



## Review article

# Mapping sustainability reporting research with the UN's sustainable development goal

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## ABSTRACT

Non-financial reporting (NFR) has become crucial to corporate sustainability strategies as companies demonstrate their commitment to the environmental, social, and governance actions outlined in the United Nations Sustainable Development Goals (SDGs) Agenda 2030. Among the various mandatory NFR initiatives, Sustainability Reporting (SR) has emerged as a widely adopted practice by companies worldwide. A gap that the study addresses is the theoretical perspectives on SR in the context of SDG. Then we conduct a bibliometric and science mapping analysis of research trends on SR and precisely map SR research to SDGs which is also a gap in the current literature. We find an exponential increase in the number of publications and citations on SR, particularly after 2015, which coincides with increased public awareness and scrutiny of the SDGs. At the country level, Australia leads with a total of 13 SDGs, followed by the UK, Spain, and Italy, which each address 12 SDGs. Emerging economies such as Indonesia, Malaysia, and India have also increased their contributions since 2019. A keyword co-occurrence analysis identified three main clusters: stakeholder engagement, corporate governance, and accountability; sustainable development goals and climate change; and sustainability reporting and global reporting initiatives. All three clusters had highly cited publications related to SDG 8 (decent work), SDG 9 (industry innovation), and SDG 12 (responsible consumption). This highlights the interdisciplinary nature of SR and its relevance to multiple SDGs. The study is distinctive in that we utilized social network analysis to examine the SDG network based on SR publications, which also affirmed the centrality of SDG 9 and 12. We utilized the prominence percentile, which indicates the momentum of a particular topic, to identify future topics in SR that align with the SDGs. These include cause-related marketing, environmentally preferable purchasing decisions, environmental management systems, education for sustainability, and green computing.

## 1. Introduction

NFR by corporations has grown in recent years due to the increasing demand for information about a company's environmental,

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## Abbreviations

CAGR	Compound Annual Growth Rate
CSR	Corporate Social Responsibility
ESG	Environmental, Social, and Governance
GRI	Global Reporting Initiative
IF	Impact Factor
IR	Integrated Reporting
NFR	Non-financial reporting
SDGs	United Nations Sustainable Development Goals
SNA	Social Network Analysis
SR	Sustainability Reporting
TC	Total Citations
TP	Total Publications
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses

social, and governance actions [1,2]. NFR is “a broad term that applies to all information reported to shareholders and other stakeholders that is not defined by an accounting standard or a calculation of a measure based on an accounting standard [3].” Over the years, several terms closely related to NFR have emerged, including Integrated Reporting (IR), SR, and Corporate Responsibility Reporting (CSR) [4]. Sustainability in social and environmental reporting is synonymous with NFR [5]. The SDGs were established at the Rio+20 Summit in 2012 as a global call to action to end poverty, protect the planet, and ensure peace and prosperity for all. The SDGs adopted by the United Nations General Assembly in September 2015 consist of 17 goals with 169 targets to be achieved by 2030, ensuring a sustainable future for people and the planet. The UN SDG Agenda also used the term Sustainability Reporting (SR). SR is now a well-established practice in the corporate world [6]. SR involves an organization publicly documenting its economic, environmental, or social impacts and highlighting its positive or negative contribution to the SDGs [7]. Similarly, SR is defined as measuring, sharing, and holding organizations accountable for their performance in achieving the SDGs internally and externally [8]. SR allows a company to disclose any significant impacts it may have on the economy, environment, or society through generally recognized responsible business practices [7]. SR is also defined as how companies disclose how they support social, economic, and environmental needs to achieve strategic development goals [9]. In summary, SR publicly reports an organization’s efforts to achieve SDGs [10].

Globally, legislative and regulatory policies have also promoted sustainability research growth, such as the Directive (2014/95/EU) legislation in the European Union, the Corporations Act 2001 in Australia, and the National Greenhouse and Energy Reporting Act 2007. Globally recognized standards on SR, such as the Global Reporting Initiative (GRI), incorporate the concept of the “triple bottom line” [11], which focuses on the reporting of social, economic, and ecological performance [12], considering a wide range of stakeholders. There is a link between these directives and the SDGs [13], which guide companies to revisit or modify their business strategies to achieve sustainable outcomes. SR also involves organizations publicly declaring their SDG initiatives and achievements [14] and can be seen as drivers of SDG actions [15]. The SDGs have contributed to adopting SR practices [16]. As the definition of sustainable development has evolved from the Brundtland Report in 1987 to the 2030 Agenda by the UN, the aspects of SR have also progressed. The recent development has been the link between the UN SDGs and SR, leading to increased academic research on these linkages and continued demand for further research on SR-SDG linkages across various industry sectors [14,17].

