviate poverty, and enhance equality (WHO-2020). Numerous variables, such as economic diversification, infrastructural development, technology skills development and education, migration, and inclusive growth, might stimulate economic expansion. According to Feldstein (2017), a 1% rise in average income or consumer spending reduces poverty by 3%. The World Bank's *Attacking Poverty* (2018) concluded that a 1 percent decrease in poverty is more likely to result in a 2 percent increase in GDP. The study's central

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premise is that gender parity in employment in a nation will lead to better economic development. The more a nation's economy grows, if it implements policies that raise the number of women eligible for the labor market. This implies that the greater the number of employed women who can contribute to the economy, the greater the economic expansion.

Since the publication of the World Bank's Attacking Poverty Report (2000), the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs) prioritize poverty reduction as the primary objective. Development programs have evolved to include poverty reduction, marginalized groups, women, and incorporating women as integral components of development narratives. The World Bank (2015) highlights the importance of addressing poverty and promoting gender equality in development (Obiorah, 2016).

South Africa's Eastern Cape is home to the Nyandeni Local Municipality in the OR Tambo District. Libode serves as its administrative capital. The whole municipal area is located inside the erstwhile Transkei homeland territory. The two tiny settlements of Libode and Ngqeleni have most of the urban population. Dispersed, low-density rural communities dominate the municipality. Seventy-nine percent of households dwell in traditional or village-like communities. These communities are scattered over the municipal territory and bordered by common grazing and cultivable grounds. Most residential constructions are constructed by their owners. There are minimal signs of considerable economic activity in the rural communities, apart from a few trade establishments (Ortiz-Ospina, & Roser, 2019).

Historically, many families in the rural areas of the municipality were supported by men who worked as migratory labor in nearby mines. Subsequent layoffs in the mines have left these villages with little resources for survival. Approximately 77% of families have a maximum of R800 (roughly \$108) monthly income. The majority of Nyandeni's educational institutions serve students in lower grades. The OR Tambo District office reports that 64 percent of the 426 schools in the Nyandeni region are overcrowded or overloaded (Ortiz-Ospina, & Roser, 2019).

Sixty-four individuals are elected to the municipal council using mixed-member proportional representation. In thirty-two wards, thirty-two councillors are elected via first-past-the-post voting. At the same time, the additional thirty-two are selected from party lists such that the number of party members is proportionate to the number of votes obtained. This study aimed to determine how gender inequality in employment affects South Africa's economic development. This topic still emphasizes the impact of gender inequality in employment on economic development in South Africa, but it narrows the focus to a specific municipality.

Considering South Africa's middle-income position, gender disparities in employment and education impede GDP development (Beneria & Sen, 2021). The OECD (2021) forecasts that unemployment and inequality in South Africa will continue to be high due to substantial skill disparities and poor education quality.

In feminist literature, race and gender have been the consistent determinants of the degree of access women and black women have to the official South African economy (Berik & Kongar, 2021). Youth development, women's economic empowerment, and concerns about serving "the poor" have taken center stage in growth-promoting measures to foster inclusive growth (Bosch & Barit, 2020). Despite this, gender disparities continue to underlie social and economic inequity across South Africa's economic development trajectory has shifted from being one of the most successful African countries in the 1990s with a growth rate to one of the continent's economies with the worst growth rate in 2018 at 1.1 percent (AfDB, 2018). The official statistics from Statistics South Africa (StatsSA-2019) provide policymakers with an intriguing challenge: how can they restore South Africa to its previous position as the economic powerhouse of Southern Africa and the rest of the region? What must the government do to bring South Africa's economic development on a positive trajectory?

Therefore, the main objective of this study is to determine the impact that gender inequality in employment has on economic development in South Africa.

2. Statement of the problem

Considering South Africa's middle-income position, gender disparities in employment and education impede GDP development (Beneria & Sen, 2021). The OECD (2021) forecasts that unemployment and inequality in South Africa will continue to be high due to substantial skill disparities and poor education quality. In feminist literature, race and gender have been the consistent determinants of the degree of access women, and black women, in particular, have to the official South African economy (Berik & Kongar, 2021). Youth development, women's economic empowerment, and concerns about serving "the poor" have taken center stage in growth-promoting measures to foster inclusive growth (Bosch & Barit, 2020). Despite this, gender disparities continue to underlie social and economic inequity across South Africa's economic development trajectory, which has shifted from being one of the most successful African countries in the 1990s with a growth rate to one of the continent's economies with the worst growth rate in 2018 at 1.1 percent (AfDB, 2018). The official statistics from Statistics South Africa (StatsSA-2019) provide policymakers with an intriguing challenge: how can they restore South Africa to its previous position as the economic powerhouse of Southern Africa and the rest of the region? What must the government do to bring South Africa's economic development on a positive trajectory?

3. Purpose of the study

This research aims to see whether there is a connection between economic development in South Africa and gender equality. As a second objective, the study seeks to determine whether the contribution of women to economic growth provides extra valuable information for economic policymaking. South Africa's gender gap in education and employment remains despite legislative and legal progress in the battle against gender inequality. Furthermore, if gender-lens research is expanded, policymakers will have a comprehensive view of the link between employment and economic development.

Policymakers must take a more significant role in determining which programs are most effective in halting South Africa's decline. Development programs in South Africa have stressed education and employment as critical drivers of economic growth and long-term development since apartheid ended in 1994. By adjusting policies in various economic areas, policymakers hope to discover the growth-inducing magic wand. Foreign Direct Investment (FDI) is an example of economic policy that examines methods to increase exports by promoting local industry growth or generating more employment. They would advocate for a greater emphasis on infrastructure delivery to create more employment. The ultimate goal of these policy actions is to boost the economy.

This research investigates the link between women's employment, educational attainment, and economic development as measured by real GDP growth. Compared to research on the significance of financial inclusion, strong institutions, power capacity, and infrastructures in economic growth, fewer studies examine the effect of including women in the formal sector. As a result, this publication will contribute to a growing corpus of research that analyzes how gendered analyses might influence economic choices, measures, and consequences. In this study, feminism is recognized as a legitimate economic theory.

4. Literature review

Gender inequality in employment on economic development: Overview

Globally, work possibilities for women are minimal, and South Africa is no exception (Department of Women, 2020). Women must actively participate in the labour force to achieve equality, success, and inclusive development in South Africa (Department of Women, 2020). The quantity of resources an individual has access

to as a consequence of working and earning a livelihood affects their capacity to engage in other sectors of the economy (Feldstein, 2017). Due to gender stereotypes and unequal allocation of duties, female labor force participation may be constrained (Feldstein, 2017). Women are considered the household's significant caregivers, while men are viewed as the primary breadwinners (Feldstein, 2017).

According to the World Economic Forum's (WEF), (2020) Global Gender Gap Index 2020, South Africa ranks nineteenth out of 149 nations regarding gender imbalance. The nation ranked top in health and survival equality but only 91st in economic participation and opportunity (WEF, 2020). Thus, even though South Africa's economic GGP score indicates a high degree of gender equality, there is strong evidence that women in South Africa lag behind men in economic participation and opportunity (African Development Bank, ADB, 2018). This persistent gender imbalance is a terrible accusation of the government and corporate sectors' capability to construct a genuinely equitable nation.

Due to these "inequalities based on gender, race, ethnicity, and class," Obiorah (2016) suggests that "macroeconomic policies that are likely to promote broadly shared growth" must address these inequalities. This topic is discussed by Amartya Sen's capabilities approach, which pertains to the capacity or inability of people to live their best lives. According to Giddings (2021), development gives individuals the tools and frameworks they need to improve their lives and those around them. According to feminist economists, their analysis of inequalities and disparities between groups is predicated on the premise that men and women experience life and institutional contexts differently (Jakab, 2020). Due to this assumption, policymakers may consider the extra costs of equality and "distributional friction and pushback from groups who benefit from the status quo distribution" (Heath & Jayachandra, 2017).

According to Jayachandran (2015), the Gender Kuznets' Curve is a model used to explain the relationship between economic progress and gender inequality. In other words, as countries developed, the wealth gap "increased, peaked, and then declined," according to Kuznets's 1955 study (Kabeer, 2016). According to the political economics study of the Kuznets Curve by Klasen (2018), there will be growth without social discontent when initial disparity is minimal; another result is that "even growing inequality may not be sufficient to drive political change" when civil society is "unmobilized." Therefore, it will only be possible for a society with broad discrepancy to become more equal if government measures significantly modify past disparities (Kocourek & Nedomlelova, 2018).

Mackay & Murtagh (2019) found that economic development has a nonlinear effect on the number of women in the workforce and that "economic success does not guarantee gender equality" in seven developed countries. Due to this correlation, growth may harm inequality (Lowndes, 2020). These results indicate no direct correlation between gender equality and economic growth. There must be constant examination and modification of policy to ensure that the positive benefits for women are preserved while the destructive features are mitigated and resolved (Mackay & Murtagh, 2019). Ferreira Sen's capacity theory states that growth, education, and employment are interconnected. According to Morsy and Youssef (2017), inequality limits growth, although varying degrees depending on a country's level of development. Low economic growth may emerge from an economic system based on uneven accessibility to services such as education and employment.

As a consequence of Ngepah et al. (2021) study, gender inequality is seen as a driver of economic growth, which has implications for policy implementation. Ngepah et al. (2021) estimate capital stock, skilled adjusted woman and man workforces, and technological breakthroughs using growth accounting approaches. She concludes that gender imbalance is beneficial to economic progress. The gender-based wage disparity between men and women has contributed to the success of export-driven economies (Ngepah et al., 2021). Export-driven companies utilize women's cheaper labor to drive profit approaches, and countries with gendered pay disparities attract more export-driven industries (Ngepah et al., 2021). The majority of prior research shows that gender imbalance is harmful to

economic growth; however, Pelinescu (2015) demonstrates that this is not the case. She argues that the more significant contribution of women to export-driven economies between 1975 and 1995 led to wage inequality, which in turn led to a rise in investment due to higher returns.

In contrast to Seguino's results, however, (2021) conclude that gender equality has contributed positively to economic growth and has shown to be quite robust. There is a disparity between traditional economic analysis and feminist analysis, which Silver & Klasen (2021) argue may be attributable to methodological discrepancies. To model equality for women, neoclassical economics only analyzes 'education, employment, and earnings,' but feminist economics incorporates a "wide range of equality criteria, including well-being, rights, and political activity" (Wannachai, 2019). According to Wannachai (2019), there is a bidirectional correlation between economic progress and enhancing women's access to development, including health and education, earning potential, rights, and political contribution.

Historically, economic research has not given much attention to women's contributions to economic development. However, this is beginning to change as an increasing number of economists examine the position of women in the labor market and their educational attainment.

Abney & Laya (2018) use dynamic panel regressions and new time series data to illustrate that gender differences negatively influence economic progress. It is discovered that the economy's structure impacts the potential to reduce gender-based economic disparity.

5. Theoretical frameworks

Theories of economic growth

Before discussing feminist views of development, we need to recall that economic growth economic development is a separate area of study. The neoclassical or exogenous models propose that external factors, such as savings, capital, and total productivity, promote economic growth.

The second category of models, endogenous growth models, gives more granularity in identifying the factors that drive economic development. Economists examine the development of knowledge, the accumulation of human capital, and government taxation policies. The endogenous models stress that when additional variables are improved, growth will be accumulative. These economic models provide the basis for understanding how to model economic growth by including various production aspects. This article utilizes the endogenous model by analyzing the benefits of education and employment as parts of knowledge generation and human capital accumulation and the benefits of education and employment for women to economic growth.

The feminist economic theory

Berik & Kongar's (2021) pivotal study on women's involvement in economic development describes the position of women in Africa, Asia, and Latin American emerging nations. Her premise was that global capitalism and economic progress impacted women unequally. Because orthodox macroeconomics and growth programs have gendered impacts, studies must include disparities, gendered labor, and structural barriers to equitable involvement (Berik & Kongar, 2021). If a gender- lens is used to investigate issues of social justice and poverty, economic recommendations would emphasize the paid and unpaid work that women do and how it contributes to the GDP and the value of goods and services produced by a country (Bosch, & Barit, 2020). The theory framing the accompanying debate focuses on inequalities, growth, gender, and capacities in general and the influence of gendered disparities on salaries, education, and economic growth.

The 2006 World Development Report (WDR 2006) examination by Elson (2006) demonstrates the distinction between conventional macroeconomics and feminist economics. It is possible to claim that equitable access is an

economic element that incorporates several other aspects, such as access to education, finances, work, health, energy, economic prospects, etc. The provision of equal chances (or access) for all asserts that once the opportunity is made available, everyone, regardless of color, age, gender, or location, will have access to it. Feminist economists such as Elson say that an emphasis on equality of outcomes, a society in which everyone has equal access to tools of production, would promote the equality that development seeks to attain. Policymakers might develop a differentiated strategy to foster conducive conditions by assuring that results are equivalent. Policymakers need to comprehend which elements would be most successful in achieving equality.

Heath & Jayachandra (2017) propose that equality of opportunities and outcomes should be considered based on research on the link between gender disparity and economic development. Their qualitative study suggests that the connection between the macro economy and gender relations relies on the structure of the economy, the form of occupational segregation, the specific measure of gender inequality, and the foreign relations of the country (Kabeer, 2016). Heath & Jayachandra (2017) note that an economist's understanding of modernization includes previous inequities that persist in contemporary economic arrangements, producing "inequality traps." Furthermore, according to Klasen (2018), the WDR 2006 pays less attention to women's unpaid work restraints on their labour market participation and labour market inequality (wages). The macroeconomy offers the structural circumstances within which equality is pursued, according to feminist economists' assessments of the link between inequality, development, and growth (Klasen, 2018).

Gender inequality and economic development

Klasen (2018:1) asserts that "inequalities based on gender, race, ethnicity, and class weaken the capacity to provide and enhance skills" and calls for "macroeconomic policies that are likely to support widely shared growth." This subject is addressed by Amartya Sen's capabilities approach, which refers to the agency, or lack thereof, of people to live their best lives. Klasen (2018) defines development as the "expansion of capabilities," which requires that people are provided with the tools and frameworks needed to improve themselves and their lives. Feminist economists argue that the premise that men and women live things and structural contexts differently is the basis of their explanations of inequality and group differences. This view permits policymakers to consider the additional costs of equality, include them in implementation plans, and address "distributional conflict and opposition from groups who profit from the status quo distribution" (Klasen, 2018).

To explain the connection between economic development and gender inequality, scientists have used Kuznets' model, often known as the Gender Kuznets' Curve (Kocourek & Nedomeleova, 2018). Kuznets observed 1955 that "as countries advanced, wealth inequality increased, peaked, and then decreased." In their political economy analysis of the Kuznets Curve, Acemoglu and Robinson (2002) found that when inequality is initially low, there will be growth without social unrest; a second observation is that whenever democratic society is "unmobilized, even broadening inequality may not be sufficient to force political reform." This indicates that a society with entrenched inequality would be unable to attain equality unless public policies undergo significant changes to rectify past injustices.

Research covering seven industrialized nations utilizes the Gender Kuznets' Curve to demonstrate that economic progress has a nonlinear influence on the number of women employed in the economy and that "economic development does not ensure gender equality" (Lowndes, 2020). In this situation, the connection is characterized by the possible negative influence of growth on inequality. These findings demonstrate that the connection between gender equality and economic development is neither inevitable nor foreseeable (Lowndes, 2020). Policies targeting gender equality must be continually evaluated and modified to ensure that women continue to receive positive advantages and that negative repercussions are avoided and addressed.

Mackay & Murtagh, (2019) research identifies gender inequality as a driver of economic development when the gendered structure of the economy influences economic policy results. Mackay & Murtagh (2019) employs a

growth accounting technique to compute the output of capital stock, skilled-adjusted female and male labor supply (human capital), and technical development. She concludes that gender inequity promotes economic expansion. Mackay & Murtagh (2019) believes that export-led economies have flourished due to preexisting gender discrepancies between men and women workers; export-led sectors employ women's cheaper labor to drive profit strategies; and women's cheaper labor draws more FDI to nations with gendered pay gaps.

Mackay & Murtagh (2019) believes that gender inequality has a positive correlation with economic development; the greater the disparity, the better the growth results. She claims that gender disparity contributed to development in export-driven countries where women did most labor between 1975 and 1995. Due to this pay discrepancy, investment grew due to greater returns. Morsy & Youssef (2017) conclude that the positive relationship between gender equality and economic development is strong, persisting across various nations, periods, and model settings.

Seguino (2021) identifies an imbalance between conventional economic analysis and feminist analysis, which may be due to the two views' distinct approaches. She believes that neoclassical economics assesses growth using basic measures of gender equality, such as "education, employment, and occasionally salaries," but feminist economics models gender equality using a "vast array of equality indicators, such as well-being, rights, and political engagement" (Seguino, 2021). According to Pelinescu (2015), there is a 'bidirectional relationship between economic progress and female equality, defined as boosting women's access to the components of development - namely health, schooling, earning possibilities, rights, and political participation'.

Studies on women's participation in economic growth have remained outside conventional economic research. However, an increasing number of studies are being undertaken on the situation of women in the workforce and their educational attainment (Silver & Klasen, 2021). Tejani (2019) used dynamic panel regressions and new time series data to demonstrate that gender inequality is inversely related to economic development. They discover that the economy's structure affects the capacity to resolve gender-based economic disparities. Wannachai (2019) verified Pelinescu's (2015) conclusion that wage disparity contributed to growth in a subset of semi-industrialized nations.

Women employment and economic growth

Traditional economics omitted 'women's labour' from early GDP estimates. In reality, 'little consideration was paid to gender disparities within the variables, and the restricted availability of gender-disaggregated data reflected this' (Abney & Laya, 2018). Although women's care work removed them from the official paid market, women's unpaid labor was not counted in the GDP. There are instances when women spend 71 percent more time gathering water than males (OECD, 2021).

Ngepah, Saba, & Mabindisa (2021) argue that gender disparity will directly influence growth since "gender concerns" affect the development of institutional, physical, human, and technical assets. According to Jayachandran (2015), gender imbalance in employment also results in disparities in human capital development, which has a detrimental effect on economic growth. In addition, the paucity of women in formal economic leadership roles hinders the growth of enterprises and economies, preventing them from reaching their full potential (Jayachandran, 2015). Jayachandran (2015) note that gender imbalance in employment and education leads to paying inequalities, which might result in particular structural preferences for economies, such as low-paid labor (women) leading to a service- or export-oriented economy (call centers) (sweatshops).

Cloud and Garrett (1997:156) utilized GNP per capita as "the independent variable in addressing the pattern of women's engagement in the economy" to ascertain whether "the economic participation of men and women differ systematically by level of GNP per capita." Women's business output is lower than male ones due to care employment is excluded from economic science, resulting in 'female rates of economic activity being much lower

than male players and GDP per capita accounted for less than 16 percent of the difference in female rates (Cloud and Garret, 1997:152).

Female involvement rates tend to increase when an economy is structured on family-based agricultural production. As the economy grows and urbanization increases, women often remain home while men work. As women's labor market opportunities expand at higher income per capita levels, female labor force participation rises again. Labour force participation patterns also reflect disparities in culture and ideology (IMF, 2017). In 2006, 67 percent of women in SSA participated in the formal sector, higher than in other developing areas (Stats SA, 2019). According to World Bank (2019) Indicators, female labor force participation in SSA was 66% in 2014, compared to 76% for males. Particularly when a nation has transitioned from an agricultural foundation to an industrialized one, the structural structure of the economy maintains gender inequality.

The effect of gender equality in labour force participation on economic development

There has been a lot of debate over whether economic growth positively affects gender equality, but theory and evidence show that it does. Economic growth may be influenced favorably by gender equality in numerous ways, both direct and indirect (Erikson, 2019). First and foremost, the talent pool employers may choose is artificially reduced due to the exodus of highly qualified women from the labor market due to gender discrimination in access to employment and managerial posts. Due to a decrease in labor force productivity, economic growth is hampered (Erikson, 2019).

Second, how women behave at home is strongly influenced by their employment. According to Heath & Jayachandra (2017), women's improved negotiating power at home and higher investment in their children's health and education are two important outcomes of women's employment and earnings. Economic growth is expected to result from this growth in the human capital of the following generation. Economic growth may be boosted by increasing the number of women in the workforce, which lowers fertility rates (Heath & Jayachandra, 2014). (2017). The higher family income resulting from female LFP stimulates more significant savings, which, in turn, increases the capital stock per worker and improves productivity, according to Heath and Jayachandra (2017).

The third issue is that when men and women are engaged in separate or independent productive activities, the gender gap may lead to distortions, with "female activities" being under-resourced and under-capitalized. In contrast, the opposite is true for "masculine activities." These losses are caused by male activities' declining marginal returns and/or women being barred from certain more productive occupations. This distortion affects production. In addition, this gender disparity may hinder the maintenance and improvement of present assets, such as land, and investments in new technology, obstructing economic advancement (Jakab, 2020).

6. Research questions and methods

The study's primary research question is, "What impact does gender inequality in employment have on economic development in South Africa?", the study explores the points of association between gender equality in employment and economic growth to answer this question. It examines the effects of gender employment equity on economic growth rates in South Africa.

The selected research methodology is quantitative and uses a statistical technique to answer the study issues. Quantitative methods refer to research techniques that involve numerical data to measure and analyze social phenomena. Babbie (2016) states that quantitative research is "a systematic empirical investigation of social phenomena via statistical, mathematical, or computational techniques". Quantitative methods focus on objective, verifiable data that can be analyzed using statistical methods to identify patterns and relationships. These methods are often used in social science research to study a wide range of topics, such as public opinion, consumer behavior, and health outcomes.

The research topic necessitated a statistical technique incompatible with the qualitative approach. The research applies an econometric model to demonstrate the existence and direction of a link between the variables. This quantitative investigation adhered to a positivist research paradigm. Babbie (2016) explains the positivist research paradigm as a philosophical approach to research that emphasizes using empirical observation, measurement, and experimentation to study social phenomena. According to this paradigm, social reality exists independently of individual perceptions or interpretations and can be understood by applying scientific methods. Positivists believe that social science research aims to identify general laws and patterns that describe the behavior of social phenomena. According to positivism, empirical inquiry may be conducted from a non-interactive and detached stance (Morris, 2016). A researcher in this capacity can assume the role of an impartial analyst, conducting unbiased data analyses. The outcomes of positivist research are thus reliable, valid, and representative. According to Saunders et al. (2021), positivists are mainly concerned with giving research results instead of subjective perceptions and summarizing them. This study is positivist since it attempts to analyze and extract specific theory-based claims from broad descriptions of actuality. The quantitative data was collected through surveys distributed to a sample of employees in Nyandeni Local Municipality.

7. Results and discussion

Categories of respondents by educational background

Participants were asked to indicate their qualifications, with 1 indicating 'No Matric,' 2 indicating 'Matric,' 3 indicating 'Diploma,' 4 indicating 'Degree,' 5 indicating 'Honours,' 6 indicating 'Masters' and 7 Indicating 'PhD' qualifications. Regarding educational qualification, 2 of the participants indicated that they have no matric certificate, 20 of the participants have a matric certificate, 19 have a diploma, 47 indicated degree, 12 indicated an honours degree. Most of the participants hold degree. The results are as indicated in Figure 1 below.

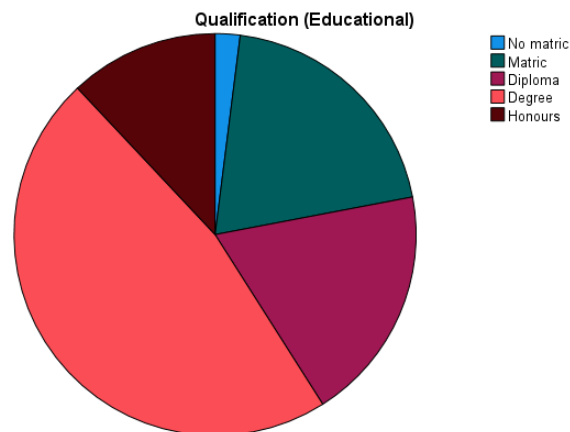


Fig. 1. Educational Qualification

Categories of respondents by occupational Rank

Participants were asked to identify their roles in the Nyandeni Local Municipality. According to the research, the positions considered were 'Senior Management,' 'Middle Management,' and 'Operational level.' The information obtained from the questionnaires, duly completed and returned, is depicted in Figure 2 below. It was evident in this study, as shown in Figure 2 below that most women hold operational positions regardless of their educational qualifications. At the same time, men have middle management at the same educational level. It was also evident in this study that those who indicated that they occupy Senior Management positions and hold Degree qualifications were men.

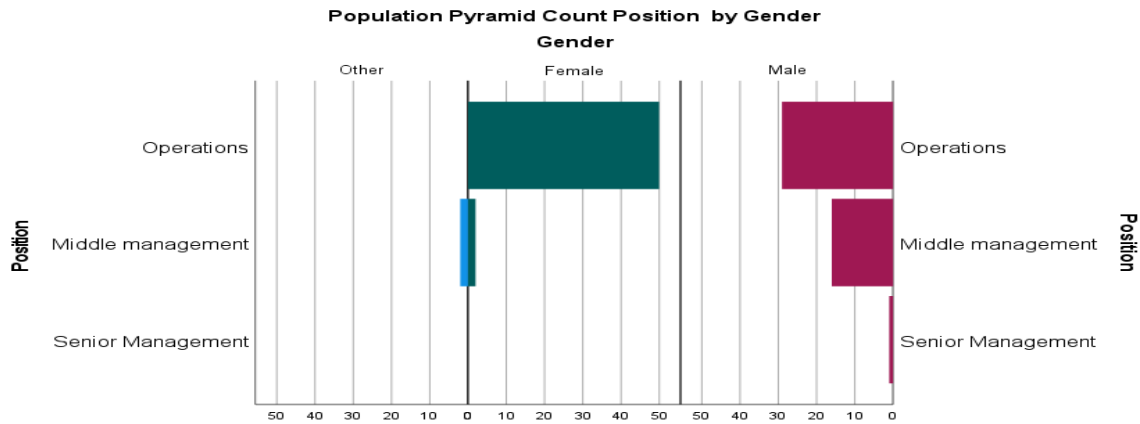


Fig. 2. Position

Respondents' response on whether females are expected to prove themselves in the workplace

Participants were asked whether they agreed with the statement that 'women have to work hard to prove themselves because of their gender'. Their response is depicted in Figure 3 below. It shows how gender privilege differs, as men are always privileged.

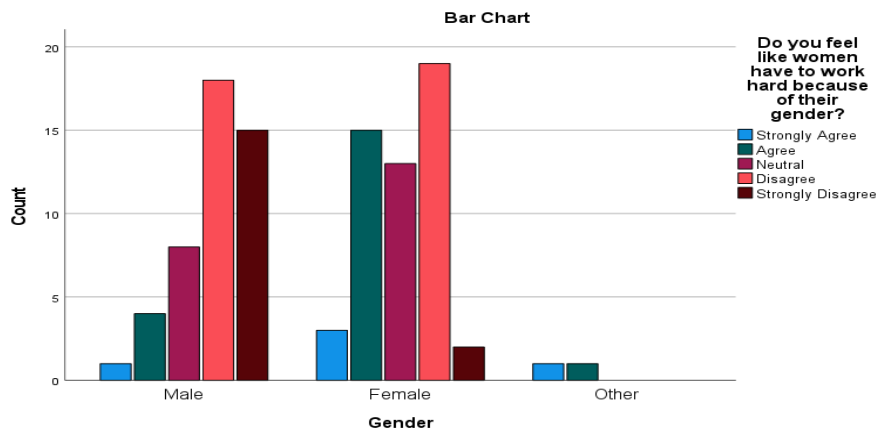


Fig. 3. Women are hard-working because of their gender.

Participants' response of salary differences

Participants were also asked to give their opinions on salary differences according to gender. The majority disagreed that men are paid more than women as they stated that salary difference is not due to gender inequalities but due to positions, which by that it was apparent to the researcher that men get paid more than women at their organization as men occupy the more paying positions.

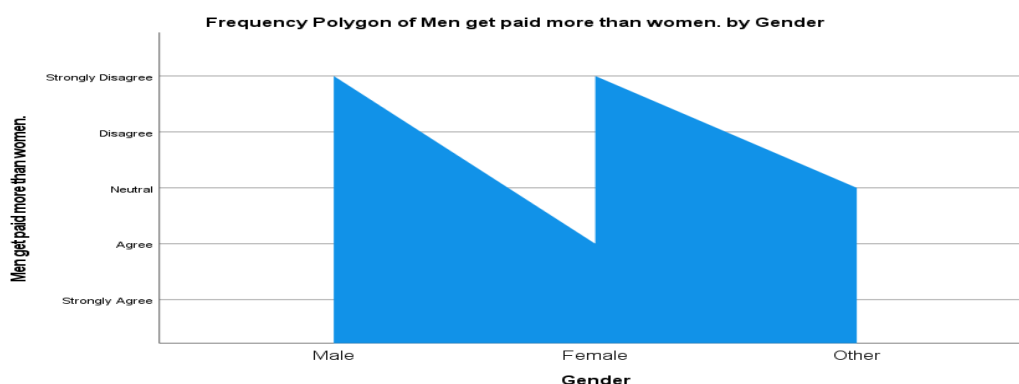


Fig. 4. Men being paid more than women

Opportunities for job development

Participants' views on whether men are given more opportunities for development than women. Participants' response to the statement 'men are given more opportunities for job development than women' is shown in Figure 5 below. Few agreed with the statement, and the majority disagreed.

