

‘Circular sustainability accounting’ in businesses for a circular economy: a framework of analysis

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Received: 08/06/2022

Accepted for publication: 18/11/2022

Published: 29/12/2022

Abstract

The introduction of the circular economy by firms entails, among other issues, an evolution of sustainability accounting and reporting practices because firms must implement specific activities for closing materials loops. Additionally, the circular economy includes finding collaborative solutions in the value chain and making decisions in a decoupling scenario. Thus, to change from a linear economy to a circular one requires the measurement and analysis of activities and has impacts other than environmental and social ones that are yet to be included in sustainability accounting and disclosure. In this scenario, this study offers an outlined framework of how circular economy-related principles can be integrated into sustainability accounting, given the strong contemporary approach towards sustainability. An integrated analysis of the circular model's implications for sustainability accounting is conducted to explore a line of inquiry hitherto little explored.

Keywords: Sustainability accounting; Circular economy; Environmental management; Circular business model; Stakeholders

1. Introduction

The circular economy (CE) has been promoted by businesses because it involves a transformation of the linear economic model to reduce dependence on raw materials and energy, and to mitigate the environmental impact of production and consumption (Andersen, 2007; Ghisellini et al., 2016). Presently, businesses are progressively introducing different CE-related activities (Aranda-Usón et al., 2020), and sustainability accounting has been highlighted as a tool that could partially capture impacts derived by the closing of materials loops (Scarpellini, Marín-Vinuesa, et al., 2020).

Adopting a circular business model raises the need to measure and analyse activities and impacts other than those considered in the framework of traditional environmental accounting, which could, perhaps, be insufficient to face the challenges of decoupling and participation at the meso level that a CE entails. When the reporting is considered from a circular viewpoint, businesses must identify and measure the impacts of a wide range of sustainability issues to become more transparent, and sustainability accounting enables businesses to create value over time within the triple bottom line (TBL): economic, social, and environmental (Elkington, 2001; Murthy & Parisi, 2013), including reporting and accountability at a meso level. In

summary, we could argue that the role of sustainability accounting seems adequate in transitioning from a linear economy to a circular one to measure results in any of the three dimensions of sustainability. However, despite the growing number of contributions focused on analysing the CE in the micro field, research on the integration of CE-related activities and investments in accounting and reporting in the framework of sustainability remains under discussion.

A few scholars have emphasised the need for methods to assess circular products' and business models' environmental, social, and economic sustainability performance (Bocken et al., 2016; Pauliuk, 2018; Stewart & Niero, 2018). Stewart and Niero (2018) have explored the relationship between reporting and the new circular model. Other studies on environmental accounting have partially analysed certain CE-related activities (Aranda-Usón et al., 2020; Stewart & Niero, 2018), carbon accounting (Marco-Fondevila et al., 2020, 2021), circular eco-innovation (Portillo-Tarragona et al., 2022; Scarpellini, Valero-Gil, et al., 2020), or waste management and cleaner production (Marrone et al., 2020; Portillo-Tarragona et al., 2022; Zhou et al., 2017). However, analysing the implementation of the circular business model in companies from an accounting perspective is an incipient line of research that has been addressed by very few researchers (Di Vaio et al., 2022; Scarpellini, 2022; Scarpellini, Marin-Vinuesa, et al., 2020). Additionally, the theoretical framework of analysis is still unclear. To fill this gap, the main goal of this study is to define a framework of analysis to connect the implications of a CE for businesses within sustainability accounting and reporting.

This article is organised as follows: following this introduction, we summarise the background, and in the third section, we analyse the CE-related implications in a sustainability accounting framework. Finally, in the concluding section, we outline the conceptual basis and suggest avenues for further research on this topic.

2. Background

The CE model originated partially in the paradigms of the industrial economy and industrial ecology (Andersen, 2007; Murray et al., 2017) and applied to the closing of material loops (Yuan et al., 2006). These paradigms emphasise the benefits of recycling waste and sub-products through, for example, the development of complex connections, such as undertaking industrial symbiosis between different businesses and production processes (Ehrenfeld & Gertler, 1997; Jacobsen, 2006).