The directives that guide SR practices have also evolved. Given the inclination of these directives (e.g., the EU Directive) towards the SDGs and the efforts to promote SR, companies were expected to enhance their disclosures. However, contrary to expectations, it has been observed that only a few companies made disclosures in the initial years [18]. This may be due to the voluntary nature of the disclosures, which personal orientations and beliefs may drive contributing to the 2030 Agenda [19,20]. Recent regulations have also emphasized the need for organizations to focus on human rights, work, and climate change aspects in their disclosures [21]. Over the last decade, the micro-focus on various aspects of development has led to the formulation of multiple additional regulations. The increased number of regulations has resulted in corresponding confusion about SR. With contradictions and confusion, the field of SR has become increasingly fragmented over time. At the same time, the world has faced disasters related to climate change and the COVID-19 pandemic, highlighting the need for better coordination and concerted action among stakeholders to achieve the 2030 sustainability agenda.

Although there has been significant growth in the literature on SR, there is still a limited understanding of the evolutionary trend and future research prospects in this field [22]. As the 2030 SDG target approaches, it is essential to examine how studies track corporate compliance with green practices, including SR, and their alignment with the relevant SDGs. The paper aims to answer the following research questions related to SR and SDG mappings, as informed by theoretical and empirical studies on SR:

1. What are the theoretical perspectives on SR, and what factors influence the adoption of SR?
2. What are the trends in SR publications and citations?
3. Which authors, countries, institutions, and journals are the most productive regarding SR research, and how do their outputs map to different SDGs?

4. Which publications are the most influential, and to which SDG do they map?
5. What does the SDG network of SR publications based on centrality measures look like?
6. What are the various themes of SR research based on cluster analysis, and how do they map to different SDGs?

To analyze the literature on SR, this study uses a bibliometric approach to address these research questions. This type of bibliometric analysis can help researchers, journal editors, and reviewers understand the field’s current status and identify ways to advance it [23]. The rest of the paper is organized as follows. The following section reviews the SR theories, their SDG mappings, and existing literature in the field. The third section describes the bibliometrics techniques used, social network analysis, and PRISMA methodology used in the study. The fourth section presents the results and discussion. Finally, the last section provides the conclusions, discusses potential directions for future research, and identifies the study’s limitations. The findings from the study might also help business sectors, planners, and policy advocates to reprioritize the strategies and actions toward achieving the SDG agenda.

## 2. Sustainability reporting: theories and literature

### 2.1. Theoretical perspectives

Several theories have been applied in social and environmental accounting research to explain the motivation for SR. These include stakeholder theory, legitimacy theory, institutional theory, agency theory, and signaling theory [24–29]. Table 1 summarizes the key features of the popular theories used in SR research and their relationship to SDGs.





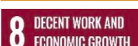






#### (a) Stakeholder theory

Stakeholder theory is commonly used in research on SR [72] and provides a framework for understanding the factors that influence corporate SR. This theory suggests that an organization’s success depends on effectively managing its relationships with various stakeholder groups. The stakeholder theory requires understanding the company’s most important goals and the management’s responsibilities towards different stakeholders [73]. Many scholars have also used stakeholder theory to explain the motivations behind disclosing SR. Stakeholder theory is connected to several SDGs, including SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production). By prioritizing stakeholders’ interests, companies can improve their economic performance, reduce their environmental impact, and contribute to achieving the SDGs.