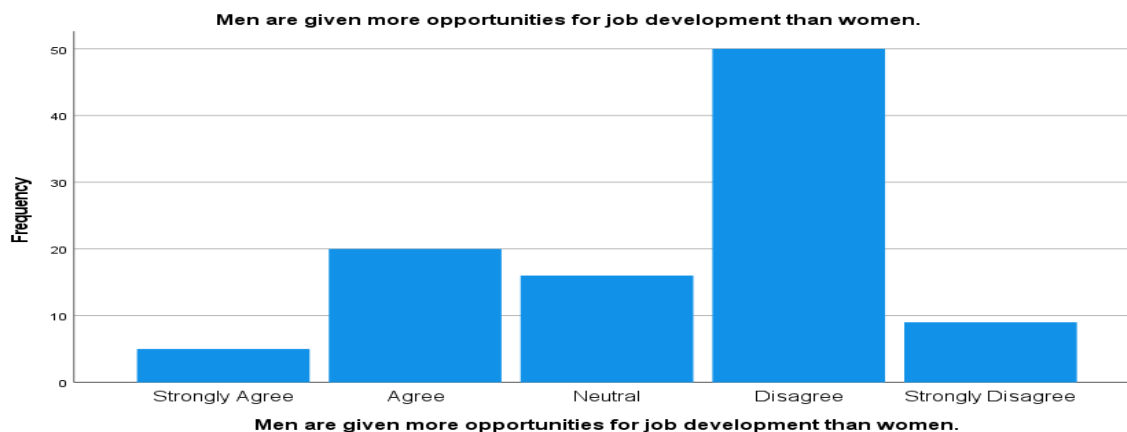


Fig. 5. Opportunities for job development

Proportion of men and women in Nyandeni Local Municipality

Participants were also asked for their opinions on the proportion of men and women in the organization. Below are the results of the responses from all the participants who participated in the study. They dismissed the statement, saying the proportion of men is not higher than that of women, although men hold higher positions

than women. It was evident from the responses that respondents chose that regarding the number of officials, women are the majority in the organization, yet they occupy operational positions. Figure 6 shows the results.

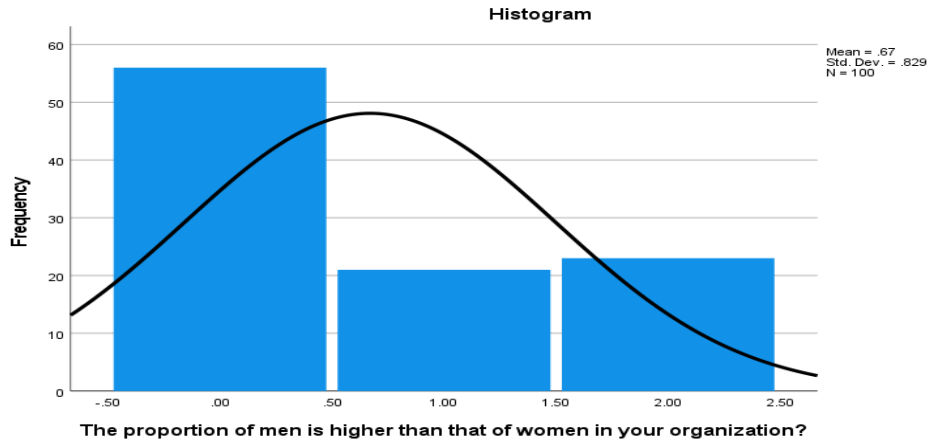


Fig. 6. Proportion of men and women

To provide a theoretical foundation for the research and fully appreciate the influence of gender disparity in employment on economic growth in the South African context, a literature review was conducted for this study. As the literature review has underlined the issues of gender equality, globally, work possibilities for women are minimal, and South Africa is no exception. The study found that gender inequality in employment significantly negatively impacts economic development in South Africa. The points of association between gender equality in employment and economic growth include increased productivity, higher levels of education, and greater access to capital. Gender employment equity policies, such as affirmative action and gender mainstreaming, have been shown to have a positive impact on economic growth rates in South Africa. In Nyandeni local municipality, gender inequality in employment was particularly acute, with women facing significant barriers to employment and entrepreneurship. This inequality was found to directly impact the municipality's economic development, with a high unemployment rate, low levels of productivity, and limited access to capital.

The outcomes of this study are consistent with the literature and suitable for the theoretical framework. Gender differences have a negative influence on economic progress, as illustrated by Abney & Laya (2018). The study used a Multiple Linear Regression coefficient to test the hypothesis. Transformational Leadership Theory is crucial for leader development, as it is more competitive in a global society and suitable for changing organizations. Transformational leaders are strategic and proficient in policy implementation. However, Nyandeni Local Municipality still needs to address this aspect of strategic leadership. The Economic Development Strategic Plan in Nyandeni local municipality is crucial for developing visionary leaders who can catalyze organizational transformation. These leaders should articulate, develop, and share the organization's vision while envisioning the future. The plan aims to create innovators who can catalyze organizational transformation, fostering a more inclusive and forward-thinking environment. The findings further revealed that women's contributions to economic growth had received little attention in economic research. However, this is changing as more scholars focus on women's labor-force participation and educational achievement. Abney and Laya (2018) show that gender gaps negatively influence economic development using dynamic panel regressions and new time series data. The economic structure has been discovered to influence the potential to alleviate gender-based economic disparity. To explain the connection between economic development and gender inequality, scientists have used Kuznets' model, often known as the Gender Kuznets' Curve.

It has been concluded that traditional economics omitted 'women's labour' from early GDP estimates. In reality, 'little consideration was paid to gender disparities within the variables, and the restricted availability of gender-disaggregated data reflected this. Female labour force participation grows when job market options for women develop at higher income per capita levels. Patterns of labour force participation also reflect cultural and ideological differences, yet those who contribute towards economic growth still face challenges of inequality.

Modernization Neoclassical thought in the early stages of a country's development claimed that gender equality in LFP would improve at all phases. It is not uncommon for female LFP to be significant in low-income agricultural economies, where family and market production are closely linked. But when the economy evolves away from agriculture and toward manufacturing and service industries, this level of engagement begins to fall. Changing economic structures, more educational attainment among women, and lower childbearing rates all combine to boost female labor force participation beyond a particular point in time (Masters, 2019)

Recently, an S-shaped relationship between LFP growth and gender equality was proposed by Eastin and Prakash (2013). They argue that economic growth has a positive effect on gender inclusivity at low-income levels because of social and political improvements that encourage an increase in female LFP, but that as income grows, there is a plateau or even a negative effect because of discriminatory companies that are looking to reinforce male dominance. They make this argument. Changes in attitudes and institutions that promote gender equality in the workplace favourably influence high output levels.

Historically, many families in the rural areas of the municipality were supported by men who worked as migratory labor in nearby mines. Subsequent layoffs in the mines have left these villages with little resources for survival. Approximately 77% of families have a maximum of R800 (roughly \$108) monthly income. The majority of Nyandeni's educational institutions serve students in lower grades. The OR Tambo District office reports that 64 percent of the 426 schools in the Nyandeni region are overcrowded or much overloaded.

8. Conclusion

Gender inequality in employment remains a significant challenge in South Africa and negatively impacts economic development. The case study of Nyandeni local municipality highlights the need for gender employment equity policies, training and education programs, and women's business networks to promote gender equality in employment and economic development. By working together, government, business, and civil society can address this issue and create a more inclusive and prosperous society.

South Africa has policies that promote gender equality at hand. The Women Empowerment and Gender Equality Bill (WEGE) is an example. This Bill sought to promote gender equality in South Africa. The Bill, approved in 2013, allowed for the execution of steps to enhance equality, such as establishing programmes to guarantee women have 50% representation in decision-making institutions. This paper's primary objective was to discover the impact of gender inequality in employment on economic development in Nyandeni local municipality in South Africa. The study's central premise is that gender parity in employment in a nation will lead to better economic development. The more a nation's economy grows, if it implements policies that raise the number of women eligible for the labor market. This implies that the greater the number of employed women who can contribute to the economy, the greater the economic expansion.

As we have already established, the problem with such policies is not the introduction but the implementation of the policy in the institutions. It is even hard to practice the policies if the implementation and monitoring is lacking. This is still a problem in big institutions and establishments; how much more for a small institution in a place that still believes in a culture that says, 'women are caregivers, homekeepers, and men are breadwinners.'

We have a long way to go with proper implementation, evaluation, and monitoring of existing policies. These policies need to be evaluated to see if they still serve the purpose; if not, they need to be adjusted and reshaped to serve and align with this era's beliefs as the world evolves.

Recommendations

To address the issue of gender inequality in employment and promote economic development in Nyandeni local municipality and South Africa as a whole, the study recommends the following:

Implementing gender employment equity policies, such as affirmative action and gender mainstreaming, to increase the participation of women in the workforce and promote gender equality in employment.

Providing training and education programs to equip women with the skills and knowledge they need to succeed in the workforce and as entrepreneurs.

Establishing women's business networks and support programs to provide women with access to capital and other resources needed to start and grow businesses.

Promoting greater collaboration between government, business, and civil society to address the root causes of gender inequality in employment and promote economic development.

Improved Monitoring and Evaluation System: There must be constant examination and modification of policy to ensure that the positive benefits for women are preserved. At the same time, the destructive features are mitigated and resolved. In doing so, it does not necessarily mean that the policy should oppress others. It should be beneficial to all but be in favor of women as they continue to suffer socially, politically, and economically.

Strengthening Implementation systems: The municipality can implement a system-strengthening strategy using various tools and methods, providing a realistic, systematic framework for economic system development and overall evaluation.

Communication and feedback: Economic development programmes must rely on communication and feedback to be successful. Managers should devote less time to "management" and more time to "mentoring." The mentoring approach reduces employee control by fostering more empowerment by allowing decision-making to become a process with larger formal and informal input.

Provide funding: Low economic growth may emerge from an economic system based on uneven accessibility to services such as education and employment. The municipality should provide funds to help in job development for the municipality where women can benefit, especially young women.

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ENERGY USE TENDENCIES IN A RESOURCE-ABUNDANT COUNTRY: THE CASE OF CANADA

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Abstract. Today's global energy agenda focuses especially on the fields of increasing energy demand, security of supply and climate change. This situation causes the energy efficiency phenomenon to be considered by policymakers seriously, and additionally to be developed strategies by determining targets in this field. In this sense, it is thought that developments in the field of energy efficiency will increase energy savings and reduce emissions caused by high consumption. On the other hand, the expected improvements in energy saving based on consumer behavior are less than anticipated. In measuring the mentioned dimension, one of the important parameters is defined as the rebound effect. This effect is considered as a dilemma that is frequently emphasized, especially in developed countries since there is a prevailing opinion that the developments in energy efficiency may not cause the expected results in savings. Therefore, it is extremely important to accurately measure the dimensions of the said effect in terms of both guiding policymakers in their strategies on energy efficiency and preventing waste of resources. This study tests the validity of the rebound effect for Canada using annual data from 1972 to 2019. In the study, the Fourier Engle-Granger Cointegration Test, which is one of the current econometric methods, was used, and then FMOLS, CCR and DOLS methods were utilized for the estimation of the short- and long-term coefficients. Empirical findings suggest that increases in energy efficiency in Canada increase energy consumption. Thus, it can be said that the rebound effect is valid for Canada.

Keywords: Fourier Engle-Granger Cointegration; Total Factor Productivity; Rebound Effect; Canada

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JEL Classifications: P18, Q4, Q43

1. Introduction

Energy is one of the necessary elements in today's world. Since the early ages, energy has been a factor that has been used in many different areas such as transportation, commerce, housing, and industry. In this context, energy resources are considered as serious inputs for modern economies.

The energy resources push countries to some competition since they are such important. The desire to reach more energy at more affordable costs is the center of the countries' agenda. Moreover, countries are faced with the challenge of the tendency to consume energy resources without harming the environment more than ever. All

these issues force countries to take measures in terms of alternative energy resources. Among these measures, the concept of energy efficiency comes to the fore.

Efficient energy usage means that the same (or more) output level is obtained by utilizing the less (or same) energy input. This situation depends on the technological developments. In this sense, developments in total factor productivity with technological progress will cause less resource utilization. The reason behind this issue is that the increasing technological developments within the framework of efficiency lead to the transition to production and consumption processes that are less harmful to the environment, especially after the global COVID-19 pandemic. By this means, the improvement of environmental quality is raised.

Energy efficiency, which was not given much importance in the past, is now classified as a priority fuel in the context of the sustainability concept (International Energy Agency, 2021). Especially after the oil crisis in the 1970s, the developed and developing countries were deeply affected economically. In the recent period, on the other hand, the environmental dimension of energy consumption has come to the fore. In this context, the phenomenon of climate change has become an important issue that the whole world focuses on. That being said, the popularization of efficient resource consumption aims to reduce environmental pollution and climate change (Şahin and Önder, 2021). Therefore, these processes have motivated the decision-makers to develop alternative policies in the fields of conventional fuel dependence, security of supply, increasing energy demand, environmental problems, and sustainability. One of these alternatives is energy efficiency. However, there are different views in the literature on whether the energy efficiency affects the energy consumption or not.

One of the prominent concepts in this field is the rebound effect. The rebound effect term is broadly used to explain the process of falling costs in energy services as a result of technological progress. In other words, as a result of the developments in energy efficiency, some or all of the expected decline in energy consumption is balanced by energy demand increases.

According to the Rebound Effect approach, technological improvements will result in output growth by reducing costs along with using fewer resources. Therefore, it is argued that initially while the demand for energy resources decreases with the increase in energy efficiency, later decreases in demand and costs may cause a rebound process (Gottron, 2001:1). When evaluated from this aspect, the actions of the political authority to increase the energy efficiency may not cause the expected results in energy saving through the Rebound Effect. This situation is illustrated in Figure 1.

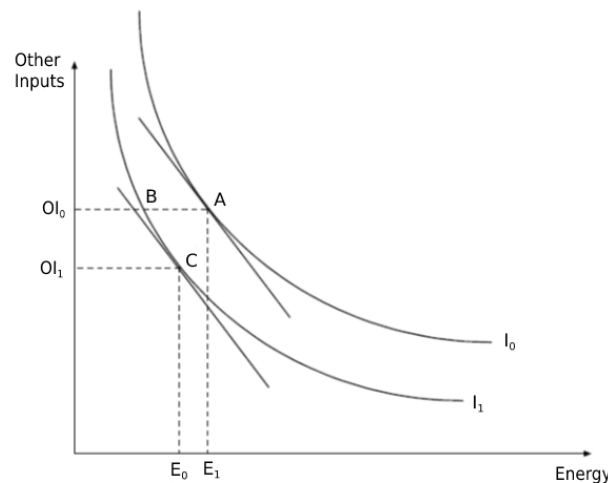


Fig. 1. Rebound Effect
Source: Birol and Keppler, 2000

In the figure above, the isoquant curves I_0 and I_1 demonstrate before and after the increases in energy efficiency, respectively. An increase in energy efficiency simply means that less energy is physically required for a given amount of output and then the isoquant curve is shifted to the left. Before the increase in efficiency, the factors of production are E_0 and IO_0 , where E is energy and IO is other inputs. The combination of these factors of production (at point A) is determined by the firm regarding the minimum cost principle. At this point, the slope of the isoquant curve (marginal rate of substitution between factors of production) is equal to the relative price between energy and other inputs.

While the energy efficiency improves, the amount of other inputs remains constant (IO_0) and the isoquant curve is shifted to the left, the combination of factors of production will be point B in the figure. In this case, all energy efficiency increases will be reflected in the reduced energy intensity. However, this point will not be the new equilibrium, since physically the relative price of energy does not change (or the relative price is lowered in terms of efficiency). The final production combination will be E_1 and IO_1 which is the new minimum cost combination. At point C, a substitution is made between energy and other inputs. Thus, the eventual reduction in energy use and consequent reduction in energy intensity is not as large as the original energy efficiency increase. At this stage, the difference between point B and point C in terms of energy use is called as the rebound effect.

The validity of the rebound effect is widely accepted in the energy economy literature and generally accepted. The most obvious disagreement on this issue is about the size of this effect. When this effect is less than 100%, developments in the field of energy efficiency will make a positive contribution to reducing total consumption and carbon emissions. On the other hand, if the same effect is greater than 100%, the energy demand after the efficiency improvements will increase more than before, and thus efficiency improvements will increase the use of energy resources. Therefore, measuring the rebound effect properly is very important in terms of both guiding policymakers and preventing waste of resources.

Measuring the rebound effect starts with a simple question: Does a 10% increase in energy efficiency reduce energy consumption by 10%? While we know that technological progress will improve energy efficiency, the answer is likely to be no. Although the developments in the field of energy efficiency have a reducing effect on consumption, this effect is not at the same level as the consumption level.

For the purpose of answering the question above empirically, this study investigates the relationship between total factor productivity and energy consumption for Canada with the current econometric method using annual data for the period 1972-2019. In this context, the effects of economic growth, trade openness, and total factor productivity on energy use are investigated for the Canadian economy. Findings show that increasing total factor productivity in Canada increases energy consumption in the related period. Therefore, it is concluded that the rebound effect is valid for Canada.

In this study, Canada was chosen as a case study, where the rebound effect phenomenon has not been investigated broadly in the literature. In addition, the use of dynamics that cause an increase in energy consumption such as total factor productivity, trade openness, and economic growth may accepted as contributions to the literature. Finally, it is aimed that this study can contribute to the research area by revealing the relationship between the variables with a cointegration test that has recently been introduced to the literature. In addition, the findings obtained from this article contain concrete information for the Canadian economy.

In the next section, the related literature review is given. Afterwards, empirical models, methods, and results are presented. Finally, in the conclusion part, several policy recommendations will be made within the scope of the key findings.

2. Literature Review

There are many theoretical and empirical studies in the literature analyzing the rebound effect. Empirical research uses elasticity calculations of variables such as price and efficiency when measuring the rebound effect (Sorrell and Dimitropoulos, 2008). The selection of these variables is generally determined in the context of the theoretical framework.

The first studies in the related field date back to the 1980s (Brookes, 1979; Khazzoom, 1980). In these studies, energy consumption sectors such as personal car transportation and residential heating were examined (Sorrell et al., 2009: 23). While these studies, which deal with different sectors, differ in terms of the method and data set used, research areas are generally evaluated in the context of the accessibility of the relevant data.

When the recent literature on the rebound effect is examined, besides country-based research, studies on household electricity consumption, the transportation sector, and the industry sector stand out in general. In addition, in the recent period, it is noteworthy that the studies conducted especially in China are high in number (Wang et al., 2014; Lin and Liu, 2015; Zhang and Peng, 2017; Zhang and Lin, 2018; Liu et al., 2019; Lin and Zhu, 2021; Meng and Li, 2022). The reason is that China has the highest energy demand increase globally. Therefore, it is important to measure the rebound effect with different methods and accurately designed models for this country.

When the literature is reviewed as a whole, the primary debate focuses on whether the developments in the field of energy efficiency reduce energy consumption. The basic assumption in this topic is that efficient energy usage will reduce the energy demand. However, since the improvements made in the field of efficiency do not always reduce energy consumption as expected, there are also findings in the literature that do not fully support the above-mentioned view.

Greene (1992) calculated the rebound effect of light vehicle use in the United States (USA) for the period of 1966-1989 by applying the Least Squares method. He concluded that the said effect is in the range between 5%-15% and quite small for the short term. According to the findings, technological advances in the transportation sector cannot reduce the energy consumption in light vehicle usage as much as desired. As a result, it was concluded that the fuel taxes should be increased at a high rate to reduce the use of vehicles.

Johansson and Schipper (1997) examined the rebound effect in the transport sector for 12 OECD countries between 1973 and 1992. According to the findings obtained in the study, the rebound effect in the relevant countries was calculated as -11% for the short term and -17% for the long term.

Haas and Biermayr (2000) calculated the rebound effect for residential heating in Austria using the cross-section method. The empirical results of this study suggest that the rebound effect varied between 20% and 30% for the examining period between 1970-1995.

In another study dealing with the USA, Bentzen (2004) examined the rebound effect in the manufacturing sector for the period 1949-1999. The results obtained by using the Dynamic Least Squares method indicate that the rebound effect in this sector was determined as 24%.

Jin (2007) investigated the rebound effect in household electricity consumption by using the price decomposition analysis method for South Korea between 1975 and 2005. In this study, the short- and long-term rebound effects were determined as 30% and 38%, respectively. In light of these results, it is emphasized that the rebound effect is an important factor when determining energy efficiency policies for South Korea.

Matos and Silva (2011) examined road transport in Portugal using data from 1987 to 2006. Using the two-stage least squares method, the authors calculated the rebound effect as 24.1%. In addition, in parallel with the results obtained in the study, it is emphasized that the rebound effect should be considered when determining any energy strategy.

Wang et al. (2014) evaluated the rebound effect on electricity consumption of urban households in China, using daily data to examine the period between 1997 and 2011. In the study, while household electricity consumption was chosen as the dependent variable, the independent variables were determined as per capita disposable income, average air temperature, electricity price, and urban population. Panel cointegration test and error correction model was utilized in this study, and the rebound effects were calculated as 72% for the short-term and 74% for the long-term. Therefore, a weak rebound effect is identified for urban households in China.

Orea et al. (2015) analyzed the 48 US states for the period between 1995 and 2011. They used a frontier model with a panel dataset to investigate the household rebound effect. The findings indicate that the rebound effect for the selected states varies between 56% and 80%. As a policy recommendation of the study, it is determined that policymakers should consider the fact that expected energy savings from efficiency improvements in the USA are not very consistent.

Using the ARDL model for the period between 1964 and 2009, Topallı and Bulus (2016) calculated the rebound effect as 18% for Türkiye's household electricity demand. According to the results, it is emphasized that the rebound effect based on the progress in the field of energy efficiency is low in Türkiye and the country should focus more on this area.

Bataille and Melton (2017) analyzed the rebound effect for the Canadian economy, which is also the subject of this study, with the General Equilibrium Model. A general evaluation has been made in this study by considering many sectors of the country such as services, mining, iron, and steel, transportation, and energy for the period between 2002 and 2012. The findings show that the rebound effect for the Canadian economy is on average 69%. Furthermore, there is a tight correlation between energy efficiency and economic activities in the country.

As mentioned before, there are a lot of studies related to China in the literature. One of them, Liu et al. (2019), examined the rebound effect in China's industrial sector using the Logarithmic Average Divisia Index. The rebound effect in the industrial sector for the 1994-2015 period was found to be 37%. In this respect, it is deduced that a significant part of the rebound effect in the Chinese industrial sector is due to the cost reduction as a result of efficiency investments.

Adha et al. (2021) examined the rebound effect on the Indonesian economy using data from 2002 to 2018. In this study, they emphasized the importance of determining the size of the rebound effect when

establishing the policies of governments regarding energy efficiency and carbon emissions. In this context, the authors calculated the rebound effect as 87.2% and -45.5% for the short- and long-term, respectively. It has been concluded that the developments in energy efficiency increased energy consumption in Indonesia.

Steren et al. (2022), in their study, investigated whether household car usage causes a rebound effect in Israel. The researchers used cross-sectional data examining the 10 years between 2007 and 2016 in their study. By using the 2-Stage Least Squares and ‘Rolling Window’ methods, the rebound effect was determined as 62%. This finding shows that policies that encourage consumers to buy energy-efficient vehicles may not reduce energy consumption in the long run.

In a recent study, the rebound effect was found between 10% and 50% for Spain by applying structural decomposition analysis. (Cansino et al., 2022). According to the results, it was concluded that the rebound effect increased during the recession periods in the Spanish economy.

Another recent study investigated the rebound effect on the Iranian economy by using the structural vector autoregressive model and the quarterly data set covering the 1988:3 and 2018:1 periods (Jafari et al., 2022). As a result of the analysis, it is determined that the rebound effect for Iran is calculated as 84%. In this sense, the reversal of the energy intensity increases in the country is determined as invalid with the adopted energy efficiency policies.

Table 1. Literature Summary

Researcher(s)	Countries	Time Period	Focus of the Study	Method(s)	Results (Rebound Effect)
Greene (1992)	USA	1966-1989	Transportation Sector	Least Squares	%5-%15
Johansson and Schipper (1997)	12 OECD Countries	1973-1992	Transportation Sector	Least Squares	Short Term: -%11 Long Term: -%17
Haas and Biermayr (2000)	Austria	1970-1995	Residential Sector	Cross Section Method	%20-%30
Bentzen (2004)	USA	1949-1999	Transportation Sector	DOLS	%24
Jin (2007)	South Korea	1975-2005	Household	Price Segregation Method	%30-%38
Matos and Silva (2011)	Portugal	1987-2006	Highway Transports	2-Stage Least Squares	%24,1
Wang et al. (2014)	China	1997-2011	Household	Panel Cointegration Test and Error Correction Model	Short Term: %72 Long Term: %74
Orea et al. (2015)	USA	1995-2011	Household	Boundary Model	%56-%80
Topallı and Buluş (2016)	Türkiye	1964-2009	Household	ARDL	%18
Bataille and Melton (2017)	Canada	2002-2012	General Economy	General Equilibrium Model	%69
Liu et al. (2019)	China	1994-2015	Industry Sector	Logarithmic Mean Divisia Index	%37
Adha et al. (2021)	Indonesia	2002-2018	Household	Probabilistic Boundary Analysis	Short Term: %87,2 Long Term: -%45,5
Steren et al. (2022)	Israel	2007-2016	Household	2-Stage Least Squares and Rolling Window	%62
Cansino et al. (2022)	Spain	2000-2014	General Economy	Structural Decomposition Analysis	%10-%50
Jafari et al. (2022)	Iran	1988:3 -2018:1	General Economy	Structural VAR Model	%84

3. Data and Methodology

In this section, the relationship among energy consumption (ENC) total factor productivity (TFP), real GDP (GDP) and trade openness (TRD) will be analysed by using econometric methods. The functional form of this relationship is given in Equation (1).

$$ENC_t = f(TFP_t, GDP_t, TRD_t) \quad (1)$$

3.1. Data

In this study, for testing the validity of the rebound effect in Canada, energy consumption (ENC) which is total energy use (ktoe) was taken as the dependent variable. The independent variables are total factor productivity (TFP), real GDP (GDP) and trade openness (TRD). The TFP variable is given as an index (input/output) which represents energy efficiency and/or technological development parameters. In addition, the study period was limited to 2019, since the most recent data for the TFP variable belongs to 2019. On the other hand, real GDP was taken as GDP per capita (US\$ 2010 base year) and TRD as the share of exports and imports in total GDP. Data were provided from different databases. Energy consumption, and total factor productivity were obtained from the International Energy Agency (IEA, 2021), and the Penn World Table (2021), respectively. The real GDP and trade openness were gained from the World Bank (World Bank, 2021). All variables were transferred into natural logarithms form.

3.2. Econometric Methodology

In this part of the study, first of all, the stationarity of the series will be investigated. For this purpose, primarily traditional ADF and current Fourier ADF unit root tests will be used. Then, the cointegration relationship between the variables will be examined. In this context, the Fourier Engle-Granger Cointegration test, which was recently introduced to the literature by Yılancı (2019), will be used. Finally, Fully Modified Least Squares (FMOLS), Dynamic Least Squares (DOLS) and Canonical Co-integrated Regression (CCR) methods will be utilized for short- and long-term coefficient estimation for the variables.

In the traditional ADF unit root test, the structural changes that can be found in the variables are not considered. Therefore, a variable with structural change can be obtained as stationary. This may adversely affect the reliability of the method to be used and the results to be obtained. Therefore, the tests that considered structural changes can increase the reliability of the test results.

Structural breaks are considered in the stationarity tests introduced to the literature by Enders and Lee (2012). For this purpose, low-frequency trigonometric functions are used in testing procedures. This test can also eliminate the problems related to the amount and time of the structural changes in the series. Moreover, in this test developed by Enders and Lee (2012), the structural breaks can be captured by including sine and cosine functions in the Fourier functions. However, one of the important issues in this process is to determine the frequency value. The standard ADF equation is given in the below:

$$\Delta y_t = \rho y_{t-1} + \beta_1 + \beta_2 trend_t \quad (2)$$

Enders and Lee (2012) obtained the following model by including trigonometric sine and cosine functions in Equation (2),

$$\Delta y_t = \rho y_{t-1} + \beta_1 + \beta_2 trend + \beta_3 \sin\left(\frac{2\pi kt}{T}\right) + \beta_4 \cos\left(\frac{2\pi kt}{T}\right) + u_t \quad (3)$$

where t is the trend, T is the time and k is the frequency to be determined. In addition, while determining the frequency value in here, the frequency value with the Minimum estimation of the Residual Sum of Squares (MinSSR) will be used. Therefore, by determining the MinSSR estimation, the appropriate frequency value can be obtained.

Since all series are stationary after taking the first difference, the cointegration relationship is investigated with the idea that there may be a long-term relationship between the series. In recent years, the Fourier Engle-Granger Cointegration test has been introduced to the literature by Yılanıcı (2019). In this test developed by Yılanıcı (2019), the traditional Engle-Granger equation is transformed into Equation (4) by adding sine and cosine trigonometric functions.

$$y_t = \alpha_0 + \gamma_1 \sin\left(\frac{2\pi kt}{T}\right) + \gamma_2 \cos\left(\frac{2\pi kt}{T}\right) + \beta' y_{2t} + u_t \quad (4)$$

Where, k represents the frequency value and the models are estimated by taking $k=1, \dots, 5$ values. The important thing for this test is to determine the appropriate k frequency value for MinSSR. The Fourier Engle-Granger Cointegration test is performed in two stages, as in the traditional Engle-Granger Cointegration test. First of all, sine and cosine trigonometric functions are added to the model as in Equation (4) and estimated with OLS. Then, residuals are obtained from this estimation. DF or ADF stationarity tests are applied for these residuals. The thing to note here is that the critical values of the traditional ADF test cannot be used since the Fourier functions are included in the model. At this point, the statistics obtained as a result of DF and ADF stationarity tests are compared with the critical values in Yılanıcı's (2019) article. As a result of this comparison, the cointegration relationship can be decided between the variables.