Significant schools of thought related to the CE emerged in the 1970s and were introduced by Pearce and Turner (1989), but gained prominence in the 1990s (Scarpellini et al., 2019). They include the functional service economy, natural capitalism, and the 'cradle-to-cradle' principles (Urbinati et al., 2017). In more advanced stages, the CE falls within industrial ecology (Li et al., 2010; Pitkänen et al., 2016), as it does within the industrial symbiosis between local companies with different production processes (Andersen, 2007).

In the literature, a few authors have defined three levels for the theoretical analysis of the CE: macro, meso, and micro (Mathews & Tan, 2011; Murray et al., 2017). The macro or national level, promoting eco-cities and sustainable production and consumption, proposes to achieve a 'recycling-orientated society' (Geng et al., 2012). At a macro level, long-term strategies are based on decoupling economic growth from consumption (Figge et al., 2014; Ghisellini et al., 2016). The meso level, or the eco-industrial park level, is designed to promote regional development and the natural environment (Scarpellini et al., 2019; Yuan et al., 2006). Finally, at the micro level or individual firm level, companies are encouraged to engage in eco-design for cleaner production approaches (Aranda-Usón et al., 2020; Murray et al., 2017), where decoupling usage from ownership is one of the primary schemes for a CE.

Several researchers have indicated that the adoption of a circular business model involves significant internal changes in firms' environmental accounting practices (Scarpellini, Marin-Vinuesa, et al., 2020) mainly related to the cost structure, the definition of prices for by-products and waste that are recovered from being transformed into resources for other companies. The application of voluntary standards and new environmental standards, or the delivery of complete information to clients about the reparability and extended use of products and services, as well as human resources management (Marrucci et al., 2021) are a few recently analysed topics. Additionally, a CE pursues business changes at the meso level (Yuan et al., 2006). Thus, in a CE-related context, companies must initiate an active dialogue with, for example, peers, knowledge partners, value-chain partners, and regulators to explore the role of the CE in their specific business. This scenario implies that when businesses adopt a circular business model, the CE must be integrated into their reporting, and the CE-related actions must be considered part of sustainability (Barnabè & Nazir, 2021a; Gunarathne et al., 2021).

Therefore, the joint support of all stakeholders is considered necessary to implement a CE at a large scale among businesses (Banaite & Tamošiūnienė, 2016; Lieder & Rashid, 2016; Stewart & Niero, 2018). Franco (2017) explains the influential nature of firms via the fact that they are subject to pressures from a wide range of stakeholders in a CE context, such as research institutes (Rattalino, 2017), value-chain actors (Tyl et al., 2015), and customers (Boons & Lüdeke-Freund, 2013). Hence, sustainability accounting and reports play an essential legitimacy role for companies because through such communication tools, they may seek to maintain their license to operate and reduce possible gaps between their stakeholders' expectations regarding sustainability (Hahn and Kühnen, 2013). Murray et al. (2015) indicated the need to consider the wider systems' role

in business and accounting decisions, which has become prevalent within environmental management and sustainability reporting (Bebbington & Gray, 2001). Thus, sustainability accounting partially helps firms capture the impact on the environment and society of the level of material loop closing achieved by firms. However, how CE-related principles can be integrated into sustainability accounting remains understudied in the current literature. Only a few studies on CE have considered sustainability accounting from a TBL perspective. Merli et al. (2018) have shown that whereas sustainability aims to integrate environmental, economic, and social dimensions, the CE literature has focused primarily on environmental issues, and our study aims to fill this gap.

The need to translate the concept of sustainability to the level of the individual organisation and merge it with accounting is not new (Gray, 1992), and the doubts highlighted in the past by Bebbington et al. (1994) about the capabilities of businesses to implement sustainability and apply a broader basis of self-imposed sacrifices for future generations can also be pertinent to the case of a CE if it exclusively prioritises waste recovery. Thus, integrating the CE into broader sustainability requires the subordination of traditional economic criteria to criteria based on social and ecological values. These changes require accountants to measure and disclose information about critical ecological functions, and scholars are claimed to provide a framework of analysis for sustainability accounting.

Given these premises, this study aims to find out which the framework of analysis for the CE is from an accounting perspective considering the business stakeholders in a circular model (RQ1).