#### (b) Legitimacy theory

The legitimacy theory is often used in research on social and environmental accounting. It suggests that the disclosure of a

**Table 1**  
Theories used in Sustainability Reporting research and their SDG relations.

Theories	Scope of the perspectives	Focal point	Rationale of actions	Significant works	SDG relation
Stakeholder theory	“Internal and external stakeholder groups”	How does an organization fulfill the demands of diverse stakeholders?	To get approval from influential stakeholders.	[14,30–40]	 
Legitimacy theory	“Social value system”	If an organization’s value system consistent with society’s value system?	To fulfill social obligations and achieve social approval.	[39,41–48]	 
Institutional theory	“Institutionalized social structures”	How to fit in with the norms that are already in place at other similar social organizations.	To conform to the standard and expectations of society.	[24,38,49–51] [52–61]	  
Agency theory	“Principal-agent Relationship”	How to handle the agency issue?	To decrease agency expenses and maximize organizational value.	[62,41,43, 63–65]	 
Signaling theory	“Signaler-receiver Relationship”	How to leverage an organization’s performance to its advantage in the marketplace?	To reduce knowledge asymmetry and increase organizational value.	[34,41,45,56, 63,66–71]	 

Source: Authors’ compilation.

company's social and environmental practices can serve as a legitimizing tool, creating the impression that the company conducts its business in a way that meets the social and environmental expectations of stakeholders who have political and economic influence over the company [48,74,75]. Many studies have applied the legitimacy theory in the context of Sustainability Reporting. Legitimacy theory is also relevant in SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production) as they highlight the importance of organizations demonstrating their commitment to sustainability and social responsibility to their stakeholders.

#### (c) Institutional theory

The institutional theory has been widely used in studies exploring adopting SR practices within organizations [76]. This theory focuses on how institutionalized behavior becomes ingrained in an organization. Several studies have applied the institutional approach to explain and predict the adoption of SR practices. The institutional theory highlights the role of external factors in shaping companies' sustainability reporting practices and is relevant to SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 12 (Responsible Consumption and Production).

#### (d) Agency theory

The agency theory has been widely used to explain the motivations behind SR. According to this theory, managers should act as agents for their shareholders. The costs associated with this agency, such as transaction and information costs, can be reduced through SR. By using SR as a communication tool with stakeholders, the gap between shareholders' and management's knowledge can be bridged, improving transparency and reducing threats from information asymmetry among stakeholders. The application of agency theory can promote accountability and sustainability performance, contributing to SDG 12 (Responsible Consumption and Production) and SDG 16 (Peace, Justice, and Institutions).

#### (e) Signalling theory

Although the Signaling theory was initially applied in the context of organizational workforce behavior, it is also well-accepted in social and environmental accounting to explain and predict the SR practices of corporate firms. The theory postulates the relationship between the signallers (insiders, such as managers or executives) and receivers (outsiders interested in seeking information about the organization). Firms constantly strive to reduce information asymmetry between signallers and receivers and increase organizational value by making necessary information available to outsiders. Some significant studies that used signaling theory to explain and predict SR practices include. Signaling theory can promote firms adopting sustainable practices, contributing to SDG 8 (Decent Work and Economic Growth).

### 2.2. Determinants of SR adoption

Companies' adoption of SR has been influenced by various factors, including firm size, sector, firm age, ownership structure, corporate governance structure, board composition, and firm financial performance [77]. These determinants can be classified into three levels: firm level, regulation level, and report level determinants. Employee base, total assets, market capitalization, and geographic presence can measure firm size. A firm's ownership structure can be evaluated through institutional ownership, management ownership, dispersed ownership structure, and ownership concentration indicators. The composition of a company's board of directors can be assessed through factors such as board experience and qualifications, the education level of directors, and the skills of executive and non-executive directors. Table 2 summarizes the determinants of SR adoption and the related studies.

### 2.3. Literature review

In this literature review, we explore the concept of NFR and discuss how it has evolved to include SR. The connections between SR and the SDGs are also explored. Historically, companies have focused on financial reporting, but in the 1990s, they also began emphasizing environmental reporting. In the early 2000s, the concept of NFR emerged, which combines elements of CSR, strategy, and corporate governance and goes beyond traditional performance measures. There are two main approaches to NFR: one that emphasizes

**Table 2**  
Determinants of Sustainability Reporting adoption.

Factor	Studies supporting the factor
Firm Size	[10,78–83]
Firm Sector	[20,79–87]
Firm Age	[78,82,83,88,89]
Ownership Structure	[82,83,90–94]
Board Composition	[83,86,95–99]
Corporate Governance Structure	[63,78,85,88,100]

the type of disclosure and one that focuses on the medium of disclosure, such as websites and press releases. Since 2003, there has been significant growth in research on NFR, leading to the development of a large body of knowledge on the topic. This has necessitated the consolidation and evaluation of this research to understand the field better.