After finding the cointegration relationship between the variables, the coefficient estimates will be made for the magnitude and direction of the effect of the explanatory variables on the dependent variable. While estimating the coefficient, the Fully Modified Ordinary Least Squares (FMOLS) method developed by Phillips and Hansen (1990), will be used. One of the main advantages of this method is its ability to allow structural changes to be included in the model. In the process of estimating the coefficient with FMOLS, the relationship between the explanatory variables with the residuals and the deviations that may occur due to the endogeneity problem can be eliminated (Nazlıoğlu, 2010: 99). To increase the reliability of the coefficients obtained from FMOLS estimation, Canonical Co-integrated Regression (CCR) developed by Park (1992) and Dynamic Ordinary Least Squares (DOLS) estimator developed by Stock and Watson (1993) will be used as short and long coefficient estimators. For the CCR estimator, the endogeneity problem arising from the correlation that may occur in the long run can be eliminated asymptotically (Mehmood et al., 2014: 9).

In the DOLS estimator, on the other hand, dynamic elements are added to the process and problems such as endogeneity between the independent variable(s) and error term and self-correlation problems in error terms that may arise in static equations can be eliminated. In addition, the DOLS estimator is used because it gives effective results for low observations and heterogeneous series (Mark and Sul, 2003: 654).

4. Empirical Results

To examine the cointegration process in the models, first of all, it is necessary to analyze the stationarity of the variables with unit root tests. For this purpose, standard ADF and Fourier ADF stationarity tests were applied to the variables. The test results are given in Table 2.

Table 2. Standard ADF and Fourier ADF Unit Root Test Results

Level	Frequency	MINSSR	Lag	FADF	ADF	F-Test
EC	1	0.004	7	-3.198	-2.473	8.284**
TFV	3	0.001	5	-1.149	-1.397	2.754
GDP	1	0.004	2	-2.046	-1.746	1.650
TRD	2	0.018	5	-3.059	-1.371	5.309
1 st Dif.	Frequency	MINSSR	Lag	FADF	ADF	F-Test
Δ EC	5	0.004	1	-6.609	-5.706***	3.168
Δ TFV	2	0.001	4	-3.336	-5.591***	2.574
Δ GDP	5	0.004	1	-5.822	-4.915***	2.133
Δ TRD	2	0.019	1	-4.890	-5.706***	2.329

Note: F test critical values 1%=10.35%, 5%=7.58, 10%=6.35%, Fourier ADF k=1 critical values 1%=-4.42%, 5%=-3.81, 10%=-3.49%, ADF critical values % The values of 1=-3.753, 5%=-2.998, 10%=-2.639, ***, ** and * indicate that the series are stationary at 1%, 5% and 10% significance levels, respectively.

When Table 2 is examined, as the F test for energy consumption (EC) is statistically significant at the 5% significance level, there is a unit root at the level according to the Fourier ADF test results. The F test was not estimated as significant at the level for the other variables. Therefore, these variables have unit root according to the standard ADF test. Then the first difference of the variables was taken. The F test for all variables was statistically insignificant. As a result, all variables are stationary at first difference according to Standard ADF test results. Furthermore, the integrated degree of all variables is obtained as I(1).

In the second stage of the analysis, the cointegration relationship between total factor productivity, economic growth, and trade openness with energy consumption for Canada was investigated with the Fourier Engle-Granger cointegration test. The results are shown in Table 3.

Table 3. Fourier Engle-Granger Cointegration Test Results

Dependent Variable	Independent Variables	Frequency	MINSSR	Fourier Engle-Granger Cointegration Test Statistic
EC	TFV, GDP, TRD	1	0.004	-4.351*

Note: Critical values for the Fourier Engle-Granger cointegration test are 1%=-5.271, 5%=-4.605, 10%=-4.252, and * indicates significance at the 10% significance level.

It can be seen from Table 3 that the MINSSR was obtained as 0.004 for the Fourier Engle-Granger cointegration test. The appropriate frequency value for MINSSR was found to be 1. In addition, since the test statistic is greater than the critical values at the 10% significance level, there is a cointegration relationship between the variables in the relevant period for Canada.

Since a cointegration relationship was found in the model, the FMOLS, DOLS, and CCR estimators were used for cointegration coefficient estimation as a third stage of the study. The results can be seen in Table 4.

Table 4. Long-Run Coefficient Estimation Results

Methods	TFV	GDP	TRD	C
FMOLS	0.810*** (0.241)	0.083** (0.032)	0.100** (0.045)	3.345*** (0.143)
DOLS	0.690** (0.304)	0.105*** (0.037)	0.083 (0.056)	3.272*** (0.162)
CCR	0.788*** (0.246)	0.085*** (0.029)	0.099** (0.044)	3.333*** (0.125)

Note: ** and *** indicates (5%) and (1%) significance levels, respectively.

It can be seen from Table 4 that the size and sign of the variables had similar results for almost all estimators. According to these results, all variables have positive effects on energy consumption. Moreover, total factor productivity (TFV) has the most powerful impact on energy consumption among all estimators. On the other hand, economic growth (GDP) (for FMOLS and CCR) and trade openness (TRD) (for DOLS) have the weakest impacts on energy consumption. When analysed as a coefficient, according to FMOLS/DOLS (CCR) results, a 1% increase in total factor productivity (TFV) increases energy consumption (EC) by approximately 0.81%/0.69% (0.79%). On the other hand, for FMOLS/DOLS (CCR), a 1% increase in economic growth (GDP) and trade openness (TRD) increased energy consumption by 0.08%/0.11% (0.09%) and 0.10%/0.08% (0.10%), correspondingly. Therefore, the increase in total factor productivity (TFV) has an increasing effect on energy consumption EC, more than economic growth (GDP) and economic integration (TRD) in the long run.

In addition to what is stated above, the FMOLS, DOLS, and CCR error correction models were used for estimating the short-term coefficients. The related results are given in Table 5.

Table 5. Short-Run Coefficient Estimation Results

Methods	ECT _{t-1}	Δ TFV	Δ GDP	Δ TRD	C
FMOLS	-0.358*** (0.071)	0.235* (0.136)	0.326*** (0.072)	0.235*** (0.136)	-0.001* (0.001)
DOLS	-0.398*** (0.115)	0.193 (0.223)	0.344*** (0.115)	0.117** (0.051)	-0.001 (0.001)
CCR	-0.347*** (0.078)	0.284 (0.185)	0.316*** (0.095)	0.124*** (0.038)	-0.001* (0.001)

Note: * and *** indicates (10%) and (1%) significance levels, respectively

In parallel with the theoretical expectation, the error correction coefficient (ECT_{t-1}), which expresses the long-term relationship between the errors, was found to be negative and statistically significant. Therefore, this result confirms that there is a long-run relationship between energy consumption (EC) and explanatory variables. In the theoretical framework, the error correction term (ECT_{t-1}) denotes the correction rate. According to the FMOLS (-0.358) and DOLS (-0.398) models, approximately 36% and 40% of a variant at period t-1 will be corrected within 1 year. Similarly, the CCR (-0.345) model indicates that approximately 35% of a variant at period t-1 will be corrected within 1 year. Furthermore, as in the long-term, all variables have an increasing effect on energy consumption in the short term. According to the short-term results, economic growth has the most powerful impact on energy consumption among all estimators. In other respects, the trade deficit has the weakest effect on the above-mentioned parameter.

As a result, the positive coefficient of total factor productivity for the short and long run implies that the rebound effect is valid for Canada. Moreover, energy consumption and total factor productivity have a synchronical

relationship in the relevant period. In addition, the positive sign for the economic growth parameter in the short and long term indicates that higher growth causes higher energy consumption for the Canadian economy. Consequently, the short- and long-term results of this study reveal that the change in the total factor productivity, economic growth and trade openness increases the total energy consumption and especially the use of fossil fuels in Canada.

5. Conclusion and Policy Recommendations

The effects of industrialization and globalization around the world have increased the global energy demand in recent years. Population growth, widespread use of electronic devices in daily life, and production ambitions of economies also cause more energy demand. Since the high demand in question is met generally with fossil fuels, environmental destruction increases, and this hurts environmental sustainability which is difficult or impossible to return. The intense environmental problems have increased environmental awareness and pushed the countries to use their production factors more efficiently. Furthermore, efficiency provides significant opportunities for sustainable growth and environmental sustainability by causing minimum input for the same output. While efficiency is important for tackling environmental degradation, it does come with some concerns, such as the rebound effect.

The primary aim of this study is to investigate the effect of economic growth and trade openness on energy consumption between 1972 and 2019. In this context, Canada offers an ideal sample of research in terms of being a member of the G-7 countries and increasing the energy consumption among these country groups. Contrary to the studies in the literature, this study uses the Fourier Engle-Granger methodology, in which Fourier functions are added to capture structural changes gradually and smoothly.

According to the Fourier Engle-Granger cointegration test results, the variables used in this study move together in the long run. Moreover, the FMOLS estimation results suggest that the positive coefficient of total factor productivity provides evidence to support the rebound effect in Canada. In addition, DOLS and CCR results also support this effect. On the other hand, the increasing total factor productivity causes more energy consumption in Canada. This issue causes an overgrowth situation for the country. In this context, the growth increment causes more demand for energy. According to all three estimators, the significant positive effect of the GDP coefficient supports this situation.

The long-term empirical results provide evidence that environmental pollution has increased in Canada due to the efficiency improvements, since the increasing energy consumption is usually met with fossil fuels. Also, positive economic growth and trade openness in Canada have an increasing effect on dirty growth. As a result, while environmentally oriented energy policies require more investment, they should serve to encourage meeting the increasing energy demand with clean energy resources.

Short-term coefficient estimations support the critical role of clean energy and efficiency improvements in reducing environmental degradation as a result of increased economic growth, and trade openness. In addition, short-term findings show that externalities in energy consumption will be adjusted within one year.

The results obtained in the study are important in terms of being a guide for policymakers. First of all, one of the most important reasons behind the rebound effect is the increase in the unconscious consumption of resources with the ambition of production and competition. Considering that fossil fuels have the highest share among the total energy resources of the Canadian economy, increasing energy consumption creates a negative situation for sustainable growth and environmental improvement. Therefore, it is important to increase clean energy consumption awareness in Canada as well as to create environmental awareness. Besides, it will be important to increase the share of renewable energy and nuclear energy use, which can be an alternative to fossil fuels. In this

way, the increasing energy demand in response to the increasing total factor productivity will be met with environmentally friendly energy resources. Therefore, the negative impacts rebound effect for the Canadian economy will be met by clean energy technologies. Increasing green energy use is extremely important in terms of sustainable energy supply.

On the other hand, as it is expected, higher economic growth results in higher energy consumption for Canada. Despite the increasing growth, the rise in the use of efficiency technologies in the field of energy will offer significant opportunities. Besides, it should be ensured that environmental-oriented policies are adopted and effectively implemented in Canada. On the other hand, considering that the Canadian economy has a high share of fossil fuels in energy production processes, the country will not be able to abandon fossil fuels soon. Therefore, technological advances in the field of fossil fuels will also be important for Canada.

In addition, trade openness enables developing economies to import advanced technologies from developed economies. The adoption of advanced technology increases energy efficiency. Therefore, the foreign trade openness ratio is shaped by the advantage of either the gains arising from technological efficiency or the negative effects of energy waste caused by excessive production. In this context, increasing foreign trade for Canada also causes an increase in energy efficiency. However, more production with gains in efficiency causes an increase in energy demand.

Moreover, it can be considered that Canada's GDP is more integrated with fossil fuels due to its high share of fossil fuels. Therefore, increasing income should increase the use of energy-efficient technologies.. Therefore, the increase in these policies will open the way to use alternative and clean energy to ensure sustainable economic growth. Also, these results encourage policymakers in Canada to meet the increasing energy demand with clean energy in response to increasing factor productivity.

This study has some limitations as it focuses on the use of total factor productivity to test the rebound effect. In this respect, future research can focus on the efficient use of energy and technological developments in the field of energy instead of or together with total factor productivity. In addition, determining the type of technological developments in the energy sector can give important clues in terms of learning the source of the rebound effect.

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FACTORS HAMPERING THE IMPLEMENTATION OF GENDER EQUALITY IN THE WORKPLACE

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Abstract. The level of gender equality is different in every country and every culture, and, therefore, the history and conceptual framework for each country and culture are different. The article examines the causes of the inequality experienced by women in a general context, drawn from a qualitative approach that utilises a desktop analysis of secondary sources. Based on the advantages of the Gender and Development (GAD) approach explored in the study, such as its focus on women's needs, gender relations, and the state's role, it was determined that the GAD theory provided the most suitable framework for this study. The findings explore that there are varied causes of gender inequality divided into ideological factors, social system factors, economic factors, and political factors. Added to this are the causes of gender inequality in the workplace, which refers to human resource practices, job segregation, pay gap, lack of commitment, glass ceiling and escalator, and the lack of female role models. The study suggests that gender equality can bring employee satisfaction to the workplace and positive economic growth to society. The importance thereof in the achievement of the sustainable development goals (SDGs), especially sustainable development goal number 5 (SDG5) (gender equality and women empowerment), can thus not be disputed.

Keywords: gender; gender equality; gender mainstreaming; Sustainable Development Goal 5; qualitative analysis

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1. Introduction

The terms 'sex' and 'gender' have become synonymous, with the two terms being used interchangeably. Budlender (2001: 20, in Vyas-Doorgapersad 2017:168) suggests that gender characteristics include biological sex, sex-based social structures or gender identity. It is, therefore, important to distinguish between the two terms. The concept of *gender* is essential to determine how female subordination and male domination are socially created and how this can be changed or ended (United Nations Educational, Scientific and Cultural Organisation [UNESCO] 2003:17). Pryzgoda and Chrisler (2000:554) provide an essential distinction by indicating that sex refers to the biological features of a person being a male or female. In contrast, gender refers to women's and men's social, behavioural, and psychological traits. Aguilar (2004:1) confirms this by indicating that gender is not grounded in the biological differences between women and men but is instead formed by social relations, culture, and the environment. The concept of gender includes individuals' expectations regarding the characteristics,

capabilities and prospective behaviour of men and women (UNESCO 2003:17). The expectations placed upon men and women and the roles they perform are learnt behaviours (UNESCO 2003:17) and therefore differ extensively among societies (United Nations Population Fund [UNPF] 2005:1).

A shared understanding of concepts should be considered, especially when matters such as equality are addressed. According to Ansari (2012:1), *gender equality* indicates that people, irrespective of gender, can make choices without being limited by stereotypes, showing that their needs and contributions are equally valued. Swedish International Development Cooperation Agency (SIDA) (2016:2) elaborates on this definition by indicating that “gender equality is a rights-based concept, and it includes all the aspects of gender equity. It is a rights-based concept because gender equality corresponds with human rights agreements and declarations. Gender equality includes justice and fairness regarding the needs and interests as described in gender equity, and therefore equality includes all aspects of equity”. However, it is significant to note that *gender mainstreaming* was recognised as a strategy in international gender equality policy. Later, through the Beijing Platform for Action, it was adopted as a tool to promote gender equality at all levels (Council of Europe [COE] n.d.:1) of government.

The article applies the Gender and Development Theory. The study responds to the following question: What factors hamper implementing gender equality in the workplace?

After the introduction, there is a literature review grounded in theory, followed by a contextual study of gender equality. The significance of women in the workplace is discussed, and the methods and challenges are included in the following section. The last section summarises the study's findings under the conclusion.

2. Theoretical framework: Gender and Development Theory

Political writing dating back to earlier centuries showcased archaic opinions regarding the role of women, reflecting the belief that women are only suitable for domestic functions. It suggested that women had no place in politics, as their capabilities were better utilised as wives and mothers (Rai, in Bari 2005, cited in Vyas-Doorgapersad 2016:140). Feminist movements attempted to address these misconceptions, resulting in the development of gender ideologies such as the Women in Development (WID), Women and Development (WAD), and Gender and Development (GAD) approach (Vyas-Doorgapersad 2016:140-141). Development originated in the 1950s as a male-dominated area, functioning as a gender-blind approach on the assumption that it affects men and women in the same way (Rippenaar-Joseph 2009:49). Feminists have exposed the misconception that sterile measures of economic growth are sufficient to evaluate goal achievement (Barriteau 2000:165). Feminist activism has profoundly transformed the discourse of development, making it clear that focusing solely on improving savings and investment functions is no longer adequate when dealing with development issues (Barriteau 2000:165).

Muyoyeta (2004:5) questioned whether or not female development is separate from the broader development issue and found the following: “Women have not benefited from development processes, programmes and projects to the same extent as men; women are very often not included in the planning or implementation of development; development can undermine the role, status and position of women in society; development affects women and men differently, often with a negative impact on women”. The question of whether or not women have benefited from development resulted in the emergence of three distinctive models which seek to explain how development affects women and why there is a difference in how development affects men and women (Muyoyeta 2004:5). The 1970s witnessed a flood of literature on women in development (Kandiyoti 1988, in Rippenaar-Joseph 2009:49) which steadily evolved from women in development (WID) to women and development (WAD), and gender and development (GAD) (Rippenaar-Joseph 2009:49). According to Vyas-Doorgapersad (2018:97), these theories opened the path for recognition that women are a vital part of their societies which requires full participation by both men and women.

The Gender and Development (GAD) approach considers the influence of development on both women and men, aiming to ensure their equal participation and benefits, emphasising equality in terms of advantage and control (Muyoyeta 2004:7). It focuses on the social relations between men and women in the workplace and other settings, and challenges issues related to male power and privilege (Rippenaar-Joseph 2009:57). This approach provides interventions to address any unequal gender relations which prevent equitable development (UNESCO 2003:18). Its goal is to ensure that both women and men have opportunities to participate, make decisions, and share benefits (UNESCO 2003:18).

The GAD approach further assisted in recognition of the ‘triple roles’ given to women and how the analysis and value of these roles affect the way development projects will prioritise or ignore particular challenges, such as the provision of childcare, which is a priority for women but not for men (Muyoyeta 2004:8). The triple roles, also known as the triple burden, refer to the gender division of productive work, reproductive work, and community activities (Moser 1993, in McLaren, Wong, Nguyen & Mahamadachchi 2020:1). Barriteau (2000:168) describes how feminist theories have contributed to the widespread investigation of women’s labour exploitation, the disparity in wages for the same work, the feminisation of certain occupations when women enter the labour force, and the accompanying decrease in wages and status. The GAD approach goes beyond women’s reproductive sphere by adopting a holistic approach emphasising women’s social, economic, and political aspects (Rippenaar-Joseph 2009:59). Development is therefore regarded as a complex process influenced by social, economic, and political factors (Muyoyeta 2004:8). By highlighting production factors, the GAD approach emphasises formal economic activities such as large-scale production and waged labour – areas where women are underrepresented and their contributions undervalued (Barriteau 2000:167). The approach advocates for a fundamental reassessment and reevaluation of social structures and institutions while focusing on women’s practical and strategic needs (Rippenaar-Joseph 2009:58). The GAD approach primarily aims to meet practical and strategic gender needs by challenging prevailing divisions of labour and power relations (Reeves & Baden 2000:33). Sustained, long-term commitment is therefore required for the GAD approach to be successful (UNESCO 2003:18).

Women’s disadvantaged position in socio-economic and political structures and restricted bargaining power places them in an unfavourable position. One of the tactics proposed by the GAD approach is women’s self-organisation at national, regional, and local levels (Tasli 2007, in Vyas-Doorgapersad 2018:95). Self-organising will provide women with an influential political voice to reinforce their legal rights and grow the number of women in decision-making positions (Muyoyeta 2004:8). Women are not regarded as passive recipients of development. Still, instead, they are active agents of development (Rippenaar-Joseph 2009:59). The GAD approach may be considered the most suitable theoretical framework for exploring factors influencing the effective implementation of gender equality.

3 Literature review: the importance of gender equality in society and the workplace

Half the world’s population consists of females, representing half of the world’s potential (United Nations [UN] 2020a:1). However, women continue to struggle to achieve equality in society and the workplace. According to the UNPF (2005:2), gender equality exists when both genders have equal opportunities for economic freedom through work or entrepreneurship; share control and influence; share responsibilities for caregiving at home; have equal access to education and opportunities for personal development, ambitions, and talents; and are free from oppression, intimidation, and gender-based violence both at home and work (UNPF 2005:2). Gender equality is challenging for every sector. Still, according to Lenka (2023:123), economics, education, health, and politics are the four essential pillars to achieve gender equality. Women who participate in the workplace improve their economic equality and have been the impetus behind successful commercial enterprises since the 17th century, yet only some women are in leadership positions (Lenka 2023:123). The second pillar, equality in education, is one of the sub-goals of sustainable development goal 5 (gender equality) and, together with political equality and health,

significantly impacts women and gender equality (Lenka 2023:123). Cultural differences require a degree of contextual specificity when political interventions for gender equality are designed (Merma-Molina, Urrea-Solano & Hernandez-Amoros 2023:3). Contextual factors include rules, procedures, standards of behaviour, and departmental cultures (Merma-Molina et al. 2023:3). The last pillar forms part of sexual and reproductive health and rights are regarded as fundamental norms of gender equality (Sanders in Barbè & Badell 2023:275). Irrespective of origin or residence, gender equality is a fundamental human right (UNPF 2005:2). Gender equality is both intrinsically and instrumentally essential and plays a vital role in a wide range of developmental outcomes (Dilli, Carmichael & Rijpma 2019:32). The advancement of gender equality has a two-fold justification: entrenching human rights and social justice, and sustainable people-centred development (Office of the Special Adviser on Gender Issues [OSAGI] 2001, in Lawal, Ayoade & Taiwo 2016:354). Promoting gender equality is essential for all facets of a healthy society, including poverty reduction, the promotion of education, health, and the protection of children (UN 2020b:2). Women play significant and diverse roles, encompassing homemaking, contributing to societal well-being, seeking employment, and providing job opportunities (Lawal et al. 2016:354). Gender equality, therefore, has a positive effect on various aspects of society, including, but not limited to, the economy, the workplace, policy development, health, and education. Dilli et al. (2019:32) state that gender equality is viewed as “smart economics”. Kaushik (2019:103) explains the statement by clarifying that increased female labour force participation leads to more rapid economic growth as a result of increased productivity (cf. UN 2020a:1). Female empowerment has ripple effects on the family, children, society, and the entire nation (Lawal et al. 2016:354). The workplace also benefits from gender equality. Cardoso, Fernandes & Teixeira (2023:45) found that “a 1% increase in female representation at the top decision-making level results in a 2.21% growth in a company’s value”. Gender discrimination turns employees into suspicious, paranoid, angry, and fearful individuals and eliminating gender inequality is essential for employees’ motivation, commitment, satisfaction, and enthusiasm (Mamun-Ur-Rashid 2018:225-226). As highlighted by Human Rights Careers (HRC) (2020:1), diversity also plays an important role, emphasising that diversity in general, including gender, race, and sexual identity, enhances productivity and innovation in an organisation. Mead (n.d., in Onley 2016:6) supports this by quoting that companies with more women in their workforce experience higher average returns, fewer incidences of fraud, enhanced decision-making, lower turnover, and higher productivity. Gender inequality has a predominantly adverse impact on women and girls, leading to their disadvantage and exclusion from decision-making processes and access to social and economic resources (UNPF 2005:3). According to UNPF (2005:3), gender equality is therefore crucial in promoting women’s empowerment, addressing power imbalances, and providing women with autonomy to manage their lives.

Autonomy may enable women to take action regarding their own and their family’s health and education. Empowered women who have the option to decide on their children’s education are more likely to ensure quality education not only for boys but also for the girls in the family. Disadvantages in education lead to a lack of skills and restricted opportunities in the labour market (UN 2020b:2). Females making autonomous decisions within a family regarding matters such as the timing of births, age at marriage, and the use of contraception will enhance the attainment of gender equality (UNPF 2005:2). Numerous studies have shown that empowering women contributes to children’s well-being (United Nations International Children’s Emergency Fund [UNICEF] 2011:5). Children growing up in a gender-equal environment perform better and achieve more than children raised in an environment with inequality (Human Rights Careers [HRC] 2020:1). Young girls are affected the most by poverty, and gender inequality keeps women and their families imprisoned in a cycle of poverty (HRC 2020:2).

The sustainable development goals (SDGs) were developed in 2015 and allowed the European Union to articulate a renewed vision regarding its global agenda (Barbè & Badell 2023:279). Gender is linked to all SDGs. This is because females make up 49.6% of the worldwide population (Richie & Roser 2019:31). By excluding almost half of the worldwide population, the eradication of poverty, protection of the planet, and attainment of prosperity for all are undermined, setting the SDGs up for failure from the onset. It is unrealistic to expect an end to poverty

and the achievement of food security while half of the population lives with hunger. The SDGs' success relies not only on women's contribution but also on the interdependence of each goal. Achieving sustainable development goal number 5 (SDG5), which focuses on gender equality, is crucial due to its impact on all the other goals.

4. Methodology

The study utilised the qualitative research method, which is primarily exploratory. Qualitative research is employed to understand underlying reasons, opinions, and motivations; it provides insights into a problem or helps to develop ideas or hypotheses for potential quantitative research. Qualitative research is also employed to reveal trends in thoughts and opinions and gain an in-depth understanding of the problem under investigation (DeFranzo 2023:1). The data was collected through a literature review of available and published secondary data. Secondary data is information that has previously been interpreted and recorded. Therefore, it is vital to ensure that the secondary data is appropriately assessed by reviewing the quality of the information, the validity of the arguments, and the writer's reputation (Walliman 2011:71-72). Comparing the information obtained from various sources is sound research practice to identify bias and inaccuracies (Walliman 2011:72). The data was analysed through conceptual analysis, which is a method of managing concepts as categories of relationships, items, assets, and procedures; it involves accurately defining the significance of a specific concept by recognising and stipulating the conditions under which it could be classified (Furner 2004:233).

5. Challenges of attaining gender equality

Gender inequality, perpetuated by men and women, arises from the disparity in social power between genders (Bosch 2019:1). Despite recognising and incorporating the instrumental and intrinsic value of gender equality as an objective in the sustainable development agenda, gender inequality persists as an inescapable phenomenon (Branisa, Ziegler & Klasen 2009:2). The causes of gender inequality can be broadly classified into four main factors with various sub-factors. The five main factors under discussion are ideological, social, economic, political, and institutional. The article only focuses on institutional factors causing gender inequality in the workplace. The other factors may form part of future publications.

Thorpe (1990:1361) describes gender discrimination as an inescapable evil which affects the work atmosphere. Lewis (2019:13) indicates that "hostile work environments still exist for professional and middle-class females," hampering gender equality on the professional front. Onley (2016:1) posits that "women and men are still not represented equally in the workplace, especially at the senior management level". Companies continue to ignore gender-sensitive policies and the working conditions required for women's health and well-being. Women are forced to adapt to a work environment and policies created for men (Lewis 2019:14). McKinsley & Co and Learning.org (in Onley 2016:1) hold that it will take more than 100 years to reach gender parity at the current rate of progress. Kaushik (2019:107) asserts that gender inequality, viewed as a whole, appears to be an enormous, overwhelming challenge within workplace processes that encompass human resource (HR) practices, job segregation, pay gap, lack of organisational commitment, glass ceiling and escalator, and lack of female role models, as discussed below.

5.1 Human resources practices

Stamarski and Son-Hing (2015:1) explain that some of the most detrimental gender disparities are endorsed within human resource (HR) practices, such as decision-making, policy development, and policy endorsement, adversely impacting women's appointment, promotion, training, and remuneration. Gender discrimination contributes to a loss of self-confidence and frustration in the workplace, and proper policies and practices are necessary to minimise workplace gender discrimination (Mamun-Ur-Rashid 2018:222). Administrative measures need to be taken to ensure that human resource policies such as recruitment and selection, sexual harassment, and

language practices do not discriminate directly or indirectly against women (Gender Links 2012:54). The HR professionals are in a unique position to ensure change. They are not only responsible for HR policies, recruitment, and compensation within organisations, but the profession itself is dominated by women (Onley 2016:2). Therefore, HR intervention is essential from the beginning of an employment term. Mudgal (2019:252) indicates that the differences between women and men at the beginning of their careers accrue over the years, serving as a foundation for the gendered organisational context. HR practices influence the three main stages of employment, beginning with the recruitment and selection process, which includes providing benefits. This is followed by the appointed employee's training, development, and ongoing monitoring and evaluation.