A few authors believe that the CE prioritises economic systems and gaining environmental benefits while only implicitly including social aspects (Geissdoerfer et al., 2017). Although ecological renewal and survival and the reduction of finite resource use evidently benefit society, there is little explicit recognition of the social aspects inherent in other conceptualisations of sustainable development (Murray et al., 2017). Considering the goal of addressing the TBL of sustainability, we suggest a second research question to study how the CE impacts social, environmental, and economic aspects as pillars of sustainability accounting and reporting (RQ2).

This study is based on a conceptual analysis. Thus, to answer to the research questions, this study synthesizes reflections reached on the basis of a desk research and the analysis of previous studies.

Given these considerations, the nexus between the CE and sustainability accounting has to be defined with specific boundaries as a third research question (RQ3), sparking a line of inquiry among academics to link the CE with sustainability on the evolution in accounting and reporting, as firms must implement specific internal and external actions related to the circular model.

3. Approach to a “circular sustainability accounting”

Various external and internal factors influence the adoption of the CE at the micro level. There is a complex relationship between a firm and external factor related to the CE, such as institutional, environmental, and technological pressure; the market; society; and other cultural issues.

Institutional pressure on firms is increasing because of resource policy frameworks and regulations for material resource efficiency (Zeng et al., 2017). The commitment to sustainable development and the CE can be consolidated with environmental regulations and public incentives (Ghisellini et al., 2018; Hu et al., 2018). Policymakers develop regulations and incentives to build an effective modern corporate governance system that could overcome barriers and engage firms to improve their behaviour in operating a CE (Y. Liu & Bai, 2014). It is now accepted that the adoption of broader circular principles related to the exchange of goods and services can also be promoted through policies to promote social responsibility in companies (Y. S. Liu & Yang, 2018) and to support CE strategies (Ormazabal et al., 2018) that comply with regulations. Fletcher et al. (2018) highlighted the role of policies in the transition to a CE: governments facilitate the introduction of CE principles through incentives to facilitate resource recovery and to guarantee investments (Aranda-Usón et al., 2019). Muktadir et al. (2018) also stated that regulation and public support improves the adoption of sustainable manufacturing practices and a CE.

The role of society and other stakeholders also emerges in CE implementation (Pomponi & Moncaster, 2017; Stewart & Niero, 2018; Webster, 2013); however, the debate about the CE’s social dimension is ongoing (Murray et al., 2017; Scarpellini, 2021, 2022), as mentioned earlier. Other sociocultural issues include market and consumer habits (Borrello et al., 2017; Milios, 2017). Additionally, increasing consumption levels are applying ever more pressure on the prices of materials and the subsequent relevance accorded to industrial ecology and waste management (Salesa et al., 2022). To this end, theoretical contributions in the field of industrial ecology (Andersen, 2007), industrial economy (Stigler, 1971), and industrial sociology have been considered to classify main CE-related activities in the framework of sustainability accounting and the stakeholders’ perspective (Figure 1).

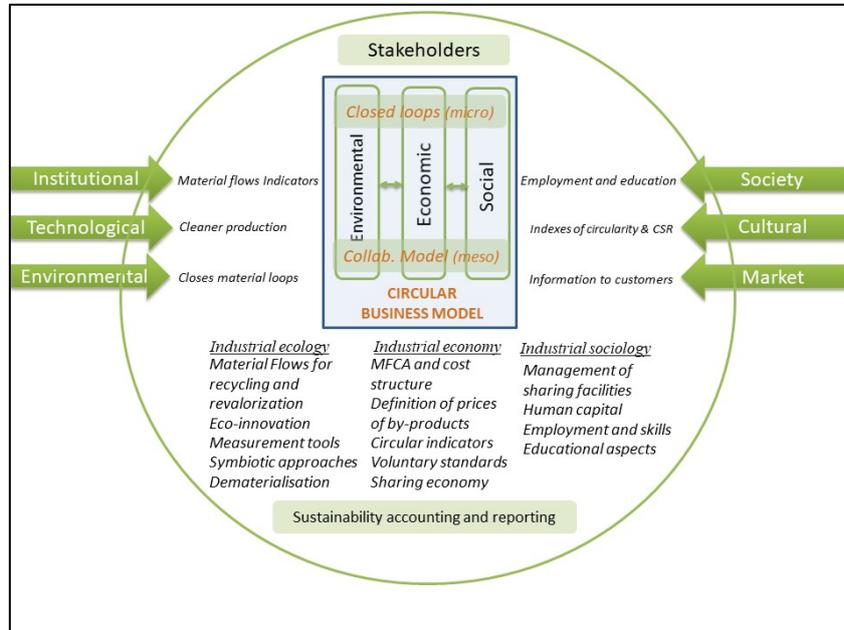


Figure 1. Study Synopsis

Source: Author's elaboration based on Baumgartner and Ebner (2010)