Progression in an organisation is different for men and women, with different trajectories for successful female and male executives (James 2019:149). Discrimination in the recruitment and selection phase is usually the beginning of a series of unequal practices (Al-Jedaiah 2020:370). Unintended name bias begins with the submission of an application for a vacancy. It continues with the requirement that a salary history be provided, which automatically places women in a disadvantageous position to receive the same remuneration as their male counterparts (Onley 2016:4). Once appointed, development and promotion opportunities are also affected by gender discrimination. Research has indicated that female employees do request development and promotions. Still, they receive a different response and are less successful than their male counterparts (Healey 2014:43). James (2019:149) found that women's developmental needs are different to those of men, and to realise their full potential women's development initiatives must be viewed from a different perspective. Senior managers also tend to favour male subordinates for assignments that stretch their abilities and knowledge to broaden their experience (James 2019:150), further impacting promotion opportunities. Performance evaluation processes used to determine compensation and rewards are also biased, resulting in inequality (Al-Jedaiah 2020:371). According to Stamarski and Son-Hing (2015:4), face time is a key performance measure that rewards employees who spend additional time at the office. Since women are generally the primary caregivers, they prefer flexible work arrangements and, as a result, face career drawbacks because they have less face time than their male counterparts. The result of these biased criteria in performance evaluation policies contributes to gender inequality (Stamarski & Son-Hing 2015:4). Onley (2016:3) holds that only one question should be answered objectively: does the person have the ability to do the work? When the tools are in place to achieve this, an equal scorecard can be obtained, leading to pay equality (Onley 2016:3).

5.2 Job segregation and pay gap

The gender wage gap can be attributed not only to the differences in the level of work experience, education, type of occupation, location, sector, and the number of hours worked but can also be described in terms of the concentration of women in lower paid jobs, undervaluation of women's work, the perception that women are economic dependents, and the lack of female representation in unions (Wirth 2001:48). According to Onley (2016:5), parenthood is as one of the most significant reasons for pay gaps because women usually have more caregiving responsibilities than men. Women are more likely to work fewer hours, work part-time, and choose positions that will not regularly require working long hours because of their family responsibilities (Wirth 2001:48). The United Nations Development Programme (UNDP) (2013:174) describes the phenomenon of a gender pay gap in the workplace as "family responsibility discrimination" which occurs despite narrowing gender educational gaps. Family responsibility discrimination occurs when women with more family responsibilities are less likely to find employment (UNDP 2013:174). The UNDP (2013:174) continues to attribute family responsibility discrimination to organisations' investment in employees' firm-specific skills. Employers are less likely to hire women, who they predict are more likely to depart from the labour market due to care responsibilities. According to Wirth (2001:57), employers may practice statistical discrimination when they assume that all women will interrupt their careers. If women have children without reducing their hours, employers believe they have reduced commitment.

Wilson (2019:3) indicates that women struggle with requesting higher remuneration. Davis (2019:7) agrees that women are less successful in negotiations, and the resulting discrepancy in starting remuneration has a long-term effect on career advancement. Kolb (2013, in Davis 2019:7) opines that the emphasis on women's hypothetical incapacity to negotiate has become problematic, as the genders are positioned differently for negotiation. Women's lack of negotiation skills can be attributed to the view held by women that negotiating remuneration is often seen as desperation or greed, resulting in women hesitating to demand their value in the workplace (Wilson 2019:3). Donovan (n.d. in Onley 2016:4) opines that although the perception has been created that women are less skilled negotiators than men, the reality is that women face obstacles during salary discussions based on unfair discrimination in the workplace. Human resources practices and policies affect gender equality in the workplace and significantly influence women's careers. They guide decision-making, but it is the organisational decision-makers, including HR personnel, who, directed by policy, must assess job candidates and decide how an approach will be applied to individuals (Stamarki & Son-Hing 2015:4).

5.3 Lack of organisational commitment

Organisational commitment is essential for achieving gender equality. Rayomo (2018:1-2) identifies and defines three categories of factors that can assist in closing the gender gap in organisations: an empowering environment, bold leadership, and comprehensive action. An empowering environment is where employees are trusted and respected as individuals, providing freedom to train and be creative while offering work flexibility (Rayomo 2018:1-2). Bold leadership is seen as a diverse team that openly determines, communicates and measures equality targets (Rayomo 2018:1-2). Comprehensive action refers to the practices and policies that support both males and females, are family-friendly, and are free of bias in attracting and retaining people (Rayomo 2018:1-2). Human resource management (HRM) must participate in every step of the employee life cycle to ensure gender equality (Onley 2016:2). Although human resource management (HRM) performs a vital role in influencing the organisational culture, they cannot achieve equality on their own and require buy-in from top management to make gender diversity initiatives effective (Onley 2016:6).

5.4 Glass ceiling and escalator

Women are generally situated at the lower level of the organisational hierarchy and are not often decision-makers, authorities, or managers (Mamun-Ur-Rashid 2018:225). It is, therefore, important for organisations to identify the factors hampering female career prospects to ensure their positive career advancement (Mudgal 2019:253). James (2019:149) highlights the deterioration of gender balance when transitioning from middle to senior executive levels, emphasising women's challenges in advancing to senior management positions. Davis (2019:2-3) describes this challenge as a result of two forms of workplace inequity that are linked and are more present in female-dominated professions, namely the glass ceiling and the glass escalator. The term "glass ceiling" was first used in *The Wall Street Journal* as a metaphor to describe the invisible barrier that prevents women from advancing in their careers (Mudgal 2019:253). The other side of the continuum is the glass escalator, which refers to men's rapid promotion in management positions within female-dominated fields (Broner 2013:2). The percentage of women decreases disproportionately at every step of the career ladder, indicating the restricted achievement and shortage of women in advanced, decision-making positions, despite their increased numbers in the labour market (El-Arnaout, Chehab, Rafii & Alameddine 2019:5-6).

Additionally, Mudgal (2019:255) attempts to understand why the glass ceiling remains persistent despite women being declared the new managers of the 21st century. The reason provided by Mudgal (2019:255) refers to "masked masculinity", where masculine values still prevail but are concealed by an ideology most managers hypocritically support. This results in women being excluded from top management due to the indirect workings of gender discrimination. Men experience an advantage over women in occupations and sectors traditionally regarded as highly feminised (Wirth 2001:52). The "glass escalator" concept describes the preferential treatment

of men in professions dominated by women by promoting them into leadership positions. The glass escalator operates more prominently as an occupation becomes increasingly female-dominated (Davis 2019:5). Men are seen as more suited for management positions than women as they are perceived to be more ambitious and competitive than women (Wirth 2001:52). Wilson (2019:4) cites one reason why women are not moving into senior management positions: the lack of female role models, which makes women feel that senior management positions are unattainable.

5.5 Lack of female role models

Females in senior positions serve as role models for other women by encouraging their career development and ensuring the pipeline of experienced and qualified women remains open (Healey 2014:24). Access to prominent and influential networks is essential to moving up the leadership hierarchy and some research regards networking as more critical for advancement than job performance (Mudgal 2019:252-253). Pavlou (2019:5) opines that "the swiftest solution to correct a lack of women in leadership roles is to appoint women in leadership roles". This seems evident because appointing women in leadership roles may increase the number of female employees at all levels of the organisation and eradicate inequality. However, it is not the only reason. Men in leadership tend to prefer interacting with and promoting other men, which creates an advantage referred to as "the patriarchal dividend" (Davis 2019:5-6). Women appointed to leadership roles are more likely to establish and promote women in similar positions for two reasons (Pavlou 2019:5): better understanding of women and acting as role models. Women understand other women's potential and can advocate for them. A female also understands how a team can benefit from gender balance, and women act as role models for others who may be cautious about applying for a post in an all-male team. Although there has been some progress in eradicating gender inequality in the workplace, it remains a global phenomenon that the management positions in organisations are occupied primarily by men (European Commission [EC] 2013; ILO 2010, in Mudgal 2019:253). Gender inequality is a direct result of gender discrimination in the workplace. The causes of gender inequality discussed in this section are not exhaustive but only address the most prominent discrimination factors.

6. Conclusion

The article recognised that causes of gender inequality include various factors and sub-factors; however, only the institutional factors were discussed. The article's purpose is to highlight the lack of progress made towards achieving gender equality in the workplace and to ensure that the debate and battle for equality do not dwindle. The plight for gender equality started more than a century ago, yet the actual achievement is evading organisations and society.

The various causes identified all relate in one way or another to the most significant aspect that differentiates men from women – the ability to fall pregnant and give birth to a child. Women must deal with the stereotype that all women are planning motherhood, automatically resulting in a decreased commitment to the organisation. Once appointed, all employees are entitled to benefits the company provides or prescribed by legislation. In most countries, women are granted the benefit of maternity leave upon the birth of a child. Ironically, this benefit often becomes a reason why women are not appointed to managerial positions. Organisations are hesitant to appoint individuals who may potentially take time off for childbirth. The appointment of men circumvents this challenge. Through the organisational culture, men are also compelled not to take family responsibility leave when a child is sick or requires care. This leads to the expectation that women will take time off to care for children, leading to increased absenteeism.

During performance management, women, once again, encounter discrimination through what is known as 'face time', resulting in poor performance reviews based on absenteeism, irrespective of their performance. Stereotypes regarding women's lack of ambition for promotion contribute to them needing to be noticed when filling senior

management positions. As a result, women often find themselves stuck in lower-level jobs and, consequently, face lower remuneration levels. Workplace discrimination does not only affect women. Discrimination affects all employees, which can contribute to a work environment with emotional and disgruntled employees and a high turnover rate.

The factors hampering gender equality directly impact the workplace, leading to gender inequality. Processes in the workplace hampering gender equality were identified as HR practices, job segregation and pay discrepancies, lack of organisational commitment, glass ceiling and escalator, and lack of female role models. The most harmful gender inequalities are sanctioned within HR practices, and appropriate policies and procedures are necessary for minimising workplace gender discrimination. Job segregation and the gender pay gap were attributed not only to aspects such as level of education and number of hours worked but also to the concentration of women in lower-level positions, the undervaluation of women's work, and caregiving responsibilities associated with parenthood. The primary cause of lower female representation in the workplace is identified as motherhood. Decisions regarding programmes to address gender inequality and management's responsibility to ensure their implementation are part of the organisational commitment. Women tend to be concentrated in lower-level positions in an organisation, and their representation significantly declines as they move into senior management roles due to two forms of workplace inequity, namely the glass ceiling and the glass escalator. The glass ceiling is the invisible barrier preventing women from entering senior management positions. At the same time, men benefit from the glass escalator, allowing them rapidly to ascend into senior management, including occupations traditionally regarded as feminised. One of the reasons for the prevalence of masculine values is the lack of female role models. Women in leadership positions can be role models by encouraging other women's career development. Gender equality is a fundamental human right that is important for developmental outcomes. Gender equality positively impacts various aspects, including sustainable development, poverty reduction, the economy, the workplace, policy development, health, and education, which positively affect families, children, society, and the nation as a whole.

NOTE: The article is based on a completed unpublished PhD Thesis titled Jansen, D.2023. Factors influencing the implementation of gender equality in Newcastle Local Municipality at UJ under the supervision of Prof S Vyas-Doorgapersad. Unpublished Thesis. Johannesburg: University of Johannesburg.

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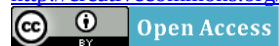
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FUTURE SCENARIOS OF GREEN HYDROGEN IN THE MENA COUNTRIES: THE CASE OF EGYPT*

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Abstract. Green hydrogen is a clean and renewable energy source that has the potential to play a major role in decarbonizing the global economy. Green hydrogen has become a promising decarbonization strategy for several industries, including transportation and manufacturing. The widespread use of green hydrogen technology still confronts several obstacles, such as high costs, a lack of infrastructure, and regulatory restrictions. The paper commences by examining the potential of green hydrogen production in MENA countries with a specific emphasis on Egypt as best practice example. It proceeds to identify the key drivers that will shape future scenarios of green hydrogen and outlines the best and worst-case scenarios for green hydrogen in MENA region by 2050. Through scenario analysis, the paper presents potential pathways for green hydrogen deployment in Egypt and the wider MENA countries, highlighting key drivers and potential barriers. According to the findings, Egypt emerges as pivotal player in driving the deployment of green hydrogen within the MENA region. The MENA region, rich in solar and wind resources and strategically located, emerges as a potent hub for green hydrogen production. Egypt, in particular, is at the forefront of this initiative, aiming to become a key exporter in the global hydrogen economy by leveraging its renewable resources, strategic projects, and conducive investment environment. The study employs a multifaceted methodology, integrating PEST analysis and identifying key drivers like renewable targets and technological advancements to assess green hydrogen's potential in the MENA region, focusing on Egypt. It constructs best- and worst-case scenarios by 2050, utilizing these drivers to evaluate the implications of various influencing factors. In the best-case scenario, by 2050, Egypt aspires to be a pivotal player in the global green hydrogen economy, aiming for up to 8% market share. Through strategic investments, policy enhancements, and global partnerships, Egypt plans to become a major exporter, particularly to the European Union, aligning with global decarbonization goals. Comprehensive strategies are expected to drive economic prosperity, potentially increasing Egypt's GDP by \$10-18 billion by 2025. Collaborations with global entities have fostered a robust infrastructure, enabling an integrated ecosystem for green hydrogen innovation and production.

Keywords: Green hydrogen; Egypt; best case scenario; worst case scenario; renewable energy; economic development; sustainability

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1. Introduction

To address the challenges of reducing greenhouse gas emissions (GHGs) and decreasing dependence on fossil fuels in energy markets, countries worldwide are actively prioritizing the development of renewable energy sources (RESs) as a key driver for the energy transition and to reduce reliance on external supplies (Squadrito et al., 2023). The complete decarbonization of the economy is now a top priority on political agendas globally. The Paris Agreement, ratified in 2015, established the commitment of most nations to limit global warming to within 1.5 to 2 degrees Celsius above pre-industrial levels. To achieve this objective, it is crucial to significantly decrease GHG emissions in all sectors by replacing fossil fuels with carbon-free alternatives (Liponi et al., 2023). As the international community moves towards a sustainable and low-carbon energy future, hydrogen is emerging as a leading energy carrier with vast potential to decarbonize various sectors (IEA, 2021).

Although there are some clean and renewable energies that are considered more cost-effective in terms of use globally, such as solar energy and wind energy (IEA, 2021), they depend greatly on the location and weather conditions, which depend on technologies. Storage is mainly through batteries (Pleßmann et al., 2014), which suffer from several technical shortcomings, such as: a limited number of useful cycles (discharge), the use of important raw materials and/or polluting compounds, and the difficulty of recycling (expensive and/or lacking to techniques) (Dehghani-Sanij et al., 2019). For this reason, interest in hydrogen as an environmentally friendly and economically competitive solution for energy storage is growing dramatically (McKinsey & Company, 2022).

Green hydrogen, which is made using renewable energy sources to electrolyze water, has gained appeal as a sustainable solution for energy storage and use. Unlike its counterparts, green hydrogen is not limited by geographic or meteorological requirements, giving it broader applicability in different regions and conditions (Furfari & Clerici, 2021). Since its production involves using surplus electricity from renewable sources such as wind and solar energy to split water into hydrogen and oxygen, it represents a powerful strategy in reducing carbon emissions (Kovač et al., 2021). The flexibility and adaptability of green hydrogen are noteworthy as well. Green hydrogen can be easily stored and transported, and its energy can be retrieved as needed through fuel cells or combustion, ensuring a continuous and reliable power supply (Winter, 2009). Furthermore, green hydrogen integrates effectively into various sectors, including transportation, industry, and power generation, enabling a comprehensive approach to decarbonization (Kazi et al., 2021 & Mazzeo et al., 2022). In the transportation sector, for instance, green hydrogen could have a transformative impact by providing a viable and emissions-free alternative to conventional fossil fuels, particularly in heavy haulage and long-distance transport applications where battery technologies may not be suitable due to their bulk and weight.

Green hydrogen is a clean and sustainable source of energy and is of great importance. It is recognized as the cleanest fuel by the World Energy Organization and has the potential to contribute to achieving zero fuel emissions strategies, however, despite its potential, the production cost of green hydrogen remains a key challenge. Economies of scale, technological innovations, and supportive policy frameworks are pivotal to making green hydrogen more economically competitive (Falcone et al., 2021). The decline in renewable energy costs, advancements in electrolyze technologies, and increased global commitment to sustainability are promising indicators of the growing feasibility and expanding role of green hydrogen in a future global energy landscape (Noussan et al., 2020). The global demand for green hydrogen is expected to increase significantly in the coming years (Figure 1). According to a report by PwC, hydrogen demand by 2050 could vary from 150 to 500 million metric tonnes per year, depending on global climate ambitions and the development of sector-specific applications (Pwc, 2023).

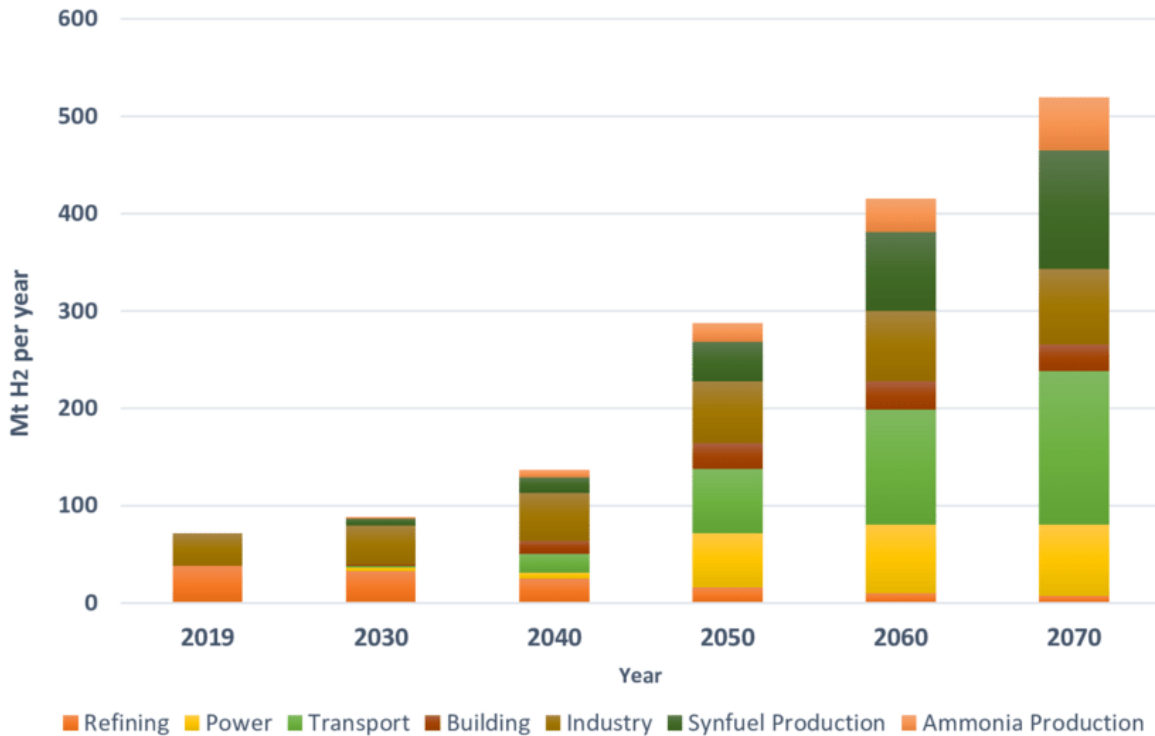


Fig. 1. Global demand for hydrogen by sector 2019-2070

Source: Okonkwo et al., 2021

The Middle East and North Africa (MENA) region possesses substantial potential for green hydrogen production and utilization (Razi & Dincer, 2022), attributed to several key factors. Primarily, the region boasts an abundance of renewable energy, particularly solar and wind resources, with significant investments already made by countries such as Egypt, Saudi Arabia and the United Arab Emirates (Chedid & Chaaban, 2003). Geographically, MENA's strategic location facilitates the efficient export of hydrogen or hydrogen-based products to Europe and Asia, enhancing the feasibility of hydrogen transportation due to its proximity to major global markets. Additionally, the region's existing infrastructure, stemming from the oil and gas industry, could be repurposed for hydrogen production and transportation, thus minimizing the need for new investments. In terms of industrial application, green hydrogen can be immensely beneficial to various local industries, including petrochemicals, fertilizers, and refineries, assisting in the reduction of their overall carbon footprint. Economically, the production and exportation of green hydrogen presents an opportunity for economic diversification, steering the region away from fossil fuel dependency and towards embracing future technologies (Charles et al., 2009).

In recent years, ambitious initiatives have emerged in the Middle East and North Africa (MENA), specifically in countries like Egypt, Morocco, Saudi Arabia, Oman, and the United Arab Emirates (UAE), aimed at establishing the region as a hub for carbon-friendly fuel supply to Europe and Asia-Pacific. A remarkable plan unfolds in Egypt, which ambitiously targets a green hydrogen production cost of 1.7 \$/kg by 2050, aspiring to occupy an 8% share of the global hydrogen market (Gado & Hassan, 2023). Concurrently, innovative roadmaps are being adopted in NEOM, Saudi Arabia, UAE, and Oman, manifesting a collaborative regional effort (Hafner et al., 2023).

Egypt enjoys an abundance of sunlight and wind, making it a mine of photovoltaic energy and wind energy, which are essential for producing low-cost green hydrogen (Moharram et al., 2022). Egypt is leading Africa in

green hydrogen production (Figure 2) with 21 projects underway. A significant agreement has been made between Scatec and the Egyptian government to develop a facility producing up to 3 million tonnes of green ammonia annually, primarily for export to Europe and Asia. Key projects include the Masdar Ain-Sokhna project, developed by Masdar and Hassan Allam Holding Group, aiming to produce 2.3 million tonnes of ammonia annually for the European market, utilizing a 4 GW electrolyzer plant located at the Suez Canal Economic Zone (SCZONE). Globeleq also plans to establish a 3.6-GW electrolyzer project at SCZONE to produce ammonia for export to Europe and Asia. Other notable projects include the ACME, Fortescue-Egypt, and SCZONE-ReNew Power projects, contributing significantly to the production capacity of green ammonia (Rystad Energy, 2023).

Million tonnes

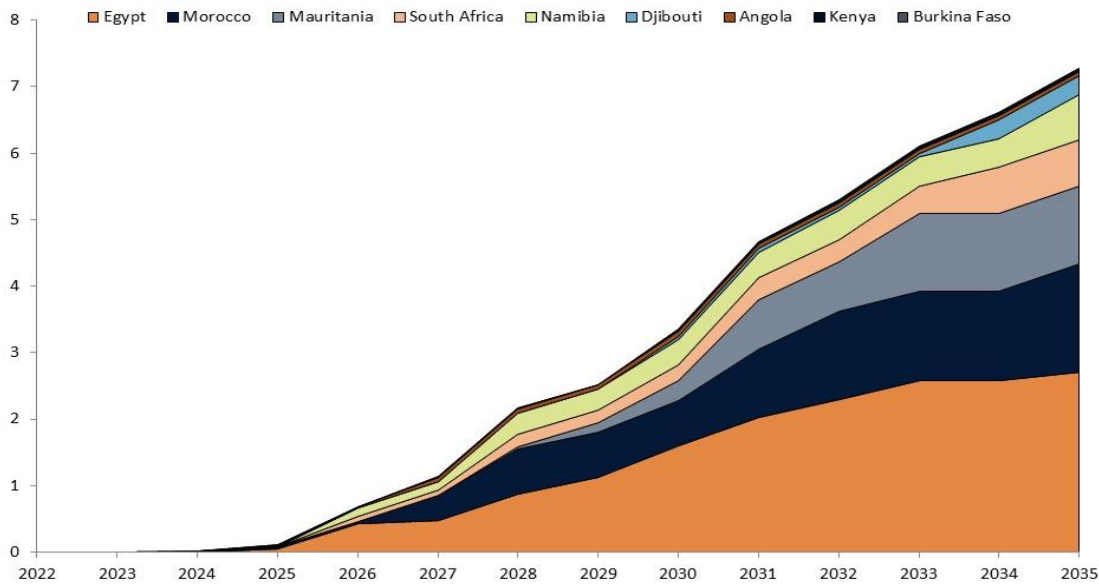


Fig. 2. Green hydrogen production in Africa

Source: Rystad Energy, 2023

The Egyptian Ministry of Electricity and Renewable Energy is strongly focused on amplifying the production and exportation of green hydrogen, making it a pinnacle priority (Table.1). By harnessing renewable energy sources, the ministry aspires to solidify Egypt's standing as a premier exporter in the burgeoning global hydrogen economy. A concerted effort is being made to foster an investment-friendly environment, attracting both domestic and international investments to fuel this ambition. Anticipated growth in the green hydrogen sector is impressive, with forecasts indicating a 60% surge by 2030 and a quadrupling of the economy by 2050, driven primarily by escalating global demands for cleaner energy and concerted efforts to diminish carbon emissions. Strategically, Egypt is positioning itself to seize a substantial share of the international market, predicting a sevenfold increase in the hydrogen economy by 2050. This strategic positioning could potentially elevate Egypt's GDP by \$10–18 billion and generate over 100,000 new jobs, thereby enhancing national energy security and reducing dependency on oil imports through a combination of increased indigenous hydrogen production and the optimization of local expertise across hydrogen-related value chains (Dokso, A., 2022).

Table 1. Egypt's hydrogen projects

Time	Initiatives	Target
January 2021	Letter of intent (LoI) with Siemens of German	Egypt's green hydrogen
April 2021	Egypt and Belgium's DEME struck a deal	Egypt's green hydrogen
May 2021	Egypt received six offers from six various firms.	Egypt's green hydrogen
July 2021	Eni signed an MoU with EEHC and Egyptian Natural Gas Holding Company (EGAS)	The technical and commercial feasibility of projects for Egypt's hydrogen generation
August 2021	letter of intent was promoted to a Memorandum of Understanding (MoU) with the Egyptian Electricity Holding Company (EEHC)	"co-developing hydrogen-based industry in Egypt with export capabilities" which includes "the creation of a trial project with an electrolyzer capacity of 100–200 MW".
October 2021	Fertiglobe, an Egyptian Emirati firm, and Scatec, a Norwegian renewable energy company, inked an agreement to be located in Ain Sokhna on the Red Sea coast.	The collaborative development of green and blue hydrogen projects
Before June 2022	The National Committee is responsible for formulating the hydrogen strategy is working with the European Bank for Reconstruction and Development (EBRD)	Unveil its \$40 billion hydrogen strategy, which includes plans for a production capacity of 1.4 GW by 2030

Source: Esily et al., 2022

Egypt is actively working towards unveiling a national strategy dedicated to green hydrogen production, incorporating numerous appealing incentives aimed at bolstering its competitive edge in this sector. The government manifests a strong political resolve to embrace a cohesive national vision for green hydrogen, collaborating with the European Bank for Reconstruction and Development to craft this strategy. A comprehensive regulatory framework focusing on the local production of green hydrogen is a crucial part of this strategy, with Egypt aspiring to account for 8% of global production. Furthermore, Egypt has been proactive in forging several pivotal agreements pertinent to hydrogen. Notable accomplishments include securing agreements within the Suez Canal Economic Zone, focusing on initiating projects that specialize in the production of hydrogen and green ammonia. These projects, valued at an impressive total investment of 83 billion dollars, are projected to collectively generate approximately 7.6 million tons of green ammonia and 2.7 million tons of hydrogen each year.

Green hydrogen scenarios are being explored in various studies. These scenarios involve the use of renewable power sources and water-splitting technologies to produce green hydrogen as a decarbonization solution (Al-Orabi et al., 2023, Correa et al., 2022 & Peterssen et al., 2022). In the UK, several scenarios have been illustrated to show potential economic trajectories in hydrogen production. One such example demonstrates that by 2030, the manufacturing of green hydrogen using offshore wind resources could rival the costs of grey and blue hydrogen, projecting a notable decrease in expenses. In alternative scenarios, focusing on the evolution of hydrogen storage and transportation technologies, for projects initiating in 2050 under these scenarios, the levelized cost of hydrogen might potentially descend to £2 per kilogram or below (Giampieri et al., 2023).

In Malaysia, the scenario has been reviewed by discussing energy demand, current population, energy policy synopsis, conventional energy sources, carbon emissions, and the direction of renewable energy in Malaysia. Besides, the conceptual framework for hydrogen as renewable energy was discussed covering the hydrogen

economy, production technology, storage, and energy production using green hydrogen (Ahmad et al., 2021; Zakaria et al., 2023). In China, the scenarios envision an increase in the annual capacity of renewable hydrogen in China, with renewable hydrogen becoming a powerful support for the country's carbon-neutral mission (Liu, 2023).

This paper aims to explore the trajectory of green hydrogen adoption within the MENA region, focusing particularly on Egypt as case study and projecting towards the year 2050. Through scenario writing, this study navigates through the multifaceted challenges and opportunities that might unfold in the journey towards establishing a robust green hydrogen economy in these nations.

Two contrasting scenarios are envisaged: a best-case scenario, where factors such as technological advancements, policy frameworks, international collaborations, and market developments align favorably to promote the widespread adoption and integration of green hydrogen within the energy systems; and a worst-case scenario, which encompasses possible setbacks such as technological stagnation, lack of investment. By exploring these divergent pathways, this paper aims to provide comprehensive insights, fostering informed decision-making and strategy formulation for policymakers, industry stakeholders, and researchers dedicated to advancing the green hydrogen sector in the MENA region.

2. Methodology

The methodology employed in the study integrates several components to comprehensively analyze the potential development and outcomes of green hydrogen in the MENA region, with a specific focus on Egypt. It begins with a PEST analysis, which assesses the political, economic, social, and technological factors influencing green hydrogen adoption on a global scale, followed by a zoomed-in analysis of the MENA region, Egypt. This analysis provides valuable insights into the current landscape, opportunities, and challenges associated with green hydrogen development in the region.

Subsequently, key drivers are identified based on their potential impact on green hydrogen deployment (Rikkonen et al., 2021). These drivers encompass various factors, including renewable energy targets, carbon reduction commitments, technological advancements, international collaborations, and public awareness. The identification of key drivers serves as a crucial step in shaping the best- and worst-case scenarios for green hydrogen in Egypt by 2050, as these drivers influence the potential outcomes. The next stage involves scenario writing (Rezk et al., 2020), wherein the identified key drivers are utilized as inputs to construct plausible future scenarios.

In addition to the mentioned methodology components, the study incorporates a literature review, previous studies, and expert input to enhance the analysis and scenario development. The literature review allows researchers to build upon existing knowledge, identify gaps, and incorporate relevant findings from previous studies. Furthermore, expert input from academia, industry, government, and relevant organizations is sought to gather diverse perspectives and informed opinions. This inclusion of expert input, along with the literature review, ensures that the analysis and scenarios are grounded in up-to-date information, existing knowledge, and expert insights. Consequently, the methodology employed in the study fosters a robust and credible assessment, providing a comprehensive understanding of the potential best- and worst-case scenarios for green hydrogen in Egypt by 2050.

3. PEST analysis

A PEST analysis is a valuable tool for evaluating the political, economic, social, and technological factors that can influence the development and acceptance of green hydrogen in MENA countries, with a specific focus on Egypt. This analysis is widely employed worldwide to identify present or potential challenges, enabling effective

planning to overcome these barriers (Sammut-Bonnici & Galea, 2015; Barbara et al., 2017; Yang, 2022). The following PEST analysis provides insights into the current trends and status of green hydrogen in Egypt:

3.1. Political Factors

New strategy for green hydrogen

Egypt unveiled its National Strategy for Climate Change 2050 in 2022 with the goals of preserving its natural resources, enhancing the standard of living for its people, and fostering sustainable economic growth. Egypt's National Climate Change Strategy aims to provide a comprehensive overview of climate change in a single document, serving as a fundamental guide to guarantee the incorporation of climate change considerations into the overall planning of all sectors within the nation. It was created at the National Council for Climate Change's suggestion. The plan is to electrolyze water with renewable energy sources to produce hydrogen, which may be utilized as a clean fuel. (Ministry of Environment, 2022).

Egypt has been developing a new strategy for producing green hydrogen to lower carbon emissions and support renewable energy sources. The strategy seeks to establish Egypt as a global leader in the low-carbon hydrogen economy and to gain a 5-8% market share in the green hydrogen industry worldwide. Targeting up to 8% of the worldwide tradable market by 2040, Egypt's ambitious objectives in the hydrogen industry will be realized with Egypt's competitive capabilities in the national strategy. The strategy was unveiled at the UNFCCC Conference of the Parties (COP27), which took place in Sharm El-Sheikh in November 2022 (Ministry of Environment, 2022).

Investment Incentives

Egypt has been working on a green hydrogen strategy to reduce carbon emissions and promote sustainable energy, Egypt aims to be one of the largest exporters of clean hydrogen in the region and secure a 5-8% share of the global commercial market for green hydrogen. The Egyptian government has approved a new bill to incentivize green hydrogen projects and companies. The law provides incentives for green hydrogen projects and companies involved in its production during the project implementation period. The incentives include a cash investment incentive equivalent to 33% to 55% of the tax paid on revenues generated by the project. Equipment and materials will be exempt from value-added tax (VAT), and taxes and contracts and land registration fees will be waived. The government aims to accelerate the deployment of green hydrogen projects in Egypt, with the country relying on its status as one of the world's leading locations for green hydrogen production (Egyptian Cabinet, 2023).

Strategic Partnerships and Agreements

The government has signed several memoranda of understanding (MoUs) and contracts to produce green hydrogen and has approved a new bill to incentivize green hydrogen projects and companies. Egypt has entered collaboration with the European Union to progress in the area of green hydrogen production. Additionally, coinciding with COP27 in 2022, Egypt initiated a range of Memoranda of Understanding with various global entities to attract overseas investments for green hydrogen production, positioning itself as a pivotal clean energy hub for Europe. During this event, Egypt endorsed seven new agreements to drive the development of industrial complexes dedicated to green hydrogen production, particularly in the Ain Sokhna industrial area. These agreements involved partnerships between several Egyptian government entities and distinguished international and regional firms focused on renewable energy production. Partners include Globeleq from the UK, Alfanar from Saudi Arabia, UAE's Alcazar Energy and K & K, MEP Energy which is a joint venture between the US and Egypt, India's ACME group, and Actis from the UK. The planned investments in these pioneering green hydrogen

projects, led by eight Arab and international consortiums, are estimated to inject approximately \$7.4 billion over the forthcoming four years (Egypt Today, 2022).

3.2. Economic Factors

Market Size and Growth

The MENA region provides world-class renewable energy resources and has huge potential to become a leading hub for renewable energy and hydrogen-based industries (Gado & Hassan, 2023). The MENA region is becoming more interested in creating a green hydrogen economy since it may help with energy security and environmental preservation. According to Müller & Eichhammer (2023), several countries in the region, including Egypt, Saudi Arabia, and Turkey, already have industrial knowledge of the components of green hydrogen technology (Figure 3). The installation of further pipelines from Morocco, Algeria, and Tunisia may be able to meet a sizeable amount of the projected 2050 demand for green hydrogen in Europe. Green hydrogen production and delivery from the MENA region to Europe are predicted to cost roughly €2/kgH₂ (Jalbout et al., 2022).

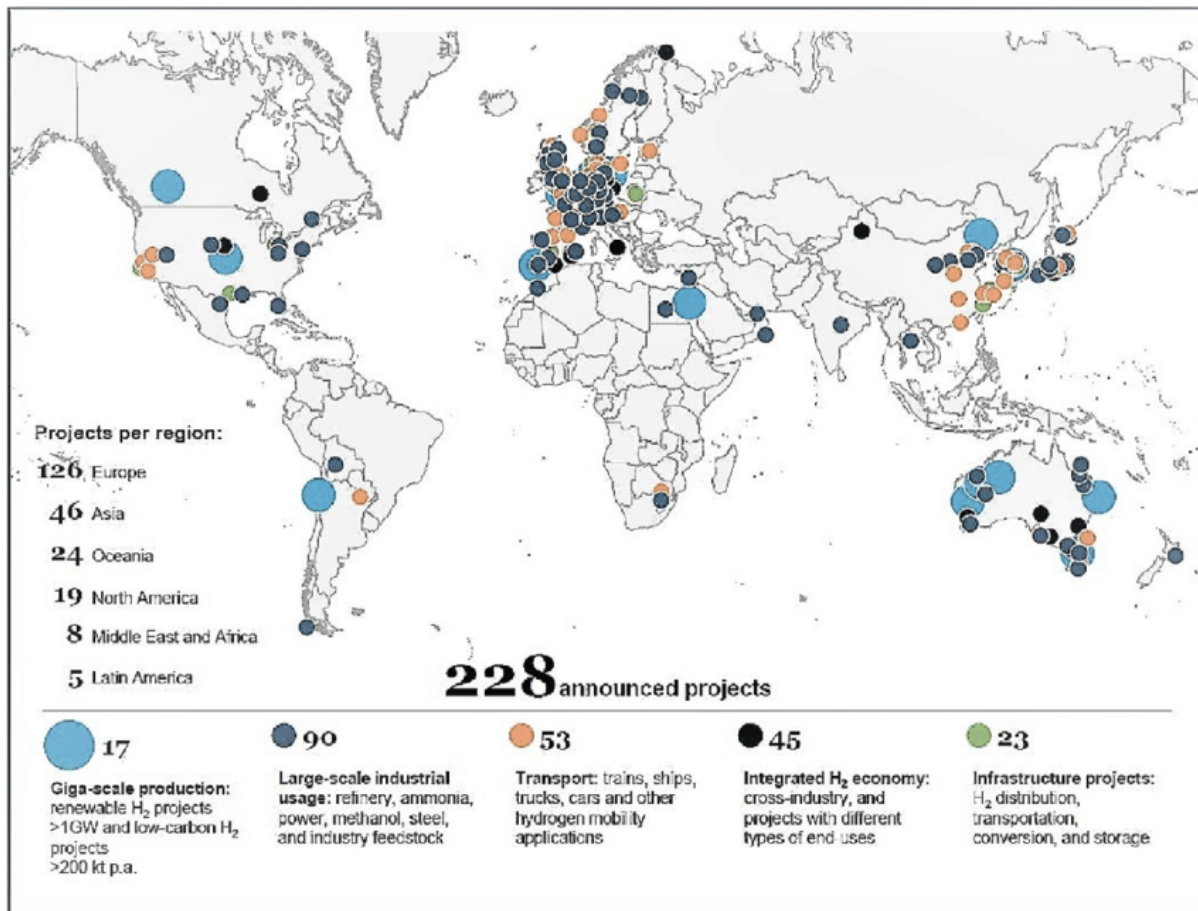


Fig. 3. Global announced hydrogen projects

Source: Okonkwo et al., 2021

The market for green hydrogen is projected to experience substantial growth in the coming years. According to various reports and market studies, the global green hydrogen market size is expected to reach significant values

in the next decade, with estimates ranging from tens of billions to hundreds of billions of dollars. By 2030, worldwide clean hydrogen trade among key areas is expected to reach above 30 MtH₂eq, representing 19% of global consumption, according to Deloitte's projection (Bernhard Lorentz et al., 2023). The Middle East, North Africa, and Australia have quickly made use of extra low-cost supply, placing them as major players in the global hydrogen market, according to Deloitte's outlook. The Middle East, historically a big exporter of oil and gas, takes the lead in early years of global commerce, exporting more than 13 MtH₂eq by 2030, which is equal to half of its domestic production. North Africa and Australia follow closely, exporting 7.5 MtH₂eq each, taking use of their substantial green hydrogen cost-competitive potential. Nearly 90% of the world's hydrogen will come from these three places by the end of the decade Figure (4).

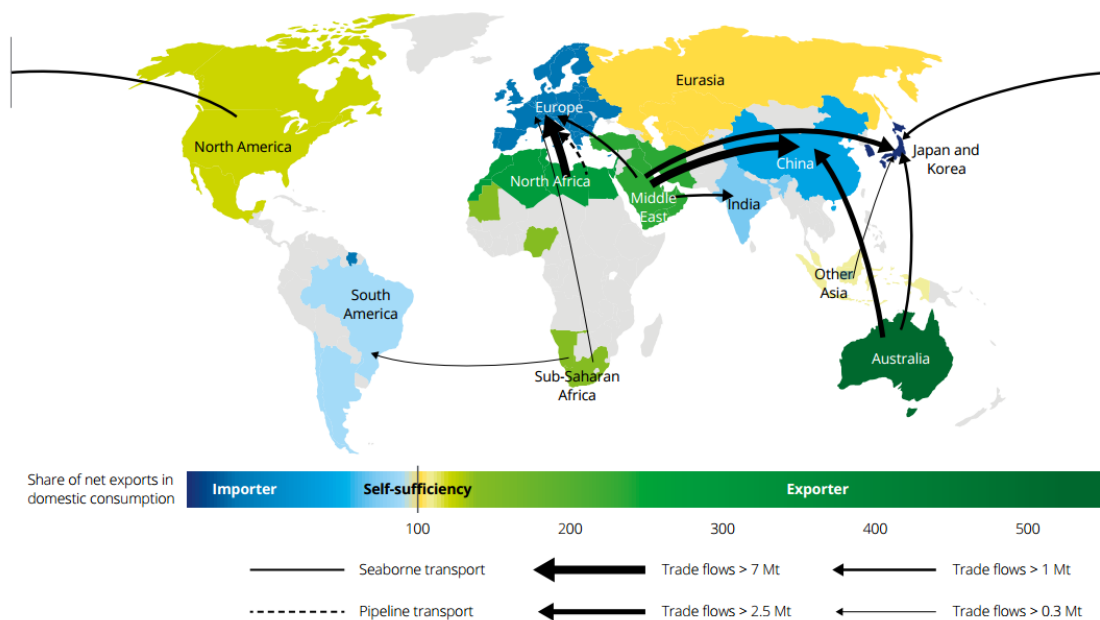


Fig. 4. Global hydrogen trade among key regions, 2030

Source: Deloitte analysis based on the HyPE model.

The market as a whole might expand significantly with clean hydrogen driving growth, from US\$160 billion in 2022 (Markets and Markets, 2022)—completely carbon-intensive hydrogen—to US\$640 billion in 2030 and US\$1.4 trillion in 2050 (Bernhard Lorentz et al., 2023). Because of cost reductions brought about by the large scale-up of green hydrogen, between 2030 and 2040, the market size will expand less in value (less than 1% constant annual growth) than in volume (9% constant annual growth). Market growth is projected to balance out between 2040 and 2050 as productivity improvements slow, figure (5) (Bernhard Lorentz et al., 2023).

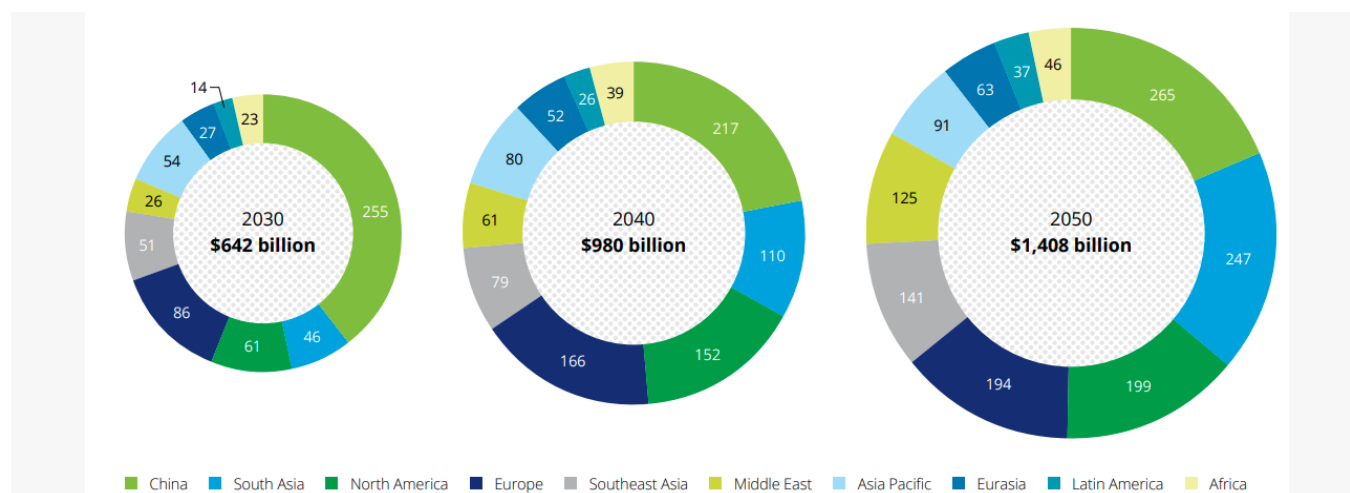


Fig. 5. Green hydrogen market size (US\$ billion per year), 2030 to 2050.

Source: Deloitte analysis based on the HyPE model.

The cost of green hydrogen production

The price of producing green hydrogen depends on a number of variables, such as location, the cost of renewable energy sources, and electrolysis equipment capital expenses. Even for green hydrogen production plants in prime locations for renewable energy, \$2 per kg is already a stretch goal for 2050, according to CRU's hydrogen cost model. Depending on the nation, this translates to a 50–70% decrease from current levels, with the cost of renewable energy having decreased by 50% and the capital cost of electrolysis systems having decreased by 75% (Butterworth et al., 2023), CRU expects the total cost of green hydrogen to a typical end user to be between \$3-7 per kilogram (at 2022 prices) in 2050, figure (6), taking into account the cost of storing, compressing and distributing the hydrogen, as well as electricity. Network connections. This means it will still be more expensive globally, on average, than blue-gray hydrogen derived from fossil gas in 2050, even when a carbon price is included (Paul Butterworth et al., 2023).

Figure (6)

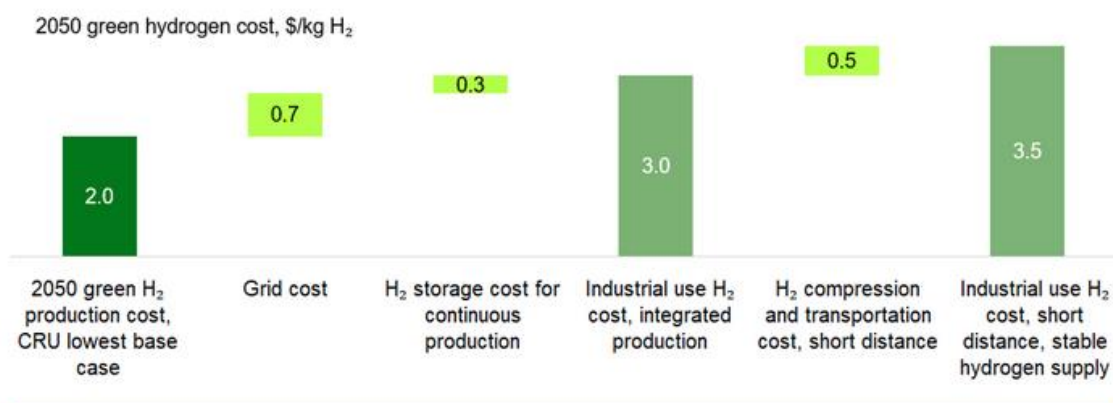


Fig. 6. The total green hydrogen cost to a typical end-user

Source: CRU hydrogen cost Model

The cost of producing green hydrogen in the MENA region is much lower than in Europe (Temmerberg and Kaltschmidt, 2019). According to S&P Global Platts, producing green hydrogen will be cheaper than producing blue hydrogen in Saudi Arabia, the UAE, Qatar and Oman, due to lower energy costs in the region (S&P Global Commodity Insights, 2023). The cheapest location for renewable hydrogen is Qatar, at a cost of just \$2.62 per kilogram, followed by Saudi Arabia, Oman and the United Arab Emirates. The cost of producing hydrogen in Hurghada, Egypt, using wind energy is US\$4.4/kg (Gado and Hassan, 2023), and the NEOM green hydrogen project in Saudi Arabia aims to produce 240,000 metric tons per year of renewable hydrogen by the end of 2020. 2026, With \$8.4 billion in financing provided by 23 banks and investment firms (S&P Global Commodity Insights, 2023). The Middle East is forecast to produce 18.15 million mt hydrogen by 2030, exporting one million mt of mostly low carbon and renewable hydrogen, by 2040, Middle East is seen leading all other regions with production projected at 28 million mt of clean hydrogen, with exports at 6.28 million mt (S&P Global Commodity Insights, 2023).

Table 2. Middle East: selected large hydrogen projects

Project	Country	Platts normalized capacity (million mt/year)
Suez Canal Economic Zone Globeleq Phase II	Egypt	0.57
Suez Canal Economic Zone Masdar Phase II	Egypt	0.48
Ocior Energy SCZone H2	Egypt	0.40
Fortescue Future Industries Egypt H2	Egypt	0.33
Suez Canal Economic Zone Masdar Phase I	Egypt	0.32
East Port Said /LOHC Hydrogen Hub	Egypt	0.30
Suez Canal Economic Zone KK Power	Egypt	0.23
Helios Green Fuels (Neom)	Saudi Arabia	0.22

Source: Hydrogen Production Assets database, S&P Global Commodity Insights

3.3. Social Factors

Green Education

Egypt's National Climate Change Strategy 2050 places a strong emphasis on the value of incorporating climate challenges into scientific research, education, technological transfer, and public awareness campaigns. Climate change, biodiversity, and environmental sustainability are just a few of the environmental themes and ideas that are highlighted in the new educational system and have been incorporated into several kindergarten and primary curriculum. Furthermore, a comprehensive plan to teach 25 million kids the value of protecting the environment was adopted by the Ministry of Education. In the Matrouh Governorate, the Ministry also started to develop the environmentally friendly smart community school's initiative. Targeting 100 schools in the governorates of Cairo, Giza, and Qalyubia, the similar project is currently underway Along with developing technical education, Egypt has established numerous technical schools, including several technological colleges and a solar energy school in Aswan (Ministry of Education, 2022).

Job Creation and Social Impact

The energy sector may undergo a significant reorganization, with the hydrogen economy playing a significant role. By 2030, clean technologies may generate up to 14 million new jobs, with an additional 16 million coming from the fossil fuel sector. Jobs related to renewable energy are typically labor-intensive compared to jobs using fossil fuels, hence energy employment increases as energy transitions. Furthermore, the clean hydrogen economy might provide a special conversion path for the numerous transferable talents from the fossil fuel business, like large project engineering, renewable energy deployment, and hydrogen transport and storage. The fact that a large portion of the positions created in the renewable energy sector require a postsecondary degree—60% of them, which is more than double the norm for the economy—is another factor contributing to productivity increase (Bernhard Lorentz et al., 2023). Egypt has succeeded in signing 9 agreements with international investors to implement projects to produce green hydrogen, with a total investment cost amounting to about 83.6 billion dollars in direct foreign investment, providing renewable energy capabilities of about 9.7 gigawatts in the pilot phase, reaching about 36.5 gigawatts in the first phase of the implemented projects, and allowing. These projects create about 44,000 direct job opportunities and 220,000 indirect job opportunities and contribute to reducing emissions by 37.6 million tons annually (SIS, 2023).

3.4. Technological Factors

The production of green hydrogen is chiefly achieved by electrolysis, a technique that involves using electricity sourced from renewables to decompose water into hydrogen and oxygen. Despite the established and validated status of this technology, several challenges persist that require resolution. For instance, there's a need to increase the efficiency of the electrolysis operations, to innovate in creating more stable and enduring electrolyzers, and to boost the energy storage density of hydrogen. Furthermore, the question of how to scale up looms large, with the expansion to wide-scale green hydrogen production demanding substantial investment in renewable energy frameworks, an endeavor that might not be immediately viable.

Technologically, critical issues remain, such as enhancing the electrolysis efficiency to make green hydrogen more cost-effective and furthering the progression of advanced electrolyzer technologies like solid oxide and proton exchange membrane (PEM) units (Hassan et al., 2023).

4. Key drivers of Scenarios

The selection of key drivers for green hydrogen involves a careful process where the various factors that significantly influence the future of green hydrogen in Egypt were examined and selected based on their potential impact on future scenarios. The selection included a comprehensive review of several elements, such as technological progress, government policies, market trends, and global economic conditions, etc., with the help of expert opinions, and analysis of current research and future reports on hydrogen, both at the global level and at MENA countries level. The next step was to identify the positive and negative trends for each driver, whether the internal drivers that can be directly influenced or the external drivers that cannot be controlled, which will help in forming the best and worst scenarios Table (3).

Table 3. list of internal and external key drives of change

Negative Direction	Internal drives	Positive Direction
Lack of coherent policies and limited government support could hamper industry growth and innovation.	Government Policies and Support	Robust policies, strategic support, and incentives could catalyze the development and adoption of green hydrogen technologies.
Limited investments could hinder technological advancements, keeping green hydrogen less competitive.	Investment in Research and Development (R&D)	Strong investments could foster innovation, lower costs, and improve the efficiency of green hydrogen technologies.
Lack of diversification strategies could make economies vulnerable and hinder green hydrogen development.	Economic Diversification Strategies	Strategies that prioritize green hydrogen could boost the industry, reducing dependency on fossil fuels.
Lack of focus on human capital development could lead to skill shortages and slow down industry progress.	Human Capital and Workforce Development	A skilled workforce could accelerate industry growth, innovation, and the implementation of green hydrogen projects.
Insufficient infrastructure could impede the efficient production and distribution of green hydrogen.	Infrastructure Development	Developing necessary infrastructure could enhance production capabilities and market accessibility.
Inconsistent or inadequate financial mechanisms could deter potential investors and developers.	Financial Mechanisms and Incentives	Financial incentives could attract investments and encourage project developments in green hydrogen.
Weak institutional support could lead to a lack of innovation and expertise in the sector.	Educational and Research Institutions	Strengthened institutions could propel research, innovation, and the availability of skilled professionals.
Lack of public awareness and acceptance could lead to resistance and slow industry growth.	Public Awareness and Acceptance	Enhanced awareness could facilitate broader acceptance and faster adoption of green hydrogen technologies.
Difficulty in integrating into existing grids and utilities could limit the practical application of green hydrogen.	Utility and Grid Integration	Successful integration strategies could maximize the utility of green hydrogen in energy systems.
Negative Direction	External drives	Positive Direction
Limited technological transfer and weak partnerships could hamper industry progress and global competitiveness.	Technological Transfer and International Partnerships	Collaborations could facilitate technological exchange, advancing the industry through shared innovation.
Weak or inconsistent sustainability trends could limit the appeal and prioritization of green hydrogen initiatives.	Environmental and Sustainability Trends	Increasing focus on sustainability could drive demand and innovation in green hydrogen technologies.
Geopolitical unrest or unfavorable policies could disrupt industry operations and global market access.	Geopolitical Factors and Global Policies	Stable geopolitical landscapes and supportive policies could facilitate industry growth and international collaborations.
Weak networks and limited collaborations could isolate markets and hinder technological advancements.	International Collaboration and Networks	Strong international networks could enhance knowledge sharing, investments, and market opportunities.
Restrictive trade barriers and limited market access could hamper export potentials and industry growth.	Market Access and Trade Agreements	Favorable agreements could foster industry expansion, opening up new markets and trade possibilities.
Inconsistent or weak global commitments could impede industry momentum and strategic focus.	Global Environmental Policies and Agreements	Strong global commitments could drive supportive policies and market demand for green hydrogen.
Limited availability could raise production costs and reduce the feasibility of green hydrogen projects.	Availability of Renewable Energy Resources	Abundant renewable resources could lower production costs and enhance the sustainability of green hydrogen.
Economic downturns could reduce investments, demand, and overall industry growth.	Global Economic Conditions	A robust global economy could facilitate investment flows and market expansion for green hydrogen.

Source: Authors

5. Future Scenarios

5.1. Best Case Scenario (“Sands of Sustainability: Harnessing Green Hydrogen in Egypt”)

Egypt leveraging decades of strategic planning and execution, have carved a significant niche in the global green hydrogen landscape by 2050. By 2050, Egypt emerged as linchpin in the global green hydrogen economy, leveraging the MENA region's intrinsic geographical and climatic advantages, coupled with strategic investments and policies implemented over the decades. Egypt became a global regional center for green hydrogen in 2030 and accounted for 8% of the global hydrogen market in 2040. Abundant solar and wind energy resources were relied upon to produce green hydrogen. Some policies and investment laws in green hydrogen have been changed to attract more investments. Egypt was able to export 50% of green hydrogen to the European Union in 2040, and by developing the green hydrogen industry in Egypt, it has supported economic growth, created job opportunities, reduced greenhouse gas emissions, and increased the country's competitiveness in the green energy sector. The Egyptian economy is witnessing an era of diversification and strength, fueled by the spread of the green hydrogen industry. Employment creation is rising, education and skill development are flourishing, and various sectors, from transportation to industry, are revitalized, creating a prosperity multiplier effect across societal strata.

Government Policies and Support

The Egyptian government has implemented a number of policies and support that will help Egypt achieve its goals, Egypt has worked to enhance its green hydrogen business, and since 2022 Egypt has signed several memorandums of understanding and contracts for the production of green hydrogen. Green hydrogen investment policies and laws have been changed to attract more investment and concessions to export green hydrogen to other regions, such as Europe and Asia, that are looking to decarbonize their economies. In 2023, an incentive for green hydrogen production ranging between 33% and 55% of tax dues was provided (Sarah Samir, 2023). Egypt has issued a number of laws aimed at promoting green hydrogen projects and related projects. Which encouraged the establishment of green hydrogen stations, as well as water desalination plants that allocate part of their production to green hydrogen.

The law also includes renewable energy facilities that allocate at least 95% of their production to green hydrogen and water desalination plants. In addition, projects dedicated to warehousing were encouraged; Transportation; And the distribution of green hydrogen also included projects to manufacture the raw materials needed for green hydrogen factories. Egypt has worked with a number of international partners, such as the European Bank for Reconstruction and Development, to support green hydrogen projects in the Suez Canal Economic Zone, and the National Green Hydrogen Council was established to coordinate and manage all aspects of green hydrogen activities in Egypt. A comprehensive national hydrogen strategy has been developed that defines the country's approach to developing and harnessing the potential of green hydrogen.

Market Access and Trade Agreements

By 2030, Egypt aimed to capture 5% of the global hydrogen market. The country established an international export center for hydrogen and its derivatives, successfully enhancing energy security and achieving sustainable development goals during this period. Additionally, Egypt became a regional hub for green hydrogen, exporting approximately 10 million tonnes of renewable energy to Europe. As the world focused on decarbonization and

improving energy security, Egypt's hydrogen demand increased significantly, reaching around 2% of global hydrogen demand. To facilitate the development of a hydrogen economy, Egypt collaborated with the European Bank for Reconstruction and Development to draft a national plan for green hydrogen, which outlined a phased approach consisting of a Pilot Phase, Scale-up Phase, and Full Implementation Phase. The Pilot Phase involved experimental projects, while the Scale-up Phase witnessed the expansion of green hydrogen initiatives. Egypt played a leading role in supplying hydrogen and its derivatives for the establishment of a low-carbon hydrogen economy.

by 2040, Egypt successfully captured 8% of the global hydrogen market. The country became the global regional center for green hydrogen, exporting approximately 50% of the European Union's green hydrogen. By this time, Egypt's hydrogen economy had entered the Full Implementation Phase, marked by the establishment of an international export center for hydrogen and derivatives, which significantly contributed to energy security and the fulfillment of sustainable development goals, the European and Asian markets will be key focus areas for establishing a strong export network. In 2050, Egypt successfully became the primary source of hydrogen for Europe, exporting around 10 million tonnes of renewable energy to the continent. The country's hydrogen economy was 400% larger by 2050 (Al-Orabi et al., 2023), with intentional trade accounting for 25% of the supply. To support this growth, Egypt's hydrogen production consumed seven times the amount of renewable electricity generated in 2020. By 2050, Egypt successfully captured up to 8% (10 million tonnes per annum) of the tradable market (Gado & Hassan, 2023). Achieving 100% green hydrogen by this time led to a cumulative CO₂ emission abatement of 417 gigatonnes of CO₂.