In this framework, sustainability accounting emerges with a bottom line in which firms incorporate economic, social, and environmental impacts from a circular perspective (Figure 2). We emphasise the need for methods to assess the environmental, social, and economic sustainability performance of CE-related activities because little is known about how companies position the CE in their sustainability agenda (Aranda-Usón et al., 2019; Bocken et al., 2016; Elia et al., 2017; Stewart & Niero, 2018). With these premises in mind, the accounting processes are approached from a circular perspective to answer the second research question (RQ2), and Figure 2 provides an analytical framework for circular sustainability accounting.

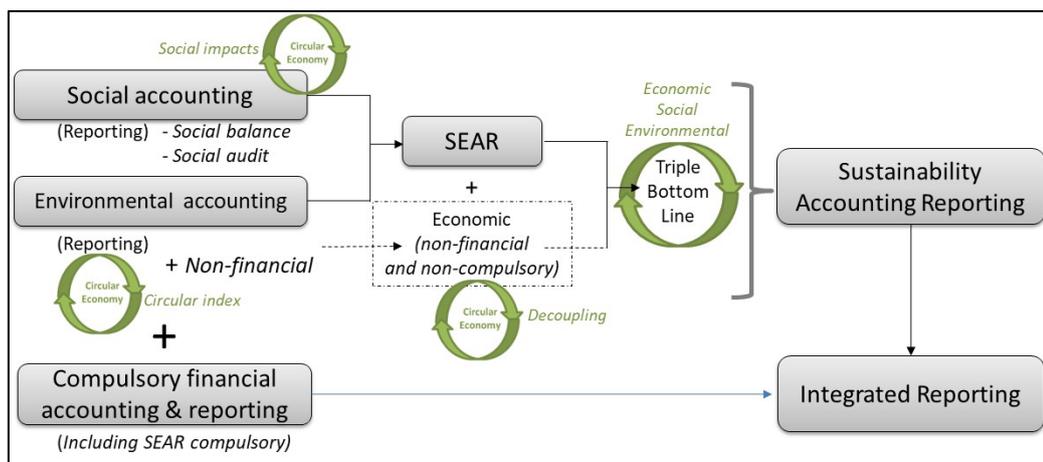


Figure 2. Circular sustainability accounting framework of analysis

Source: Author's elaboration

The internal implications for sustainability accounting derived from the adoption of the CE by businesses are mainly related to the collaborative model and the loop closing that the CE requires. The implications of the CE for sustainability accounting

can be classified according to the TBL and the three pillars of sustainability because environmental, economic, and social aspects must be integrated into the circular model.

In this scenario, to enable and accelerate the CE transition driven by industry, new integrative decision support tools are required to identify and tap the potential of CE transition scenarios at the company and inter-company levels (Lieder & Rashid, 2016). Integrated tools that will be introduced by firms when adopting a circular business model will require the inclusion of the primary industrial ecology objectives in sustainability accounting practices and the integration of material flow information in reporting. In the activities of recycling and waste valorisation, the accounting procedures of firms will be influenced by the collaboration scheme that the CE entails with other companies (competitors, suppliers, etc.) in the value chain, the definition of by-product prices, and the management of shared facilities, among other changes.

A few researchers have included the industrial economy in their analyses of the CE because it refers to a restorative and regenerative model by intention and design (Ellen MacArthur Foundation, 2013; Franco, 2017; Roos, 2014). In a circular model systems orientation, actors are analogous to a natural ecosystem (Ehrenfeld, 2004) because they collaborate in a meso scheme rather than viewing an industrial economy as a collection of individual actors loosely coordinated by the price signals in a market, as is usually the case. An industrial economy is a system in which material flows and technical nutrients are designed to circulate at high quality (Lieder & Rashid, 2016; Murray et al., 2017) and in which greater resource productivity is promoted by developing ways to continually reacquire and reintroduce the discarded assets following the completion of one life cycle (Moktadir et al., 2018; Pomponi & Moncaster, 2017).