Reform of Education

Egypt has embarked on an ambitious path to become a global leader in green hydrogen production and technology. Over the next two decades, the nation underwent a remarkable transformation, not only in its energy landscape but also in its educational system, serving as an inspiring model for the entire MENA region. To realize its comprehensive roadmap for green hydrogen development, the government acknowledged the significance of a highly skilled workforce and initiated a series of educational reforms aimed at equipping the nation's youth to embrace the challenges and opportunities presented by the green hydrogen sector. This included the integration of green hydrogen education into the national curriculum from primary to tertiary levels, ensuring that students were exposed to concepts related to renewable energy, electrolysis, and hydrogen production from an early age. Egypt also established specialized institutes and research centers across the country, focusing on hydrogen technology and renewable energy. These institutions offered state-of-the-art programs and attracted leading experts and researchers from across the globe. Furthermore, to incentivize students to pursue degrees in fields related to hydrogen technology, the government introduced substantial scholarships and research grants, guaranteeing a continuous influx of talent into the sector.

Hydrogen Skills

With the high demand for skilled professionals in global and local labor markets, especially for technical positions such as engineers and technicians specializing in areas such as chemical processes, industrial engineering, health and safety, and high-voltage electricity in the hydrogen sector, Egypt has responded by expanding its educational and training programs. This expansion includes the introduction of specialized programs in hydrogen and fuel cell technologies at the master's and doctoral levels. Tailored training courses have been developed to meet the diverse needs of the hydrogen industry. Furthermore, vocational education now includes specializations designed to meet the immediate need for specialized skills and prepare the workforce for the expected expansion of the hydrogen sector. Egypt has also benefited from the widespread availability of hydrogen training globally and has established many partnerships with international universities focused on green hydrogen.

Human Capital and Workforce Development

The hydrogen economy could create up to 14 million jobs by 2030 and shift another 16 million jobs from the fossil fuel industry (Bernhard Lorentz et al., 2023), Egypt was able to obtain 8% of the global hydrogen market share. This has led to an increase in Egypt's GDP by between 10 and 18 billion dollars by 2025, in addition to providing more than 100,000 job opportunities (Fatma Ahmed, 2023). Egypt was able to develop a highly skilled and efficient workforce that meets the requirements of the green hydrogen industry. To position Egypt as a leader in the global green hydrogen market, vocational training programs and educational initiatives focusing on green hydrogen technologies were established in cooperation with educational institutions, vocational training centers and industrial associations to develop specialized courses and certificates, this has led to the availability of a skilled workforce with experience in areas such as electrolysis, hydrogen storage, and hydrogen infrastructure. International cooperation and knowledge transfer were enhanced through partnerships with leading countries in the green hydrogen sector and by facilitating exchange programs, research cooperation and technical assistance to benefit from the expertise and experience of existing players, which led to accelerating the learning curve and providing Egyptian professionals with global best practices. Support for entrepreneurship and the development of emerging green hydrogen companies was encouraged, and the establishment of incubators, accelerators and financing mechanisms that provide financial support, guidance and direction to aspiring entrepreneurs in the green hydrogen sector was encouraged.

Infrastructure Development

Egypt has created a green hydrogen infrastructure by implementing a comprehensive strategy that included a thorough evaluation of the country's existing infrastructure to identify deficiencies and establish the conditions for integrating green hydrogen technology. Hydrogen production facilities, such as electrolyzers that employ renewable energy sources like solar and wind energy, have been created. Technologies and infrastructure for the storage of compressed hydrogen as well as strategies for compounds like ammonia have been developed. Pipelines have been developed and constructed to enable safe and dependable transit of hydrogen, and a strong and effective hydrogen distribution network connecting production sites to end customers has been established. A network of hydrogen refueling stations has been established to assist the adoption of hydrogen-powered transportation as the culture of dependence on hydrogen has grown. To allow the international trade of green hydrogen, infrastructure and logistical skills have also been built. To serve the global supply chain and ensure seamless integration and compliance with trade regulations, export terminals and import facilities have been created.

5.2. Worst Case Scenario (“Sands of Stagnation: Barriers Bloating Egypt’s Green Hydrogen Vision”)

The worst-case scenario, which is a warning scenario, aims to draw a hypothetical image of what Egypt will look like if it does not exploit the current and future opportunities in green hydrogen or is exposed to some external drives that cannot be controlled.

Organizational failure

There is a delay in developing a thorough regulatory framework that focuses on local production of green hydrogen, a critical component of the national strategy, in view of expanding international prospects. This can result in unclear policies and inconsistent laws, which could hinder both domestic and foreign investment in this industry. In addition to the lack of donations that create tax incentive packages and stimulate investment, this may also result in a lack of incentives and support for the creation of green hydrogen projects, which could impede the industry's growth.

Lack of international cooperation

Egypt's ability to acquire cutting-edge technology, industrial best practices, and expertise in the field of green hydrogen has been constrained by a lack of international cooperation and a reliance on only a few nations. Egypt's attempt to establish itself as a significant regional producer of the substances has been hampered by the difficulty it now has in exporting green hydrogen to other nations. Egypt's competitiveness in the worldwide market for green hydrogen has decreased as a result of the absence of international cooperation, which has also prevented access to the most recent technology, industry best practices, and knowledge in the field.

Economic and financial challenges

In the worst scenario, Egypt would experience financial and economic issues that would impede the growth of the green hydrogen industry. The expansion of green hydrogen programs may be hampered by a lack of finance. Industry funding may be insufficient if investors fail to recognize the financial sustainability of participating in this sector. It is now more expensive to produce green hydrogen than other forms of energy, making it more expensive for investors to invest in this sector. Egypt might become too reliant on conventional energy sources, which would hurt the green hydrogen industry's ability to expand and compete. This might lead to a lack of investment in the green hydrogen market, which would prevent initiatives utilizing green hydrogen from receiving funding and assistance. Lack of funding and assistance may impede the industry's expansion, making it challenging for Egypt to win a sizable portion of the world hydrogen market. The development of the green hydrogen industry may also be hampered by inadequate infrastructure, such as a lack of access to cost-effective and dependable renewable energy sources, inadequate storage and transportation infrastructure, and a shortage of competent labor.

Technological Recession

Although Egypt developed centers and institutions for specialized study at first, their closure was caused by insufficient administration and limited funding. These universities became less competitive, and the nation's capacity to draw in foreign scholars and experts declined. The Egyptian green hydrogen industry could potentially suffer from a lack of innovation. This might happen as a result of insufficient funding for research, development, and innovation, which would cause a decline in technological advancement. Egypt might adopt new technology later than other countries, which would hurt its ability to compete in the global green hydrogen market. Because of this, Egypt may struggle to win a sizable portion of the global hydrogen industry due to a lack of innovation and competitiveness.

Reforms to green hydrogen education falter

Reforming the educational system faced resistance and bureaucratic roadblocks, even in spite of the government's early goals. With little practical implementation, the proposed educational reforms aimed at preparing the next generation of students for the green hydrogen industry have mainly stayed in theory. There hasn't been a thorough framework or depth to the incorporation of green hydrogen education in the national curriculum. Students are not gaining the necessary knowledge and abilities in these areas since subjects related to electrolysis, renewable energy, and hydrogen production have not been sufficiently developed.

Human Capital Deficits

Egypt might face a skilled labor shortage in the green hydrogen sector, which could impede the sector's expansion. This could result in a lack of expertise and experience, which could make it challenging for Egypt to create and put in place a thorough regulatory framework and draw in international investment. The green

hydrogen business may experience a shortage of qualified professionals and specialists due to a lack of emphasis on education and training, which would impede productivity, innovation, and industry expansion. Additionally, Egypt may see a brain drain as people pursue possibilities in more suitable global markets due to a lack of prospects and industry support. This could result in a lack of qualified and experienced professionals, which could hinder Egypt's ability to grow and modernize.

Infrastructural deficiencies

Egypt's assessment of existing infrastructure to identify deficiencies was insufficient. As a result, the country's efforts to integrate green hydrogen technology have been hampered by a lack of understanding of the necessary upgrades and modifications required. Planned hydrogen production facilities using renewable energy sources such as solar and wind have faced chronic problems such as lack of investment and setbacks. Technological. These facilities have struggled to operate reliably, limiting green hydrogen production. The development and construction of hydrogen pipelines has faced delays and cost overruns. As a result, the promised safe and reliable transport of hydrogen remains a distant goal. The hydrogen distribution network linking production sites to end customers was inefficient and fragmented. Egypt's plans for international trade in green hydrogen have faced logistical challenges and regulatory obstacles. Export terminals and import facilities have suffered delays, hampering the country's ability to effectively participate in the global green hydrogen market.

6. Policy Recommendations

By implementing these policy recommendations, Egypt can move away from pessimistic scenarios and create an enabling environment for the growth of the green hydrogen industry, ensuring long-term success and sustainability.

- Support a strong regulatory framework with a strong focus on domestic green hydrogen production through the National Green Hydrogen Strategy. This framework would facilitate an enabling environment for domestic and foreign investments in this sector and regulate investments.
- Strengthening international cooperation and partnerships with a variety of countries developed in green hydrogen technologies to access the latest technologies, best practices and experience in the field of green hydrogen.
- Prioritize investments in developing green hydrogen infrastructure, including access to cost-effective renewable energy sources, establishing reliable infrastructure for hydrogen storage and transportation, and developing a skilled workforce. Ensuring the necessary infrastructure is in place to support the thriving green hydrogen industry.
- Support and financially support specialized educational institutions to maintain their competitiveness, attract foreign scientists and experts, and allocate resources to research, development and innovation to drive technological progress and enhance competitiveness in the global green hydrogen market.
- Ensure the full integration of green hydrogen education into the national curriculum, with a focus on providing practical knowledge and skills related to electrolysis, renewable energy and hydrogen production to students.
- Invest in educational and training programs to address the potential shortage of skilled workers in the green hydrogen sector. Creating opportunities for local talent to gain expertise and experience, thus reducing dependence on foreign experts and professionals.
- Ensure that planned hydrogen production facilities using renewable energy sources receive adequate funding and adhere to stringent technical standards.

- Accelerate the expansion of hydrogen pipelines and distribution networks to create a safe and reliable hydrogen transportation system.

Conclusion

the future scenarios for Egypt's green hydrogen industry present a stark contrast between the best-case and worst-case outcomes. The best-case scenario, as envisioned in "Sands of Sustainability: Harnessing Green Hydrogen in Egypt," depicts Egypt as a global leader in green hydrogen production and technology by 2050. Through strategic planning, government policies, international cooperation, and educational reforms, Egypt successfully harnessed its natural resources and transformed into a key player in the global green hydrogen market. This scenario paints a picture of economic prosperity, job creation, technological innovation, and a diversified energy landscape, all driven by the growth of the green hydrogen sector. While the worst-case scenario, "Sands of Stagnation: Barriers Bloating Egypt's Green Hydrogen Vision," serves as a cautionary tale. It illustrates the potential pitfalls and challenges that Egypt could face if it fails to seize opportunities or encounters unanticipated external obstacles. Organizational failures, a lack of international cooperation, economic and financial challenges, technological stagnation, and educational inertia all contribute to a scenario where Egypt's green hydrogen ambitions are stifled. This could result in missed economic growth, job opportunities, and the failure to establish a prominent presence in the global green hydrogen market.

The contrast between these two scenarios underscores the importance of proactive and thoughtful policies, investments, and strategies to ensure that Egypt's green hydrogen vision becomes a reality. While the best-case scenario represents an inspiring vision of Egypt's potential, the worst-case scenario serves as a reminder of the risks and challenges that must be addressed to avoid stagnation and missed opportunities. Egypt's path in the coming decades will depend on its ability to overcome these challenges and leverage its strengths to become a global leader in green hydrogen production and technology.

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**BUILDING TOMORROW: ADDITIVE MANUFACTURING UNLEASHING SUSTAINABLE
PROGRESS IN THE US MILITARY****Daniela-Elena Hrab ^{1*}, Gheorghe Minculete ²**¹“Carol I” National Defence University in Bucharest, Romania²“Nicolae Bălcescu” Land Forces Academy in Sibiu, RomaniaE-mails: ^{1*}edaniela.hrab@gmail.com (Corresponding author); ²minculetegh@yahoo.com

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Abstract. Additive manufacturing (AM) has recently attracted the attention of academia and private companies, viewing it as a tool for achieving sustainability within the context of sustainable development (SD). As the previous studies revealed an ongoing debate on the sustainable nature of AM, making it challenging to conclude, the primary objective of this article is to explore new perspectives that enhance the contribution of AM to the sustainability vision. Given the limited number of studies considering the potential contribution of AM to specific Sustainable Development Goals (SDGs) and associated targets, this research aims to complete the existing body of knowledge through an in-depth analysis. Furthermore, recognizing that AM could generate some unsustainable effects from a security standpoint, this study investigates how the military organization, with its capacity to mitigate such concerns, could contribute to implementing specific SDGs and targets through AM small and large-scale adoption. Therefore, the study follows a qualitative approach, studying the case of the American military forces in an attempt to reveal the main reasons for adopting AM and the possible contribution to specific SDGs and targets. The results highlight a consistent potential for the US military to contribute to SD, mainly through the large-scale adoption of AM. This measure could reduce their military logistic footprint and provide financial, operational and strategic advantages. While the main findings are presented in a detailed list which supports these conclusions and offers valuable lessons learned, it is essential to acknowledge the limitations of this research – namely, the lack of quantitative evidence. Therefore, to formulate a conclusive judgment on the sustainable nature of AM, future studies should concentrate on assessing financial data from private and public entities, including military organizations.

Keywords: additive manufacturing; sustainability; Sustainable Development Goals; targets; U.S.; military

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JEL Classifications: H56, L60, O51, Q01, Q53, Q56, Q58**1. Introduction**

Sustainability, the ultimate purpose of Sustainable Development (SD) (Blewitt, 2018, p. 41), has emerged as one of the most substantial reasons for adopting additive manufacturing (AM), which is utilized by the private sector as a tool to achieve both competitive advantages and optimization (Sonnenburg, 2022). The existing body of literature offers numerous examples crediting this emerging disruptive technology (Leonardo, Del Prete, 2022, p. 1) for sustainability efforts. However, only some researchers have analyzed the contribution AM technology

could make toward specific Sustainable Development Goals (SDGs), and their assessments highlight the possibility that AM sustainable impact will be greater. Therefore, the main objective of this article is to explore new prospects of AM sustainable potential, with a focus on additional private and public sectors, completing the picture of private contribution to the implementation of SDGs and their subsequent targets, as defined by the United Nations. It should be noted that the SDGs and targets were proposed by this international organization in 2015, establishing 2030 as a deadline for their implementation (United Nations, 2015, pp. 13-27). Consequently, each actor that can contribute to an extent to this endeavor is more than welcome.

The research unfolds in two main steps. In the initial phase, the actual state of knowledge was reviewed, revealing the imperative for a more detailed analysis of the AM sustainable potential. This involves considering specific SDGs and their associated targets, not only from the perspective of private companies but also from that of public actors. Moreover, the review highlighted that AM adoption does not guarantee sustainability in any condition, posing a real threat to security. Recognizing that public organizations, such as the military, possess tools to prevent and mitigate these unsustainable effects, the subsequent step of the research is dedicated to an exploratory case study on the potential contribution of the US military to security and sustainability through AM adoption. This qualitative approach aims to answer two research questions: 1) Why are the American military forces interested in AM technology? 2) How do the American military forces contribute to implementing specific SDGs and associated targets through AM adoption?

The answers to the two formulated questions are provided in the subsequent sections of the case study. These unfold within the context of joint efforts to develop AM technology at an industrial level in Guam - a remote location in the USA, which also holds the potential of serving as a strategic military hub in the Asia-Pacific region (Brice et al., 2023, pp. 28-29). As a result, the main output of this scientific approach is presented as a list outlining the sustainable effects that the military forces could achieve through the implementation of this project. At the same time, the associated contributions to specific SDGs and targets are also detailed. The article introduces a new perspective, completing the existing research framework with military insight.

For the space economy, the *short titles of SDGs* (United Nations, 2023) are used within this article, and they are mentioned mostly when a certain SDG is referred to for the first time. For the same reason, it is noteworthy that all descriptions and ideas associated with the content of SDGs and targets are taken from the UN 2030 Agenda for SD (United Nations, 2015, pp. 14-27).

2. Literature review on the contribution of AM technology to Sustainable Development Goals

Most writings on AM sustainability highlight its economic, environmental and social benefits, but they often do not specify which SDG they align with. A more effective approach involves analyzing each SDG and its corresponding targets to understand how exactly AM contributes to sustainability. However, to our knowledge, only two notable scientific contributions directly explore how AM technology can help achieve specific SDGs outlined by the United Nations in 2015 (United Nations, 2015, pp. 14-27). One study from 2019 delves into several dimensions identified in the literature as generating sustainable benefits through AM, such as: enhanced cooperation among different stakeholders, improved health and safe conditions for workers, education and training, pollution prevention, enhanced performance of products, sustainable consumption of energy and raw materials and lighter supply chains (Machado et al., 2019, p. 484).

When it comes to fostering greater collaboration, authors point out that SDG 8 – “*Decent work and economic growth*”, SDG 12 – “*Responsible consumption and production*”, and SDG 17 – “*Partnerships for the goals*” could be implemented more easily if solutions offered by reverse logistics, remanufacturing, efficiency during production and usage phases (minimized waste and energy). Customer involvement was considered when establishing a company's strategy (Machado et al., 2019, p. 486). The analysis also highlights some indirect

benefits to workers' health and safety due to the simplified production process, which involves less welding and exposure to toxic substances (Machado et al., 2019, p. 485), revealing a possible contribution to SDG 3 – “*Good health and wellbeing*”, though it is not explicitly mentioned.

From the standpoint of products obtained through AM, the sustainable benefits are linked to improved quality associated with materials and weight reduction, extended durability, the capacity to be reintroduced in the manufacturing cycle and produced where needed, lighter logistic burden and, thus, reduced pollution (Machado et al., 2019, p. 485). According to the authors, there are seven SDGs which are positively impacted in this case, namely SDG 8, SDG 9 – “*Industry, innovation, and infrastructure*”, SDG 11 – “*Sustainable cities and communities*”, SDG 12, SDG 13 – “*Climate action*”, SDG 15 – “*Life on land*” and SDG 17 (Machado et al., 2019, p. 485).

Regarding the impact of a simplified and resilient supply chain, the main arguments which support AM's contribution to SDGs 9, 11, 12, 14 – “*Life below water*” and 17, consist of reverse logistics enablement, shorter transportation routes and cooperation between industry and customers (Machado et al., 2019, p. 485). Additionally, the dimension of training and education reveals some promising prospects of adopting AM technology, particularly in the social aspect of employment, as the new approach in manufacturing requires different educational paths, supporting this way SDG 4 – “*Quality education*” (Machado et al., 2019, p. 486).

As the fourteen companies analyzed by authors reveal sustainable practices across dimensions taken into consideration, the study suggests that the benefits of AM can directly or indirectly contribute to a broad spectrum of SDGs and targets (Machado et al., 2019, p. 484). Thus, a comprehensive overview indicates that AM could positively influence ten out of seventeen SDGs (59%).

Published this year, the other study, which also focused on AM's contribution to SDGs implementation, revealed some more optimistic expectations. Following an exploratory literature review, the authors found that AM has high influence on six SDGs (1 – “*No poverty*”, 3, 4, 9, 12, 14), a moderate effect on two SDGs (7 – “*Affordable and clean energy*”, 10 – “*Reduced inequalities*”) and a low influence on other four SDGs (2 – “*Zero hunger*”, 5 – “*Gender equality*”, 6 – “*Clean water and sanitation*”, 13). Meanwhile, SDGs 15, 16 – “*Peace, justice, and strong institutions*”, and 17 were reported as not positively influenced by AM (Muth et al., 2023, p. 2). What is more, the authors of the study could not reach a conclusion related to AM contribution to SDGs 8 – “*Decent work and economic growth*” and 11 – “*Sustainable cities and communities*”, highlighting the need for future studies in these areas (Muth et al., 2023, pp. 7-9). This latest study added to our knowledge of AM contribution to SDGs in four ways: discovering new potential for sustainability (SDGs 1-7, 10), confirming the results of the former study (SDGs 9, 12, 13, 14), contradicting some of the previous findings (SDGs 15, 16, 17), and expressing doubts about AM sustainable potential (SDGs 8, 11).

Compared to the previous study, the recent one considered a more significant number of SDGs positively impacted by AM technology adoption (twelve out of seventeen – 71%). Although the degree of contribution varies, AM has a growing potential to influence more SDGs. This evolution is likely due to the rapid discovery of new ways to integrate AM into the vision of SD, driven by technological progress. Given the increasing interest in the sustainability of AM, it is worth considering that the impact of this technology on SD could be even more significant. That is why it can be hypothesized that a more detailed assessment, focused on the 169 SDGs targets (United Nations, 2015, pp. 13-27), might offer a more realistic understanding of AM sustainability.

Consequently, building on the conclusions developed by the authors of the later study, who state the impossibility of evaluating the enhanced contribution AM could have on the accessibility of sufficient food sources (Muth et al., 2023, p. 4), the literature review continues with the analysis of other studies, to complete the AM contribution to sustainability. However, these studies do not explicitly mention the impact of specific SDGs. As other studies

reflect the increased interest in alternative sources of food and the wide range of possibilities in this respect, and some companies and public players allocate funds to integrate AM solutions for food production (Sher, 2021), it can be estimated that in the future, "algae, mycoproteins, cultured meat, plant proteins, and insects" (Van Huis, 2020, pp. 965-966) will be quickly processed through AM. This could complement the environmental benefits of AM, mainly because these alternative food sources have become more readily accepted. For instance, mealworms "produce fewer greenhouse gases and require less land than chickens, pigs and cattle" (Oonincx, De Boer, 2012). To grasp the urgency of changing our approach to nutrition needs, it is notable that between 2000 and 2022, greenhouse gases (GHGs) emissions from farming increased by 13%, more than half attributed to livestock, while the agricultural land decreased by 134 million ha (Food and Agriculture Organization, 2022, p. 3). What is more, as the food demand for meat is estimated to increase by 15% by 2032 (OECD-FAO, 2023, p. 188), these challenges could be addressed by consuming 3D printed alternative food products, cheaper and healthier than traditional options, already validated during space operations (VoxelMatters, 2023, pp. 21-22). Thus, AM could have a significant contribution not only to SDG 2 – "*Zero hunger*", but also to SDG 3 – "*Good health and well-being*" and SDG 13 – "*Climate action*".

Another area in which AM could significantly contribute to SDG 6 – "*Clean water and sanitation*" is the increased access to drinking water. Although the authors of the later study attributed a low potential of AM in this regard, the availability of this technology in remote areas could lead to reduced prices, as prices decrease with an increase in supply, in accordance with the law of supply and demand (Kramer, 2023). Additionally, examples of AM applications in water treatment, such as microrobots designed to clean polluted and toxic natural and man-made water sources, provide a compelling argument for the positive impact of this technology, not only on SDG 6, but also on SDG 3. The innovation brought to the medical sector may also be considered, as biomedical applications involve microrobots capable of reaching difficult areas within the human body without rejection by the immune system (Dabbagh et al., 2022). From these perspectives, an unexpected influence could extend to SDG 15 – "*Life on land*", considered to be supported by AM in the former study but assessed with no sustainability chance by the latter. The very thing that AM makes possible is that new food sources come from alternative sources in the marine ecosystem, and laboratories decrease the pressure on land-based resources, slowing down biodiversity loss. Moreover, microrobots play a role in reducing the toxicity of natural waters, preventing the development of "alien species" invasion, and contributing further to SDG 15 (United Nations, 2015, p. 25).

In close alignment with the aforementioned points, the third argument supporting a greater contribution of AM to the sustainability vision revolves around reducing greenhouse GHGs emissions. Despite the lack of robust evidence, as claimed by the authors of the later study regarding AM contribution to SDG 13 – "*Climate action*", a compelling example emerges in the context of AM sustaining alternative food sources that concurrently have the potential to curtail GHGs emissions.

Besides this, AM potential to contribute to SD is given by numerous other examples. Notably, AM contribution to the environmental dimension of SD gained a lot of attention lately. While researchers still debate whether AM is more sustainable than conventional manufacturing (CM), private companies have proposed tools to enhance the sustainable dimension of AM. For example, although researchers acknowledge that AM environmental friendliness depends on factors such as the life cycle stage of the product (Tadesse, Durieux, Duc, 2020, p. 22), the nature of raw materials (Sanchez-Rexach et al., 2020, pp. 7105-7119) or other factors, there can be taken four steps to improve AM contribution to a decreased environmental footprint: 1) ensuring transparency of materials and processes; 2) developing a comprehensive database to provide sustainable information about each product life cycle stage; 3) predicting environmental impact before 3D printing; and 4) enhancing recycling efforts (Langefeld et al., 2022, pp. 2-7). As this roadmap was developed to assess energy usage, the diminished consumption of energy resources could serve as a pivotal driver for the broader adoption of AM and, consequently, a more significant impact on SD.

This idea aligns with the prospects that "carbon emission goals can only be reached if the overall energy consumption is reduced at the same time" (Wycisk et al., 2022, p. 6), lending significant value to the aforementioned roadmap. Furthermore, the distinctive value that AM adds to this dimension is given by another instrument offered by private sector for the calculation of CO₂ footprint, which takes into account energy consumption in every step of the production process, with different combinations of alloy and manufacturing routes, to choose the best environmental option which gives AM superiority over the CM (Wycisk et al., 2022, pp. 9-17). Apart from this sustainability interest, private companies also manifest the need to reduce energy consumption, which will translate into lower prices for their products and foster competitive advantage and the economic dimension of sustainability. For instance, the results of a study show that AM could bring savings of maximum 27% in industrial energy consumption by 2050 (Verhoef et al., 2018, pp. 349-360). Hence, the prospects are favorable for finding and encouraging sustainable AM solutions in this respect.

From the social dimension perspective, apart from the already mentioned contributions, AM holds the potential to instigate profound changes in tomorrow's society. The four steps outlined above, aimed at reducing the environmental impact through digital sources of sustainable information, could pave the way for a shift from expert know-how to data-driven decision-making (Langefeld et al., 2022, p. 8). Additionally, the wide range of production possibilities brought by AM could reduce globalization and foster the local supply chains (Langefeld et al., 2022, p. 8) while promoting social justice as the production becomes accessible to a larger part of the population (Coblens, 2022). This trend aligns with the prevailing sentiment among consumers, as two-thirds prioritize environmental and social challenges over economic concerns (Coblens, 2022). Other important social changes AM could include transforming consumers into prosumers and encouraging increased engagement with societal needs contingent upon responsible production and consumption activities (Ford, Despeisse, 2016, pp. 13-22). An essential role in this regard belongs to education and training programs, which have the potential to bolster AM sustainability knowledge while offering new skills and reshaping the occupational landscape (Masurtschak, Almeida, 2021, pp. 2-4), at the same time, a valuable contribution to SDG 4 – "*Quality education*".

Apart from the numerous sustainability arguments presented in the reviewed literature, some studies set the alarm on AM's threat to SD. Examples from the security domain reveal the unsustainable potential of this emerging technology. For instance, despite the positive economic contributions AM makes to the development of next-generation nuclear reactors and the extended life cycle of older nuclear plants (Sher, 2022) - offering a viable solution for obsolete parts no longer available on the market - the darker side of AM lies in its potential to facilitate illegal and autonomous production of a wide range of weapons. These include missiles, nuclear weapons, bullets, and chemical explosives (Fey, 2017, pp. 21-30). This concern arises from the fact that violence, crimes, terrorism and illicit arms flows are inherently incompatible with SD, particularly SDG 16 – "*Peace, justice, and strong institutions*", which aims to stop these problematic practices (United Nations, 2015, pp. 5-9, 25-26). Fortunately, specialized structures are in place to pre-empt such actions and mitigate unsustainable effects. These measures include raising awareness, establishing stringent legal provisions related to export regulations and control of AM production beyond the purview of national security and defence actors, assessing AM activities through intelligence actions, establishing key AM activity indicators, tracking the sales of AM and digital files, and, last but not least, fostering international cooperation (Stehn et al., 2017, pp. 12-14). Moreover, innovative solutions, such as the "development of an artificial dog-nose device", enable the identification of guns created through AM (Martín Palacios, 2018, p. 37).