In the circular model, supply chain collaboration (increasing dependencies) and changing success factors have significant implications; so, risks and liabilities will differ. New entities can be found within the value chain (e.g., recollection platforms) that enable firms to share risks, costs, and revenues among suppliers, collaborators, and competitors; therefore, new accounting practices are required. The cash flow, cost structure (total cost), and financing required for a circular business model will impact 'classical' financial indicators that must change. Changes in cost structure can enhance the implementation of CE-related activities, such as for materials, energy consumption, staff behaviour, etc., closing the material loops and adopting a business model (Lewandowski, 2016). Thus, mutual learning is required, traditional measurements must be improved, and business management focusing on a CE must include activities such as controlling, leading, monitoring, organising, and planning (Lieder & Rashid, 2016).

The social dimension of a CE is mainly related to the following aspects and activities that a circular model introduces: specific indicators for social issues included in corporate social responsibility (CSR); health improvement due to environmental improvement and waste reduction; voluntary standards that can include social aspects; information delivered to consumers; and other aspects derived by the sharing economy model and other collaborative schemes.

To frame the implications of the CE in sustainability accounting and reporting (RQ3), a matrix is proposed as an integrated approach for our analysis (Figure 3).

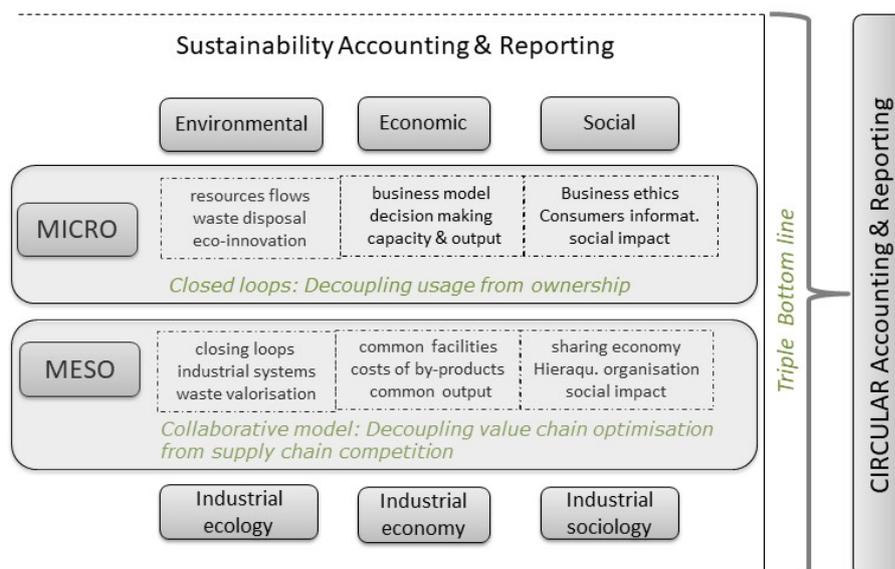


Figure 3. Boundaries of the 'circular sustainability accounting' from a CE perspective.

Source: Author's elaboration

In summary, the adoption of a circular model by firms implies the introduction of several changes in the management accounting practices inherent in the CE-related activities introduced by businesses and linked to the micro and meso dimensions of the CE. At the micro level, the new processes derived from industrial ecology and industrial economy involve measuring and controlling resource flows and waste disposal. In the economic–financial sphere, the CE implies the decoupling paradigm that involves separating usage from ownership. Changes in decision-making processes are required because of the control of production capacity in circular thinking and the output control required to adopt incremental material loops closing. In the social sphere, the CE, undoubtedly, influences business ethics, CSR, accountability, and measurement of social impacts derived from the circular business model, such as generating employment through investments.

At the meso level, a CE implies a decoupling of value-chain optimisation from supply chain competition. This general paradigm implies the introduction of a new sphere of activities and impacts that must be measured and integrated into accounting practices because of the collaborative environment that the CE requires among several companies, for example, in industrial symbiosis.

It must also be considered that the essential future developments for CE implementation will imply more extensive work in social awareness. The TBL includes a social dimension involving human stakeholders, human well-being, and human rights, and stakeholders demand greater transparency in a circular phenomenon (Benito-Bentué et al., 2022). Moreover, the ecological renewal and the closing loops of the CE benefit the society (by reducing resource use). However, the explicit recognition of the social aspects of the CE is not clearly stated in the accounting sphere, and it remains unclear how the CE will be considered in the circular sustainability accounting practices in response to the stakeholders' and society's pressure (Scarpellini, 2022).

The CE cannot be exclusively related to the flows of raw materials and resources as it has been considered at the first stage of analysis. Thus, circular sustainability accounting transcends the limits of environmental accounting for the material flow measurement, and it will enable organisations to consider their impacts on a wide range of sustainability issues. In this framework, businesses can be more transparent about the risks and opportunities related to the CE principles, and circular sustainability accounting facilitates sustainability of the planet's boundaries (Antonini & Larrinaga, 2017), expanding the debate about a strong or weak approach to sustainability accounting (Moneva et al., 2006) for accountability in the Anthropocene (Bebbington et al., 2020).

From a TBL perspective for reporting, environmental indicators have been proposed and applied by different authors (Aranda-Usón et al., 2018, 2020; Barnabè & Nazir, 2021b; Ibáñez-Forés et al., 2022); the economic measurement has been mainly analysed in the framework of the circular business model (Centobelli et al., 2020; Rossi et al., 2020); and the social dimension of the CE is still understudy (Mies & Gold, 2021; Padilla-Rivera et al., 2020; Scarpellini, 2021, 2022; Vanhuysse et al., 2021). Some specific CE-related indicators for sustainability reports have been proposed by (Ibáñez-Forés et al., 2022).

Finally, we must realise that circular integrated reporting will only be accepted if it delivers the 'right' message and if it does not create an alternative source of accounting-based discourse that challenges existing power positions, such as for environmental and social accounting (Larrinaga-Gonzalez & Bebbington, 2001; Larrinaga & Garcia-Torea, 2022).

4. Main conclusions

Drawing on the reviewed literature, this study offers an outlined framework of how CE-related principles can be integrated into sustainability accounting, given a strong approach to sustainability. We, accordingly, pay particular attention to earlier research focused on adoption of the CE by businesses and stakeholders, and external and internal factors to address sustainability accounting and reporting goals from a TBL perspective.

Framing of sustainability accounting and reporting from a circular perspective is at the forefront of the circular business model and opens new, contemporary debates surrounding the theoretical backgrounds of industrial ecology, industrial economy, and industrial sociology as the first approach to an integrated framework of analysis based on accounting and management theories. It is not our intention to revisit these theoretical frameworks; instead, we establish a common framework of analysis to explore the boundaries of an incipient circular sustainability accounting discipline, to add something substantial to the debate about the specificity of reporting from a circular perspective. This necessity meets the challenge for modern accounting and the future debate around integrated sustainability reporting.

The framework outlined here provides a better understanding of CE principles integrated into sustainability accounting, combining them with the TBL proposition to design an integrated reporting mechanism adapted to the circular model. Overlapping CE principles at the micro level and the business model, a new integrated vision of the social aspects of the CE emerges. This study provides specific CE-related activities for reporting processes to be measured for non-financial disclosure. Practitioners can apply these measurements to achieve greater CE-related accountability, but would require more detailed social

impact analysis for integrated reporting. Thus, our findings directly translate into practices that are the leading accounting indicators for reporting CE in businesses. Additionally, this study addresses the research gap by defining the boundaries of sustainability accounting applied to circular models and examining the general conceptual framework of the CE through a TBL prism.

Future intensive scientific work should concentrate on developing environmental and social assessment methods designed for companies adopting a circular business model. Using the framework outlined here, firms can consider introducing CE principles into their reporting practices; however, circular integrated reporting requires further development.

This study has a few limitations. It is the first attempt to define specific boundaries of sustainability accounting related to the CE, and further applied and comparative studies are recommended. Although considerable efforts have been made to generalise the framework of analysis to the dawn of the CE as an economic model and transfer it to a more recent vision of sustainability accounting, a deeper theoretical debate and analysis is required going ahead.

Acknowledgements

This study was made possible by funding from the Spanish Ministry of Science and Innovation - Project PID2019-107822RB-I00. It was partially co-financed by the Regional Government of Aragon in the framework of Research Group Ref. S33_20R and the LMP159_21 project. The University of Zaragoza is also acknowledged for the UZ2021-SOC-02 project.

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