All these measures, especially the last one mentioned, are possible through achievements in SDG 17 – "*Partnerships for the goals*". Therefore, the possible unsustainable side of AM could paradoxically foster progress in this respect, bringing public actors into the AM sustainability discussion. However, despite the negative security issues that AM could unveil, the analyzed literature does not take into consideration public actions aimed at enhancing security through the sustainable usage of AM. Moreover, as mentioned before, in the

case of some SDGs, notably SDGs 16 – “Peace, justice, and strong institutions” and 17 – “Partnerships for the goals”, AM has not received ample credit for SD. The analysis performed by other authors focused solely on studies within the private sector, making it imperative to explore the potential contribution that the defence domain, a part of the public sector, also responsible for security, could make, given its significant interest in this technology and the potential to diminish its unsustainable effects. Its decisive role comes not only from implementing SDG 16, but also in providing favorable conditions for implementing other SDGs. This perspective is supported by the fact that the military organization was among the first to express interest in parts created through AM (Montero et al., 2020, p. 3), inherently possessing the potential to act as a key player on the sustainability path. The figure below provides a brief illustration of the literature-review process conducted so far (see Figure 1):

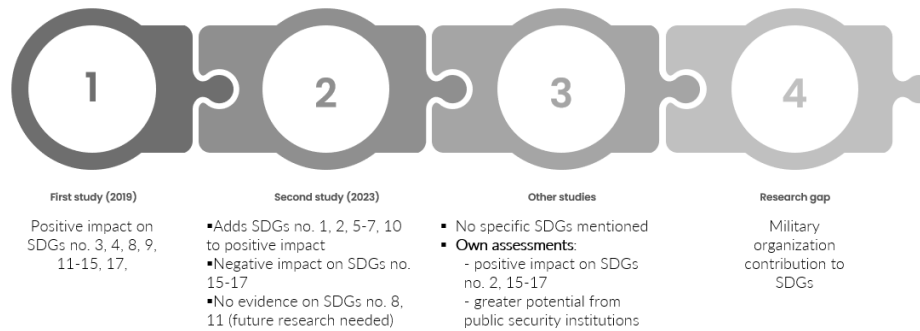


Fig. 1. The literature review on AM contribution to sustainability

The following section presents the case of US military forces, shedding light on the rationale behind the adoption of AM in their pursuit of mission objectives and the preservation of security, revealing an in-depth analysis of the contribution the military could have to specific SDGs and associated targets from AM perspective.

3. Military AM technology usage contributes to SDGs and associated targets. The case of the US military forces

This case study introduces a distinctive AM sustainability approach for two primary reasons. Firstly, the assessment diverges from the conventional evaluation of a private, productive entity, focusing instead on a military organization. Secondly, it aims to explore whether a military entity, which contributes considerably to security and is considered to generate negative spending, as the procurement of combat equipment and systems does not bring added value in society (Azam, 2020), could contribute positively to the implementation of SDGs and associated targets. Consequently, this exploration goes beyond the roles mentioned in the previous section, such as ensuring intelligence and fostering cooperation.

The selection of the US military forces as a case study is driven by the notable interest revealed in the analyzed literature regarding their adoption of AM technology (Fey, 2017, p. 23), a strategy being recently adopted in this respect (Joint Defense Manufacturing Council, 2021), aligning with the historical goal of maintaining technological dominance in military power (Brimley et al., 2013, pp. 9-10). The interest is justified by three critical reasons that position AM as a logistic and operational facilitator: firstly, its contribution to national defence modernization; secondly, its role in improving materiel readiness; and thirdly, its support for tactical innovation, for units deployed in a theatre of operation (Office of the Secretary of Defense, 2018, pp. 5-11). The intent is to use AM primarily in expeditionary missions, for the logistic support of forward deployed and afloat units (Joint Defense Manufacturing Council, 2021, p. 14). Secondly, apart from the mentioned strategy, US DoD

issued instructions dedicated to using AM technology by its armed forces, creating the favorable premises for large-scale adoption (Office of the Under Secretary of Defense for Research and Engineering, 2021). Finally, this interest is underpinned by statistical data indicating that the USA leads globally in AM capacity, retaining 33% of the international share - three times more than any other player (Wohlers et al. 2022, p. 7) - with an experience spanning over four decades (Brice, C. *et al.*, 2023, p. 16). Consequently, the expectation is that this extensive AM usage will be mirrored in the military domain, yielding valuable insights for this study.

In this context, the case study aims to answer two pivotal research questions:

1) Why are the American military forces interested in AM technology?

This question arises from the distinctive nature of military structures, which, while pursuing the same efficiency goal, differentiate from profit-focused entities as they are not traditionally involved in the production process (Louis et al., 2014, pp. 4-7). Their primary concerns are retaining operational benefits from using military products and seeking operational advantages (Joint Defense Manufacturing Council, 2021, pp. 4-5). However, adopting AM technology could bring military structures closer to productive entities, enhancing their resilience and contributing to sustainability.

2) How do the American military forces contribute to implementing specific SDGs through AM adoption? This question can raise awareness and unveil new measures and possibilities for achieving SD. Examining concrete examples will provide compelling arguments, revealing a distinct and novel contribution that complements existing knowledge. Additionally, the insights from addressing this question may offer valuable lessons to facilitate various military structures' widespread adoption of AM, thereby enhancing their unexpected contribution to SD.

For organizational clarity, this case study will be structured into two subsections, each dedicated to one of the previously formulated research questions.

3.1. Reasons for AM adoption by the US military forces

The comprehensive review of the literature has revealed a myriad of reasons motivating the adoption of AM by the US military forces. The imperative for enhanced efficiency arises from multifaceted needs, particularly in maintenance and supply chain management, both in peacetime and expeditionary operations. Budgetary constraints underscore the need for an effective solution (Louis et al., 2014, p. 2). At the same time, AM is poised to contribute substantially to the digital supply chain (Louis et al., 2014, p. 14), ultimately resulting in a reduced logistic footprint of forces deployed abroad (Brice et al., 2023, p. 21).

From a financial standpoint, AM holds the potential to generate economies of scale, predominantly linked to prolonging the life cycle of military equipment. As an illustrative example, the annual obsolescence costs associated with outdated military systems, estimated at \$750 million for the US Navy alone, could be mitigated through AM, as this technology enables the manufacturing of parts that are no longer available on the market, postponing procurement of new military equipment (*Apud* Freeman et al., 2015, p. 6).

Avoiding resource wastage is a primary concern at the force category level, especially when conventional maintenance procedures prove inadequate during austere times (Tadjdeh, 2014, pp. 24-26). The consequential effects are linked to a broad spectrum of economic and operational advantages applicable to all military structures. These advantages include but are not limited to reduced manufacturing and maintenance time (Inspector General, 2019, p. 7), diminished dependence on fuel and transportation assets, mitigated risks associated with dysfunctional supply chains (Louis et al., 2014, p. 4), the ability to customize products following specific requirements (Cottleer et al., 2014, p. 9), the incorporation of sensors directly printed on weapons or the battle dress uniforms (Louis et al., 2014, p. 10), improved performance of existing or new products (Louis et al.,

2014, p. 14) and reduced waste (Coykendal et al., 2014, p. 11), to name just a few. Ultimately, this approach not only enhances readiness but also minimizes the overall consumption of resources.

The operational benefits of AM technology were validated during the recently conducted operations of the US military forces in Afghanistan, where the US Army successfully deployed and used AM laboratories to address challenges related to plastic components affected by extreme heat (Cox, 2012). Furthermore, the battlefield utility of AM was rigorously tested during the US forces' participation in the Trident Juncture Exercise held in Norway in 2018. This exercise included securing AM-specific files between coalition forces (Joint Defense Manufacturing Council, 2021, p. 12). Nevertheless, an audit report from 2019, at the US Army level disclosed a temporary use of AM-manufactured parts until the original products became available (Inspector General, 2019, p. 8). This approach, indicative of a high-risk aversion, could be considered a duplication of supply efforts justified by the urgent operational needs. The risk-averse approach is also specific to the US Air Force, which obtains important economies by using AM to produce "noncritical weapon system components" and other accessories (Inspector General, 2019, p. 10).

What is more, the wargaming tactic was applied by the US DoD in conjunction with several contractors and public actors to test the performance of AM integration in the defence procurement area and decide upon a widespread adoption (Mickley, Swank, Hagen, 2021, p. 75). This fact attests to the importance of a comprehensive approach, and the recognized AM benefits deserve a more significant effort for a successful implementation. This measure was implemented to address specific operational challenges, as there was evidence about units that failed to consider all the AM implementation requests and could not use the purchased 3D printers (Mickley, Swank, Hagen, 2021, p. 80). The comprehensive approach is particularly pertinent to joint operations, as the potential of AM technology to confer operational advantages at this level is substantiated by the enhanced self-sustainment and readiness of the units across different Military Services (Office of the Under Secretary of Defense for Research and Engineering, 2021, p. 3).

The examples provided revealed the high AM potential to facilitate three logistic functional areas within the US military forces - supply (with parts and fuel), materiel life-cycle support, and equipment maintenance (NATO Standardization Office, 2018, pp. 5/1-5/4). An assessment of the ten classes of supply specific to US military structures (Joint Chiefs of Staff, 2019, pp. II-5, II-6) revealed that only two are particularly amenable to AM solutions: class II (comprising items of clothing, individual equipment, administrative materials, and tools) and class IX (focused on repair parts) (Muniz, Peters, 2016, p. 47). Nevertheless, the utility of AM technology extends beyond these classes, as evidenced by the acceptance of 3D printed elements in military food rations (Caulier et al., 2020, p. 10), augmenting AM's contribution to the supply chain and for obtaining blood vessels and skin (Fey, 2017, p. 25), critical for another logistic functional area: medical support (NATO Standardization Office, 2018, p. 5/5).

In 2023 fiscal year, the interest in AM was closely tied to its application in building and repairing ships as a solution to address the high costs generated by these operations. Additionally, there was a concerted effort to establish the state of AM process qualification and certification for aerospace vehicles, along with addressing associated barriers (House of Representatives, 2022, pp. 14, 217-218). The recent AM applications developed by the US DoD include constructing a runway for the air force (Clemens, 2022), manufacturing submarine parts (Avery, 2023), and producing dental prosthetics for on-board military sailors (Clemens, 2022).

Excepting the operational (logistical) benefits, the most crucial reason for the keen interest of the US DoD in integrating AM technology lies in its potential to steer the defence industrial capability of this country, which enables a resilient and functional AM supply chain, as the availability of products and services connected to this capability is also a significant concern (Office of the Under Secretary of Defense for Research and Engineering, 2021, p. 3). Thus, the fourth line of logistic support, which includes industrial capabilities and serves as a source

for the other three lines of logistic support (NATO Standardization Office, 2018, p. 1/8), is being made functional. This approach not only enhances the military's operational efficiency but also strengthens the nation's overall defence industrial capacity.

The reasons for the adoption of AM by the US military forces, as outlined thus far, have primarily centered around utilizing AM solutions for small-scale manufacturing to provide on-the-spot logistic support to military forces. However, there is a current intent to extend the application of AM solutions to a larger scale (House of Representatives, 2022, p. 61). Recognizing the vast potential of this technology to address broader logistic needs, the authorities of Guam, an island within the USA territory, have initiated a comprehensive study. This aims to analyze the possibilities of the island for large-scale manufacturing using AM technology, with the US DoD and its Allies as initial customers (Brice et al., 2023, p. 1). In this particular case, the main reason US military forces are looking to leverage AM technology on a larger scale is intricately tied to the strategic interest of the USA in the region, and particularly to the security and supply chain advantages offered to all national and allied Military Services (Kan, 2014, pp. 2-12). Thus, the economic development and security needs are addressed comprehensively, opening new opportunities for advancements in SD and technological superiority.

The upcoming subsection will further build on this framework, linking small-scale and large-scale AM adoption by the US DoD to operational interests, specific SDG targets, and a comprehensive overview of the potential contribution this military organization could make to security and sustainability.

3.2. The potential contribution of the US military forces to Sustainable Development Goals and targets through AM adoption

As presented in the previous subsection, the reasons for adopting AM technology by the US Military Forces share commonalities with sustainability arguments depicted from the analyzed literature in *Section 2*. This sub-section provides an in-depth analysis of the US military forces' potential contribution to the implementation of SDGs resulting from the adoption of AM technology on both small and large scales.

In the context of AM adoption by the US DoD on a small scale, the interest comes from internal needs that hold the potential to contribute to the economic and social dimensions of SD. Firstly, the possibility of reducing maintenance costs for military equipment aligns with SDG *target 1.1*, centered on economic poverty reduction (United Nations, 2015, p. 15), with cheaper raw materials and AM parts being significant drivers of this technology (Office of the Secretary of Defense, 2018, p. 11). Notably, the analyzed literature did not reveal instances where AM, as a military logistic solution, generated higher costs; on the contrary, the possibility of avoiding procurement of entire military equipment or having low costs for small quantities stands as a robust economic argument for AM adoption (Inspector General, 2019, p. 6). Additionally, this idea can be sustained by the shorter period when the equipment is back on the battlefield, cancelling the need for procurement (Inspector General, 2019, p. 7). This contributes to a lower level of military spending, affording authorities to allocate funds towards other military or civilian needs, thereby alleviating economic burdens and advancing towards poverty eradication or other security concerns.

Secondly, there are prospects of a clear contribution to SDG *target 2.1* which focuses on providing access to food for “people in vulnerable situations” (United Nations, 2015, p. 15), like soldiers deployed in isolated, rough terrain, experiments with 3D printing of food rations being conducted (*Apud* Fey, 2017, p. 25). Thirdly, the fact that the US experiments also pursued the 3D printing of skin and blood vessels in order to save wounded soldiers on the battlefield, represents a noteworthy advancement in military medicine, which could complement the civilian medicine efforts in AM related medical applications, contributing thus to SDG *target 3.8* (United Nations, 2015, p. 16). As for the concerns expressed by other authors concerning the negative impact AM could have on their users' health (Machado et al., 2019), it is noteworthy that the US DoD structures solved this problem through

a face shield, which effectively prevents the entry of toxic particles into the respiratory system (Braunberger, 2020, p. 31).

However, at small-scale adoption, the sustainability impact is difficult to assess for several reasons: different situations, different AM procedures, different raw materials and low quantities (which are typically more expensive), coupled with the lack of a robust procedure to register, monitor and report the spending generated by AM solutions. Nevertheless, the US DoD is actively addressing these challenges through audit missions, highlighting the need for improved tracking of AM spending (Inspector General, 2019, p. 5). This initiative will empower the US military decision-makers to choose the most sustainable option, provided operational and sustainability criteria are considered.

Additionally, when military interests align with economic objectives, leveraging the dual-use capability that AM offers from this perspective, the SD benefits could be higher. This synergy is exemplified by the Guam project, where the intention to integrate AM at a large scale is expected to not only address economic and social dimensions associated with military internal needs but also contribute to the environmental dimension of SD. From this perspective, the Guam project is a rare example of a comprehensive approach, delivering sustainable benefits for the military and the local community.

In this respect, one intention is to contribute to local tourism development through the expected enhanced maintenance capacity for military and civilian aircrafts, submarines and vehicles (Brice et al., 2023, pp. 24, 26, 52). Firstly, the unusual combination of military interests and tourism could have a consistent contribution to SD of the area, but mainly to *SDG target 8.9*, promoting sustainable tourism measures that generate new jobs and support local products and culture (United Nations, 2015, p. 20), solving the economic downturn caused by the COVID-19 pandemic (Brice et al., 2023, pp. 14, 27, 104). Secondly, the project aligns with sustainable industrialization actions, addressing *SDG target 9.2* (United Nations, 2015, p. 20). This involves leveraging technological innovations associated with AM adoption, contributing to the growth and sustainability of local industries.

Thirdly, the construction domain in Guam will also benefit from the military presence. This encompasses addressing deficits in specific jobs and overcoming challenges related to the availability of construction materials. This aligns with *SDG target 11.c*, focused on sustainable buildings created from local materials (United Nations, 2015, p. 22) and apply the advancements obtained by US marine and land forces in 3D concrete printing (Brice et al., 2023, p. 31).

Fourthly, beyond the direct benefits brought to the military and tourism sectors, which currently dominate the occupational landscape in Guam, the strategic project is expected to bring economic diversification. This will be supported by AM technological innovation and financial support to local businesses (Brice et al., 2023, p. 34), contributing directly to *SDG targets 8.2.* and *8.3* and tangentially influencing *SDG target 9.b.* (United Nations, 2015, pp. 19-20)

Regarding *SDG target 1.5*, oriented towards disaster relief (United Nations, 2015, p. 15), it can be acknowledged that AM adoption by the US DoD could have a contribution in this respect, enhancing the availability of materials and equipment needed by the US military forces to address disaster and humanitarian needs in the area (Kan, 2014, pp. 1, 8). This approach facilitates quicker responses without positioning preventive stocks or resupply transportation, yielding economic and social benefits. This capacity enhances the ability of the region to face natural calamities, aligning with *SDG target 13.1* (United Nations, 2015, p. 23).

Another sustainable aspect that needs to be considered is that the strategic project developed by the US DoD in Guam depends on sustainable sources of financing (Brice et al., 2023, p. 75). This approach strengthens local financial institutions, thus contributing to *SDG target 8.10* (United Nations, 2015, p. 20) and facilitating the

development of other local businesses, already mentioned to align with *SDG target 8.3*. The DoD will also support these new businesses, which is expected to invest "more than \$11 billion in Guam" (Brice et al., 2023, p. 78).

The social dimension of sustainability is also favored by the widespread adoption of AM by the US DoD. In the context of the Guam project, where local manufacturing is not sufficiently developed, the anticipated AM site to be established by the US military promises to enhance production capacity. This could utilize locally sourced materials, providing locals with access to sustainable, better-paid jobs, not only in the military and tourism domains but also in other sectors like construction (affordable 3D printed houses and military barracks), agriculture, space/satellite, etc., where AM can bring benefits (Brice et al., 2023, pp. 31, 34, 38, 67). The integration of AM into agriculture aligns with *SDG target 2.a*, which seeks agricultural advancements through technology (United Nations, 2015, p. 16). Moreover, this initiative has the potential to contribute to *SDG target 11.1*, and *SDG target 11.c*, which point to the need for accessible living spaces constructed from locally available raw materials (United Nations, 2015, pp. 21-22).

As the Guam project is not feasible with the actual workforce, there is a significant need to orderly integrate migrants (Brice et al., 2023, pp. 38, 53), fact that will generate a contribution to *SDG target 10.7*, which supports migration policies (United Nations, 2015, p. 21). However, security concerns have imposed strict conditions based on migrants' nationality, the ones from China not being accepted several years ago (Kan, 2014, p. 15).

As the innovative AM technology requires a highly skilled workforce, there has been established a need for new academic and skill development programs, to adapt to AM challenges and to make the project feasible, as only a plan can become reality with a well-prepared human resource. From this perspective, measures like establishing precisely the required professions and their unique skill sets (also for defence manufacturing sub-domain), assessing the capacity and educational portfolio of existing educational institutions, differentiating between skills that can be acquired through online versus on-site classes, informing future workers and students and raising awareness about the benefits of these occupations (Brice et al., 2023, pp. 39-49), are examples of an efficient approach. At the same time, the aforementioned measures could generate contributions to *SDG targets 4.3, 4.4 and 4.5*, which have in common the request to provide relevant technical skills and knowledge to meet the evolving needs of society (United Nations, 2015, p. 17). As research and educational facilities on the island focused on teaching people how to make the best use of recycled materials, it is expected that AM integration for both military and civilian purposes to serve local community, through contribution to a healthier environment (Brice et al., 2023, p. 47). In this context of educational shift and adaptation, the incentives are represented by higher than the national rate incomes (Brice et al., 2023, pp. 38, 53), fact that contributes to the feasibility of the project and, at the same time, to *SDG target 10.1* (United Nations, 2015, p. 21).

Another important facet of the contribution the Guam military AM project has made to the social dimension of sustainability lies in its significant potential to promote inclusion. Researchers underscore the necessity to consider the entire workforce available on the island, based on a good understanding of diversity and equity issues. This measure holds promise in maximizing the available resources, especially considering the higher number of female students compared to male students, a lower percentage being met in college (Brice et al., 2023, pp. 49-51). This focus on young students in general, and on women, in particular, could also bring benefits to *SDGs targets 10.2 and 13.b* (United Nations, 2015, pp. 21-23), raising the capacity to implement the project successfully.

Moreover, the environmental dimension of sustainability reaps significant benefits from the US military investment in AM, particularly considering the streamlining of supply chain processes. Establishing local production capabilities in Guam could transform the island into a "transshipment hub", cancelling the need for extensive transportation, fuel and specific assets, thereby reducing emissions associated with American and Asian

markets (Brice et al., 2023, p. 26). Despite these advancements, there will still be ongoing resupply requirements, particularly for consumable hardware and raw materials, which must be brought from the original supplier or unavailable on the island (Brice et al., 2023, pp. 64-67). However, even with these considerations, there is a notable reduction in pollution of the marine environment, offering inputs for *SDG target 14.1*; if the interest in tourism revitalization on a small island like Guam is considered, there could also be a contribution to *SDG target 14.7* (United Nations, 2015, pp. 23-24). Additionally, the considerable waste reduction brings benefits to the environment. However, the lower volume of waste still needs to be managed properly, to avoid environmental and health problems, regulatory requirements are necessary (Brice et al., 2023, p. 62). In this respect, prioritizing recycling emerges as a crucial goal, bringing benefits related to lower levels of raw materials and energy consumption, thereby supporting *SDGs targets 1.1* and *12.5* (United Nations, 2015, pp. 15, 22).

As Guam explores the development of alternative energy sources through the utilization of AM, the prospect of locally producing parts for the generating equipment (Brice et al., 2023, p. 91) brings the zero-emission goal closer to reality, while the energy clean profile of the island can be obtained by exceeding the 25% level of 2021, a variety of alternative power sources being taken into account (solar, hydro, and even wind sources) (DeRivi, 2021). Because the AM technology has the potential to boost the availability of specific and cheaper clean energy equipment (Brice et al., 2023, p. 91), *SDG targets 7.a* and *7.b*, which focus on sustainable, clean energy sources and services, could be supported and also supporting *SDG target 7.3*, which calls for the need to double the energy efficiency (United Nations, 2015, p. 19). This comprehensive plan, coupled with a commitment to circular economy practices, corresponds to *SDG target 12.5*, which pursues measures of preventing, reducing, recycling and reusing waste materials (United Nations, 2015, p. 22), AM technology having an important role in these endeavors. These actions could also potentially impact the availability of unpolluted water sources and spare parts for corresponding systems. The very fact that Guam Power and Guam Waterworks are part in the project (Brice et al., 2023, pp. 90-91) represents a clear signal that energy and water challenges are being addressed seriously, aligning with *SDG targets 6.1* and *6.3* (United Nations, 2015, p. 18).

What is more, the US DoD underscores its commitment to steering a circular economy through the sustainable potential of AM in the Guam project, while affecting the fossil-fuel-based energy sources through manufacturing easy recyclable products (Brice et al., 2023, p. 36). In contrast to earlier military papers that predominantly highlighted operational advantages with minimal emphasis on environmental impact, the Guam project represents a distinctive approach. Here, the adoption of AM technology for military applications is intricately linked with "green workflows", emphasizing the most efficient resource allocation and the least environmental impact (Brice et al., 2023, p. 36). At the same time, the Guam project marks a shift towards manufacturing easily recyclable products, impacting fossil-fuel-based energy sources, aligning with the broader goal of promoting sustainability and minimizing the ecological footprint. By intertwining AM technology with environmentally conscious practices, the project sets a precedent for how military initiatives can actively contribute to circular economy principles, fostering resource efficiency and environmental stewardship. The holistic approach reflects an evolving mindset within the military, acknowledging the importance of operational effectiveness and environmental responsibility in the pursuit of long-term sustainability.

Another way the US military structures contribute to SD is their commitment to cooperation and partnerships, aligning with the principles of *SDG 17 – Partnerships for the goals*. For the US DoD, the interest in AM, cooperation and partnerships exceeds the limits of the national military structures, AM challenges being addressed together with government, industrial base, academic and NATO partners representatives (Joint Defense Manufacturing Council, 2021, pp. 10-11). To highlight the impressive "network" developed by US DoD around AM effort, there can be mentioned: eight public-private partnerships, National Aeronautics and Space Agency (NASA), Department of Energy (DoE), Federal Aviation Administration (FAA), Manufacturing Innovation Institutes, and the Department of Commerce (DoC) (Joint Defense Manufacturing Council, 2021, p. 11). These key stakeholders play pivotal roles in facilitating the successful implementation of AM for military needs.

Coordinated by America Makes, a national structure with consistent financial support (*Apud* Nelson, 2020, p. 30), these partnerships are critical not only at the national level, but also for effective collaboration with the local community in Guam (Brice et al., 2023, p. 52). Thus, the AM implementation goal in Guam can contribute to both *SDG targets 17.16* and *17.17* (United Nations, 2015, p. 27). An early advantage of these collaborations is evident in the DoE's assessment, which estimated a remarkable 90% reduction in raw and waste materials quantity and a 50% reduction in energy consumption compared to traditional manufacturing methods (Brice et al., 2023, p. 21). These numbers reflect the possibility of the US DoD to contribute to SD through AM adoption in military sites like the one in Guam, and more specifically to *SDG target 1.1.*, a reduction in the manufacturing resources being translated into their higher availability for future generations.

As a whole, the Guam militarization project serves as a noteworthy model of sustainable industrialization, the US DoD and the other involved actors contributing significantly to the implementation of *SDG target 9.2*, which follows this effect (United Nations, 2015, p. 20), as depicted from the previous examples. What is more, as the critical elements needed to make this project effective and efficient can be provided by the US DoD (AM software, equipment, feedstock, part manipulation and validation), this military actor is seen as the “ideal partner” (Brice et al., 2023, pp. 1, 94).

Apart from the presented SD potential contribution that the US DoD and its Military Services can have by fostering the broader implementation of AM technology, it is not advisable to minimize the role of the military structures, in general, to SD, as the favorable context for development is only possible due to a peaceful environment (United Nations, 2015, p. 9). Thus, defensive military forces retain the noble mission to support peace, creating the premises for SD advancements while also contributing to *SDG target 16.1*, which is focused on reducing “all forms of violence” (United Nations, 2015, p. 25). Consequently, the military lens provides AM sustainability debate with a second positive vision, apart from the general perception that considers it unsustainable. It is the case of Guam militarization project, assessed to bring additional security in the area.

The following table summarizes the main findings in this article, related to the contribution of the US DoD military structures to the implementation of SDGs and their associated targets (Table 1):

Table 1. The list with military Guam project contribution to Sustainable Development

SDG*	Target*	Effects generated by US DoD military structures' adoption of AM
SDG 1: No poverty	1.1. Poverty reduction	• reduced maintenance costs for military equipment • cheaper raw materials and AM parts • postponed procurement of the entire military equipment • audit on the level of AM spending • development of local economy • dual-use manufacturing capability • cheap buildings from 3D printed concrete • lower needs for raw materials through recycling • reduction in the amount of energy, raw and waste materials
	1.5. Disaster relief	• availability of materials and equipment needed by US military forces in disaster relief missions
SDG 2: Zero hunger	2.1. Access to “safe, nutritious and sufficient food [...]”	• 3D printed military food rations for soldiers in difficult missions
	2.a. “[...] technology development [...] to enhance agricultural productive capacity”	• Stimulating agriculture through AM implementation
SDG 3: Good health and well-being	3.8. “access to quality essential health-care”	• 3D printed prosthetics for soldiers in difficult missions • 3D printed skin and blood vessels for wounded soldiers • adequate protective equipment for AM workers

SDG*	Target*	Effects generated by US DoD military structures' adoption of AM
SDG 4: Quality education	4.a. "[...] inclusive and effective learning environments for all"	- establishing the required professions and their corresponding skills - assessing the capacity and educational portfolio of the existing educational institutions - differentiating between skills that can be acquired through online vs. on-site classes - informing future workers and students - raising awareness about the benefits of AM occupations
	4.5. "equal access to all levels of education [...] for the vulnerable, including persons with disabilities"	women have access to education and are not excluded from AM development plan
	4.4 "increase the number of youth and adults who have relevant skills, including technical [...] skills"	taking into consideration students, including female students, for AM jobs
	4.5 "[...] eliminate gender disparities in education and ensure equal access to all levels of education and vocational training for the vulnerable [...]"	youth and migrants (including women) taken into account for AM development plan
SDG 5: Gender equality	5.1. closing the gender gap	female students have access in AM development activities
SDG 6: Clean water and sanitation	6.1. "[...] access to safe and affordable drinking water for all [...]"	participation of energy and water responsible structures in workshops focused on AM implementation
	6.3 "improve water quality by reducing pollution and [...] substantially increasing recycling"	- participation of energy and water responsible structures in workshops focused on AM implementation - recycling taken into account, with benefits for water quality
SDG 7: Clean and affordable energy	7.3 Enhanced energy efficiency	boosting the availability of specific and cheaper clean energy equipment
	7.a "[...] investment in energy infrastructure and clean energy technology"	- boosting the availability of specific and cheaper clean energy equipment - clean energy equipment and the specific parts enhanced availability through AM
	7.b "[...] expand infrastructure and upgrade technology for supplying modern and sustainable energy services [...]"	boosting the availability of specific and cheaper clean energy equipment
SDG 8: Decent work and economic growth	8.2 "[...] economic productivity through diversification, technological upgrading and innovation [...]"	economic diversification generated by AM
	8.3 financial support for companies	financial support to local businesses (DoD contribution included)
SDG 8: Decent work and economic growth	8.9 "[...] sustainable tourism [...]"	sustainable tourism through access to specific jobs and local products promotion
	8.10 Access to financial support	strengthen the local financial institutions
SDG 9: Industry, innovation, and infrastructure	9.2. "promote inclusive and sustainable industrialization [...]"	- sustainable industrialization: dispersion of manufacturing sites, job creation for youth, women and migrants - AM software, equipment, feedstock, part manipulation and validation provided by US military
	9.b "Support domestic technology development [...]"	economic development supported by AM technologic innovation

SDG*	Target*	Effects generated by US DoD military structures' adoption of AM
SDG 10: Reduced inequalities	10.1. "[...] sustain income growth [...] at a rate higher than the national average"	• AM jobs may generate higher than the national rate incomes
	10.2. "[...] social, economic and political inclusion of all [...]"	• AM job creation for youth, women and migrants
	10.7 Migration policies	• integration of migrants into the workforce, with security concerns mitigated
SDG 11: Sustainable cities and communities	11. 1 "[...] access for all to adequate, safe and affordable housing [...]"	• affordable places for living (3D printed houses and military barracks)
	11. c "[...] financial and technical assistance, in building sustainable and resilient buildings utilizing local materials"	• cheap buildings from localized materials (3D printed concrete)
SDG 12: Responsible consumption and production	12.5. "[...] reduce waste generation through prevention, reduction, recycling and reuse"	• fostering circular economy • recycling of waste • lower level of energy consumption • alternative power generating equipment with parts created locally • energy clean profile of the island
SDG 13: Climate action	13.1. "[...] resilience and adaptive capacity to climate-related hazards and disasters [...]"	• availability of materials and equipment needed by US military forces to intervene for disaster relief
	13.2. climate change policies	• the circular economy approach • decarbonization through reduction in the amount of energy, raw and waste materials • pollution reduction measures • support for clean energy production
SDG 14: Life below water	14.1. "[...] reduce marine pollution [...]"	• reduced level of pollution in the marine environment (reduced level of transportation, fuel, etc. and polluting emissions)
	14.7. economic benefits through sustainable tourism	• tourism revitalization AM potential
SDG 16: Peace, justice, and strong institutions	16.1 Reduced violence and death levels	• AM in support of defensive military forces • security concerns at the base of AM development
SDG 17: Partnerships for the goals	17.16 Global partnerships	• AM challenges addressed with government, industrial base, academic and NATO partners representatives • US DoD seen as an "ideal partner"
	17.17 "[...] effective public, public-private and civil society partnerships [...]"	• AM challenges addressed with government, industrial base, academic and NATO partners representatives

Source: created by authors, on the basis of the analyzed case

* SDGs and targets description from: United Nations, *Transforming our world: the 2030 Agenda for Sustainable Development*, New York, 2015, pp. 14-27, and <https://sdgs.un.org/goals>

However, while the economic, social and environmental benefits are evident from AM technology development perspective, the environmental impact of the military activities in the area represent a real concern, raising concerns regarding landholdings and military interference in local authorities' decisions, that could hamper the natural environment protection (Brice et al., 2023, p. 52). From this perspective, it can be argued that the AM military implementation project in Guam may not be entirely sustainable. This assessment has all rights to be valid, as the military project contributes to the implementation of 34 SDG targets presented in the table above, out

of the 169 targets formulated by the United Nations (United Nations, 2015, pp. 13-27), a share of almost 20%. Therefore, it should be taken as a good start for a military organization, as the difficulty of accomplishing the complex mission of SD is widely known. Additionally, there could be voices expressing the rival explanation that the US DoD pursues sustainable initiatives in the area only because the military presence in Guam was accepted on the condition to bring benefits for the local population (Kan, 2014, p. 17). Nevertheless, the examples provided in this sub-section show a genuine concern for the development of the local community, as a unique solution to make AM project feasible, as the military cannot adopt AM at a large scale only through internal resources. Therefore, it is a win-win situation in which both military and civilian partners retain sustainable benefits.

4. Summary and conclusions

This article presented a unique private-public approach in assessing the contribution of AM technology on the sustainability path. From the private assessment side, conducted in the section dedicated to literature review, it can be concluded that certain new AM applications, such as those alleviating pressure on land resources or utilizing microrobots, paint a positive picture about the contribution of this technology to SDG 15, contradicting previous findings. Similarly, positive effects on SDGs 16 and 17 are noted, shedding light on a potentially more significant contribution that AM adoption could make to SD.

Additionally, recognizing the crucial role of public security institutions in implementing the last two SDGs, this study delved deeper into this issue, presenting a novel perspective that has not been thoroughly explored previously: the contribution of military organization to SD, through AM small and large-scale adoption. The case study performed to explore this perspective provided valuable answers to both research questions. Concerning the first question, the high level of interest displayed by the American military forces in adopting AM is mainly supported by the need to mitigate financial and supply chain problems and avoid resource wastage. Consequently, military logistics has the chance to become more supple and efficient, contributing thus to important operational advantages. Overall, the benefit of adopting AM to a small scale on the battlefield transforms it into a major military logistic driver, which can develop the country's defence industry. The US military decision-makers are oriented towards a large-scale adoption of AM to make this happen and gain a strategic foothold in certain areas.

As a result, while the small-scale adoption of AM solutions in the military organization are not to be neglected, from the large-scale adoption perspective, particularly exemplified by the Guam project, it can be concluded that this technology has, indeed, a greater potential, conferring the military organization an active and positive role to SD. Thus, with regard to the second question, this study revealed the possibility that AM contributes positively to all SDGs, albeit partially, with only one-fifth of the SDG targets favored. It also emphasizes the need for further research, particularly in areas like SDGs 8 and 11, where additional investigation can uncover more insights and refine the knowledge related to the sustainability of AM technology.

Therefore, another important aspect revealed by this study is the need to look deeper into the contribution of AM adoption to SDGs. By adopting the framework of the 169 SD targets, this study broke down the complex landscape of sustainability. Unlike a general approach that might be misleading, the study revealed that AM military projects could contribute to all SDGs (100%), but only to 34 out of the 169 SD targets, resulting in a more realistic impact of only 20%.

Despite this relatively low percentage, the military interest in AM integration is deemed significant both for sustainability and security reasons. This aspect is supported by the list developed in this study, which serves as a valuable reference for both private and public actors involved in large-scale AM adoption, which also pursue sustainability targets. Further research is needed to explore the potential contributions of other public actors, like military and civilian structures from other nations. To provide a more detailed assessment, access to quantitative data would be essential to reach a conclusion with respect to AM contribution to sustainability.

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**GOVERNANCE OF STATE-OWNED COMPANIES IN THE ENERGY SECTOR OF SOUTH AFRICA:
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Abstract. Ubiquitous political interference, especially from the governing African National Congress through cadre deployment practice of patronage, has undermined strategic and operational efficacy within state-owned entities such as ESKOM, contributing to loadshedding due to the unavailability of electricity for many hours daily. A critical analysis is undertaken through desktop literature review and document analysis to juxtapose institutional performance between ESKOM as a non-performing state-owned entity and TELKOM as a performing state entity in meeting performance objectives and strategic goals to contribute to the National Development Plan of creating an economically viable and capable state in South Africa. The study aims to contribute to deepening debates and public discourse about strengthening performance efficacy within public sector institutions and entities and towards achieving the strategic goals of the National Development Plan of building a capable and capacitated South African developmental state.

Keywords: Cadre deployment; ESKOM, governance; inefficacy; loadshedding TELKOM

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1. Introduction

Loadshedding due to the failure of governance models and systems within ESKOM has become a significant risk and, if not ameliorated, can result in South Africa being counted amongst the failed states in the African continent. The inquiry is a critical comparative study that juxtaposes institutional performance between ESKOM as a non-performing state-owned entity and TELKOM as a performing state entity in meeting strategic goals and performance objectives to contribute to the National Development Plan of creating an economically viable and capable state in South Africa. Nkosi (2020) foregrounds that ESKOM's reliability on financial backups and bailouts from the South African fiscus creates a culture of wastage, kleptocracy and malpractices in terms of financial management. This is also because NERSA will approve the price adjustment required by ESKOM,

which leads to the injection of equity from the South African government, which makes the entity not to become competitive and efficient in its performance (Julies, 2018). A negative consequence of the South African government's equity injection for ESKOM is an increase in its debts that it accumulated through foreign capital borrowing to appease price adjustment but, in the long run, will be unsustainable and force the government to sacrifice service delivery projects and other socio-economic developmental imperatives to service its debts. Deficiency at ESKOM due to its lack of sound corporate governance practices is demonstrated through ESKOM's revenue being driven solely by an increase in electricity prices implemented by NERSA (Nkosi, 2020). Therefore, ESKOM's ability to be financially productive and make profit through its performance in rendering electricity transmission and distribution to South African citizens and industry has become more costly to the South African national developmental agenda (Gigler & McMillan, 2018).

The critical analysis becomes relevant and necessary to explore how governance systems, structures and processes within ESKOM are failing to be responsive to strategic objectives of providing electricity continuously to propel South Africa's socio-economic growth and assist its participation in African Continental Free Trade Area (African Union, 2012) as an important member. It intends to initiate new ideas and plans that improve the viability of ESKOM as a strategic state entity that can reengineer its governance systems and processes to be more productive in the performance of its mandate of providing South Africa with a continuous supply of electricity. When ESKOM reengineers its governance systems to improve performance, South Africa can become economically productive and increase its gross domestic product (GDP) to tackle the triple challenges of poverty, inequality, and employment to create sustainable livelihoods for all South African citizens.

The study analyses how the loadshedding of electricity by ESKOM is risking South Africa's socio-economic development prospects and exemplifies the governance system's failures in the public sector and state-owned entities. However, the study demonstrates that despite governance systems failures within state-owned entities like ESKOM, there are pockets of excellence in a state-owned entity like TELKOM that improved its governance and strategic performance to be viable and profitable for its stakeholders. The central argument of the inquiry is that state-owned entities like ESKOM and TELKOM should abide by and implement good corporate governance frameworks, standards, and practices that can enhance effective governance and lead to performance efficacy, which they currently want. In the case of ESKOM, loadshedding in South Africa, which started in 2007, is an albatross around ESKOM's neck as it demonstrates its deficiencies and inabilities in carrying out its constitutional and governance mandate of providing South African citizens and industries with continuous electricity supply to sustain socio-economic growth path as envisaged by the National Development Plan's goal of building a capable state by the year 2030 (National Planning Commission, 2012).

The study is structured around sections on the background that necessitated the study, a literature review that contextualises loadshedding and its economic cost to South Africa, a third section, an international perspective on good corporate governance and its relationship to state-owned entities' performance mandates, the fourth section on governance and performance issues and challenges within ESKOM, and a fourth section on governance framework and performance of TELKOM. The fifth section poses the main question for the study, and the sixth section research methodology. The seventh section engages in an analytical discourse based on emergent themes, and the last section serves as a conclusion and recommendation from the analysis.

2. Literature review

A descriptive review of ESKOM and TELKOM in South Africa

Eskom is a South African state-owned entity mandated to provide an uninterrupted electricity supply to the country's economic growth and development trajectory, thus making it a major institution that enhances its socio-economic stability (Dames, 2011). Based on Eskom's 2011 report, the state-owned entity has made good investments and is a trusted, ethically governed and managed company that is highly rated (ESKOM, 2011).

However, the information provided in the ESKOM's 2011 report is diametrically incomprehensive to what was revealed during the Commission of Inquiry into State Capture led by the then Deputy Chief Justice, Raymond Zondo, who founded massive financial management inefficiencies and institutional dysfunctionality exemplified by R 14,7 irregular contracts awarded to entities linked to the Gupta Family that made it to be viewed as an epicentre of corruption and state capture of South Africa's state-owned entities (Bloomberg, 2022). Some examples of institutional and financial dysfunctionality at ESKOM based on the findings from the Judicial Commission on State Capture (2022) was how the Gupta Family influenced the appointment of ESKOM's board of directors who will do their bidding in terms of winning suppliers' contracts as they were placed in strategic position and interfered with procurement processes. Justice Raymond Zondo, as the chairperson of the Judiciary Commission, made serious findings and recommendations against senior executive managers of ESKOM in positions of Chief Executive Office, Chief Financial Officer and former Chief Executive Officer to face criminal prosecutions as they failed in their fiduciary responsibilities as per Public Finance Management Act, no. 1 of 1999 as they abetted corruption, mismanagement and misconduct instead of protecting the interests of ESKOM and the people of South Africa.

Financial Times (2023:1) highlights that TELKOM SA SOC Limited is a South African-based communication service provider offering end-to-end ICT solutions, including high-speed fibre, mobile and data services, information technology (IT) services, and mast and tower solutions. Gyro's evaluation of TELKOM's properties and data centres is at the revenue of R 43.14 billion in 2023 with a net income of R 9.97 billion comprising approximately 11,6 thousand employees. However, in terms of its performance between 30 September 2021 to 31 October 2023, the net income of TELKOM SOC LTD fell from the gain of R 2.63 billion to R 9.97 billion (FactSet Research Inc in Daily Investor, 2022). This indicates that TELKOM, besides being one of the best performing state-owned entities currently in South Africa, is experiencing higher competition from other private competitors in the same space and requires astute governance and management structures. The Daily Investor (2022) supports this assertion about the stiff competition that TELKOM faces by elaborating that it has been losing market share to Vodacom and MTN, which are private entities, despite investing heavily in growing its mobile subscriber base.

Contextualising loadshedding and its cost to South Africa's economy

Nkosi (2020) underscores how ESKOM's dire financial situation has become a contingent liability to South Africa's public purse due to numerous financial rescues or bailouts that burden the country's economic health. Loadshedding by ESKOM in the form of ration electricity daily to protect the collapse of the power grid due to lack of maintenance poses a severe threat to South Africa's ability to become economically viable. South Africa must gain its ability to attract investors as an investment destination to build industries and create jobs for most unemployed South Africans from poor communities (De Lannoy, Graham, Patel & Leibbrandt, 2020). Loadshedding further erodes business entrepreneurship amongst emerging young entrepreneurs who rely on their human agency and dexterity to create business opportunities as the South African government has failed them because of a skyrocketing unemployment rate that currently stands at 32,7 per cent of the populace based on the last quarter of 2022 (Statistics South Africa, 2023). There is a symbiotic relationship between loadshedding of electricity and growing unemployment rates in South Africa, as industries are limited in their operations and fail to create much-needed jobs. Entrepreneurs in numerous South African townships, informal settlements, and rural areas are therefore limited in their abilities to develop new business innovations and ventures that can assist in creating employment opportunities at the micro-level, indicating that loadshedding is very costly for South Africa.

Loadshedding has become a major stumbling block to the success of young entrepreneurs, especially those in townships and rural areas who are engaged in business start-ups that major South African financial services cannot fund. National Youth Development Agency (2023:1) in South Africa detailed the negative impact of loadshedding amongst aspiring young entrepreneurs to be a lack of information about how to improve their business start-ups during the loadshedding periods, inability to produce goods and services and a halt in

productivity that result in discouragement for emerging entrepreneurs as they do not have a backup in terms of financing to maintain their business productivity. A major government intervention mechanism to mitigate the adverse effects of loadshedding on the business sector, including young entrepreneurs, has been initiated by the South African President

International perspective on corporate and good governance frameworks and systems for state-owned entities

PWC (2015:2) delimits state-owned enterprises as "enterprises where the state, regional governments or cities have significant control, through full, majority, or significant minority ownership". Grossi, Papenfub and Tremblay (2015) underline interlinkages between good corporate governance, accountability, accounting, efficiency, and efficacy of state-owned entities (SOEs), which drive a country's national economic growth prospects. Good corporate governance frameworks and mechanisms are necessary to ascertain that state-owned entities like ESKOM and TELKOM deliver on their performance mandate of rendering public services for public goods to improve citizens' quality of life. According to PWC (2015:12), components of good governance frameworks such as board composition and roles, trust and control, transparency, and public value, amongst others, should be succinctly articulated to guide state-owned entities to pursue their public performance mandate in a manner that engenders confidence amongst the public. Berneir (2015) and OECD (2014) reflect that corporate governance and accountability have become a massive challenge in many countries, inherently within state-owned entities, since they can receive financial bailouts from states that do not force them to be competitive.

Verhoest, van Thiel, Bouckaert and Laegreid (2012) accentuate that due to the high amount of public expenditure budgets allocated to state-owned entities (SOEs), there is an expectation from the citizenry for these entities to perform efficiently and effectively, which puts pressure on them to be more transparent, accountable, and sustainable to justify usage of public money. Florio and Fecher (2011) analyse that as debates emerged in relation to strengthening the efficiency, efficacy, and sustainability of SOEs to safeguard public pursuit, corporate governance frameworks and models were imported from private-sector domains to be practised within public sector institutions. Therefore, critical and contemporary discourse shifted to how good practices and corporate governance mechanisms can be embedded as legal, institutional, and fiduciary instruments and arrangements to improve SOEs' effective and sustainable performance to derive public value for the citizens. While good practices and corporate governance have been extensively applied within private sector institutions to set a basis for good governance frameworks and accountability mechanisms, there is a paucity of knowledge on their utilisation in public sector institutions (Bruton, Peng, Ahlstrom, Stan & Xu, 2015; Grossi et al., 2015).

World Bank (1989) points out that Africa's litany of developmental problems characterised by performance inefficiencies are linked to a crisis in governance and, therefore, calls for well-thought-out measures to promote good governance within public institutions. United Nations Development Programme (UNDP) propagates good governance as a combination of transparent and accountable institutions, persuasive skills and competencies, and a fundamental willingness to do the right thing' (Tsegaw, 2020:3-4). Therefore, Good governance mechanisms should entail those public institutions are led and managed by people of high ethical and moral standing while being competent enough to identify wrongdoings and proactively institute accountability measures as a stopgap to arrest malfeasance before they permeate an institution. South African state-owned entities like ESKOM should take cue from good governance indicators set by institutions such as Africa Peer Review Mechanism (APRM), Moe Ibrahim Index of African Governance, and World Bank's Governance Indicators (WGI) that can be aligned with their governance and accountability systems to enhance quality of institutional governance and performance which demands prompt and assiduous actions be implemented to curtail any emergent act of corruption or malpractices (Keser & Gokmen, 2017).

Governance and performance issues and challenges within ESKOM

According to the World Bank (2014), ESKOM has vacillated from being productive in terms of its strategic and operational performance and joined fellow travellers amongst South Africa's state entities to be unproductive, inefficient, and wasteful in terms of financial expenditure. Yi-Chong (2012) affirms the World Bank's analysis of ESKOM as having metamorphosed into unproductivity by alluding that it poses a financial risk to the South African government. This results in its inability to monitor credit borrowing as it relies on the government's guarantees and is not challenged to be productive in performing its strategic mandate, which can lead to bankruptcy and future liquidation. Julies (2018) denotes that ESKOM is the biggest beneficiary of the South African government's guarantees amongst all state entities, constituting on average 75 per cent mainly constituted by current rather than capital expenditure. Creamer (2011) claims that ESKOM received R 12,25 billion of global bonds due to favourable government guarantees in 2010, which is costly to South African fiscus and poses financial risk exposure.

While there have been no incentives for performance productivity at ESKOM due to poor service quality, lack of sound corporate governance, and deterioration of infrastructure due to lack of maintenance, executives' salaries increased by 109 per cent in 2011 (Ngwenya & Khumalo, 2012). This means that the government's guarantees for ESKOM are provided to service its debts due to poor performance and non-productivity rather than to invest in capital infrastructure that provides future profit that can lead to its financial viability. This analysis reveals that the loadshedding of electricity daily by ESKOM is an indictment of poor governance systems, structures, and processes within ESKOM, which highlights governance failure that is costly to the South African development agenda of generating productivity in the performance of state institutions to accelerate economic development and growth opportunities.

Governance framework and performance of TELKOM

Pau (2011) identifies TELKOM to be the largest current contractor of fixed telephone networks, which is the owner and the backbone of the South African communication network. According to the TELKOM Annual Report (2020: 5), its five core values that guide its performance culture and outline its feature success are continuous improvement, honesty, accountability, respect, and teamwork. Despite stiff competition and challenges from foreign competitors, TELKOM invested heavily and became profitable within the local South African market as it has outperformed its domestic competitors (Africa Report, 2011). TELKOM has adopted a valued creation under the guidance of its leadership that has outlined its governance model, which depicts short, medium, and long-term performance indicators that demand its governance board to take accountability and responsibility for monitoring its operational performance and steering it in the right direction (Annual Report, 2020). Due to its most significant public ownership, whereby the South African government owns 40,5 per cent shareholding and 51,6 per cent shared by numerous institutional stakeholders, TELKOM has become intrinsic to the operations of the South African economy (TELKOM Annual Report, 2020).

Pau (2011) postulates that TELKOM's strong financial, technical, and historical attributes make it prominent within the legislative and regulatory framework in South Africa. This created a situation whereby its competitors viewed it to have an unfettered and unfair advantage as they tried to take legal action against it at South Africa's Competition Commission without success. Finnweek (2010) stresses TELKOM's vulnerability when local South African customers mostly rely on its network operation provision and thus proposes its decoupling. Based on its Annual Report (2020: 25), TELKOM has sustained its mobile business operation by growing it to 54,4 per cent revenue, which accumulated to R 12,6 billion, making it the fastest-growing mobile business in South Africa with 12 million customers. The analysis reveals that despite TELKOM facing challenges from its mobile competitors like Vodacom and MTN in the South African telecommunication landscape, its governance model agility of ensuring that it leverages on government support but also some measures of privatisation has enabled it to be competitive when compared to ESKOM that relies solely on South African government fiscal injection.

Main research question

The main research question that informed the inquiry is, "How does governance systems failure at ESKOM impede its ability to supply electricity continuously to the South African public?"

Sub-questions

- What governance challenges negatively impact the ability of ESKOM to meet its strategic mandate of providing a continuous supply of electricity to grow South Africa's economy/
- What lessons and strategies can ESKOM learn from TELKOM and other governance models to improve its governance system?

3. Research Methodology

The research methodology consisted of a desktop review's primary and secondary document analysis (Bowen, 2009). A literature review was conducted to explore and analyse systematic governance failures that negatively impact ESKOM's ability to provide electricity to South Africa as envisioned in the National Development Plan. Key documents were reviewed to answer research questions. The documents included strategic plans and annual performance reports of ESKOM and TELKOM, policies, secondary literature articles, and newspapers. The literature review involved critically exploring and evaluating relevant materials because of their soundness, relevance relating to poor performance, and district development model. Thematic analysis was employed to extract themes from the reviewed literature (Creswell, 2014).

4. Thematic Analysis and Discussion

Thematic analysis was adopted to systematically search for themes that emerged from literary sources through careful reading and re-reading the data. Rice and Ezzy (1999: 258) observe that thematic analysis results in pattern recognition within the data, where emerging themes become categories for analysis. Boyatzis (1998) explains that thematic analysis of data involves a coding process that necessitates capturing the qualitative richness of the phenomenon, leading to the organisation of data and the development of themes. Strauss & Corbin (1990: 20) explain that qualitative data analysis is framed by an inductive approach, which means that patterns, themes, and categories of analysis come from data rather than being imposed on them before data collection and analysis. Thus, The thematic analysis follows a transparent step-by-step process to demonstrate how researchers develop main themes from participants' data transcripts (Higgs, 2001). Thematic analysis derived themes: *loadshedding being symbiotic to misgovernance, erosion of a culture of entrepreneurship, the interrelationship between good corporate governance frameworks and service delivery improvement, and proactive and assiduous actions against emergent malpractices*. The generated themes are subsequently discussed below.

Theme 1: Loadshedding being symbiotic to misgovernance

There is a serious interlinkage between loadshedding and poor or misgovernance of ESKOM, which are the cause and effect. The provision of electricity to enhance South Africa's productive capabilities and improve the quality of lives of citizens is a major strategic mandate of ESKOM. However, due to a lack of oversight in ensuring that ESKOM performs efficiently and effectively on the board of directors, ESKOM's delivery of its mandated service provisioning has degenerated, resulting in loadshedding. This, therefore, means that governance systems at ESKOM are either poor or have collapsed, whereby the board of directors tasked with governance duties has continuously failed to hold the executive management team at ESKOM accountable for performing their mandated tasks. The inability of ESKOM's governance structure to hold the executive management accountable for poor performance resonates with the assertion by Julies (2018), which postulated its reliance on NERSA for equity injection and Nkosi (2020) view on reliance by ESKOM on government bailouts rather than being competitive.

Theme 2: Erosion of a culture of entrepreneurship

ESKOM's loadshedding due to mismanagement and governance undermines a culture of entrepreneurship amongst South African citizens, particularly university and TVET college graduates who have to rely on their ingenuity to create job opportunities. Personal agency and ingenuity have become significant attributes required amongst South African graduates and youth who can no longer rely on the government for employment. The economy is performing poorly due to lack of electricity, corruption, poor planning, and imagination. However, despite these groups of aspirant entrepreneurs doing their best to create new ideas that can result in productive capabilities, they are being led down by poor governance within ESKOM as it failed to carry out its constitutional and institutional mandate of providing electricity for businesses to growth and procure products and services from emerging entrepreneurs. A culture of entrepreneurship has become a necessity in the current socio-economic challenging situation in South Africa whereby, based on the 2023 Quarterly Labour Force Survey for Quarter 1, 7.9 million people are unemployed, 3.3 million are discouraged work seekers, and 13.2 million people are not involved in any other economic activity, respectively (Statistics South Africa, 2023). ESKOM's board mandated with responsibilities of good and effective governance, should take a cue from the counterparts at TELKOM, who have grown and sustained its mobile business operation by increasing it 54.4 per cent revenue which accumulated to R 12.6 billion, which made it the fastest growing mobile business in South Africa with 12 million customers (TELKOM Annual Report, 2020).

Theme 3: Interrelationship between good corporate governance frameworks and service delivery improvement

An analytical literature review revealed an interrelationship between good corporate governance frameworks and service delivery improvement. Good corporate governance frameworks are made up of components such as the proper constitution of a board of a public entity and building a culture of accountability and transparency that ensures that decisions made are in the best interest of an institution for operational performance efficiency and efficacy. The assertion of PWC (2015) accentuates that trust, control, and transparency are critical drivers to enhance public value within public institutions. This empowers the board of directors to apply corporate governance rules, measures, and procedures geared towards improving the service delivery performance of a public institution. This means that board members should be appointed based on meritocracy and the ability to exercise high ethical standards and judgment rather than making decisions to benefit political masters who appointed them to the board. Tsegaw (2020) concurs that public institutions can improve service delivery performance if a board of directors governs them and is made up of individuals who possess specific and relevant competencies aligned to the strategic mandate of a public institution and concurrently have the guts to act morally and doing the right things rather than beholden to political superiors.

Theme 4: Proactive and assiduous actions against malpractices

Proactive and diligent actions against malpractices within public sector institutions like ESKOM can be pre-emptive and preventive to deter unscrupulous senior managers and operational officials from looting coffers meant to improve service quality and enhance performance efficacy. Boards of public sector institutions should clearly and creatively apply their minds to strengthen governance measures so that they can be proactive rather than reactive in deterring corruption that has become a norm within many public institutions, as indicated in the revelation at the Commission of Inquiry into State Capture (2022) whereby there were collusions between senior managers, junior officials from procurement units, politicians from the governing African National Congress, and suppliers of goods and services in the private sector. Good and corporate governance mechanisms such as the Moe Ibrahim Index of African Governance, and the World Bank's Governance Indicators (WGI) should be contextualised, embedded, and institutionalised within governance and accountability systems of ESKOM to enhance the quality of institutional governance and performance systems and procedures. This will require a board of directors of ESKOM and senior managers to be engaged and trained on building a new ethical culture of good and effective governance that can permeate ordinary officials and become part of institutional values, behavioural practices, and ways of thinking. Such an ethical behavioural approach to institutional thinking,

governance, and management should be subjected to quarterly review by the National Treasury, Department of Public Enterprises, and Standing Committee of Public Accounts in Parliament as part of their oversight.

Conclusions and Recommendations

The analytical review article investigated how governance systems failure at ESKOM impeded its ability to supply electricity continuously to the South African public, identified challenges related to poor governance systems failures, and highlighted lessons that can be learned from TELKOM as a better-performing state-owned entity. The review factored in how loadshedding due to the lack of effective governance systems at ESKOM has become an albatross around South Africa's finances due to continuous and misguided financial bailouts despite its inability to keep the lights on for economic productivity. ESKOM's misgovernance undermines and threatens South Africa's taking a leading role in the African Continental Free Trade Agreement (AfCFTA) to generate economic growth envisaged in their developmental pathway. It is also noteworthy to observe that malpractices in the form of poor financial management and lack of accountability by ESKOM's board of governance were not a one-off event but became a recurring theme or pattern during Zuma's administration. This manifested through changes of board members to bring those aligned to the Gupta to the fore and undermined those executives committed to good governance. The lack of governance stability was a well-orchestrated move to cause division and panic that benefitted Zuma and his benefactors. This Gupta family were able to get procurement contracts without following due processes.

Based on the analytical review of the article, the following recommendations are made:

- Effective actions should be taken by the responsible oversight structures, committees such as the National Treasury, Department of Public Enterprises, and Standing Committee of Public Account to strengthen governance oversight within ESKOM.
- ESKOM board of directors, senior executives, and operational managers should be continuously subjected to lifestyle audits, trained on implementing good and sound corporate governance systems, and sign an ethical charter of best practice within the public institution.
- Whistleblowing mechanisms should be strengthened to report on suspicious corrupt practices, which should demand proactive and assiduous actions from executive managers to deter malpractices from happening and face immediate consequence management action for failure to act proactively.
- ESKOM's board, mandated with responsibilities of good and effective governance, should take a cue from their counterparts at TELKOM, who have grown and sustained its mobile business operations.

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