The authors did a bibliometric analysis of NFR, reviewing 3113 articles published from 1970 to 2019 in the Web of Science database [101]. They found that the number of articles in this domain increased rapidly between 2003 and 2009. Through their analysis, they identified six main themes in the NFR literature: the “essence” cluster, which focuses on CSR; the “determinants” cluster, which examines the factors that influence NFR; the “reports” cluster, which discusses NFR reporting practices; the “IR” cluster, which explores the Integrated Reporting framework; the “consequences” cluster, which looks at the impacts of NFR; and the “environmental” cluster, which focuses on environmental performance metrics related to NFR. Of these six themes, the “reports” theme has garnered particular attention in recent years, as it covers areas such as integrated reporting and sustainable reporting. The increasing awareness of sustainability and the demand for information about companies’ sustainability practices have led to businesses’ greater adoption of SR [102].

Sustainability actions have been gradually integrated into corporate activities and have been influenced by global actors, particularly the release of the Brundtland Report in 1987 by the World Commission on Environment and Development (WCED) [103]. This report emphasized the importance of using resources to meet current needs while also considering the needs of future generations, thereby highlighting the need for environmental protection and social equity. This was followed by the UN Summit for Development and the Environment and Agenda 21, which were outcomes of the Earth Summit held in Rio de Janeiro in 1992. These events refined the concept of sustainable development to include economic, social, and environmental aspects, commonly called the triple bottom line. This has led to the emergence of terms such as eco-efficiency firms (focusing on economic and environmental aspects), stake-holding firms (focusing on environmental aspects), and corporate social responsibility (focusing on social aspects). This has spurred the academic community to explore these concepts further [17]. The most recent influence on corporate sustainability has been the agenda 2030 proposed by the UN in 2015, which includes 17 SDGs with 169 targets. In recent times, business sectors have also been proactive in exploring transformative solutions by sourcing and scaling sustainable development investments to address the significant gap among developing countries in achieving the SDGs by 2030 [104].

Ever since, researchers have shown increasing interest in sustainability, publishing many articles in the last decade. In one of the works, the authors [105] reviewed articles on sustainability based on the Scopus ( $n = 928$ ) and Web of Science ( $n = 698$ ) databases from 1981 to 2020. They found that the United States, Australia, and the United Kingdom had the highest number of publications. They also identified research themes on corporate social responsibility, sustainable development, and disclosure as essential areas for future research. A unique finding of their study was identifying a “bifurcation point” in 2011, which suggests that the field has reached a mature stage. The highest burst frequency occurred in 2011, after which at least one new burst keyword emerged each year, indicating the broad applicability of sustainability research in various domains. A bibliometric analysis to examine the relationship between CSR and sustainability, using 3079 papers published from 2001 to 2020, was conducted by authors [106]. They found that most prominent researchers were from Europe, although the United States had the highest number of publications. The research at the intersection of CSR and sustainability followed the main lines of interdisciplinary research focusing on stakeholders, sustainable development, decision-making, business ethics, communication, and business strategy. Additionally, the authors suggest that future research should focus on the social aspects of sustainability and explore its applications in the field of the circular economy.

The development of the SDGs marked a shift from a short-term focus on yearly CSR actions to a long-term focus on measuring their contribution to sustainability [107]. However, studies have called for further research to assess the impact of SDG reporting on corporate sustainability [108] and to understand the connection between institutions and SDG reporting [14]. With sustainability research gaining increasing attention over the last decade, the volume of publications on the topic has also increased, prompting the need to consolidate and evaluate the field’s current state and suggest directions for future research. Bosi [22] conducted a review of studies linking environmental, social, and governance (ESG) with SR over 24 years (1998–2022) and identified four clusters: the first cluster indicated a stronger focus on CSR and SR on social aspects; the second cluster highlighted CSR rewards; the third cluster emphasized ESG disclosure and equity cost; and the fourth cluster focused on governance and the cost of capital in CSR. The following section describes the methodology adopted to address the research questions from the extant literature on SR, as posed in the paper’s first section.

### 3. Methodology

To analyze the field of SR and its evolution, a bibliometric analysis and literature review were conducted. These methods were chosen because they are appropriate for this type of analysis [109]. The dataset for the analysis was developed using the PRISMA-P 2015 framework [110].

#### 3.1. Bibliometrics and social network analysis

Bibliometric analysis is a method that helps to identify patterns, themes, and shifts in a particular area of research [111,112,113a,b], as well as the most prolific institutions, authors, and countries in that area [114]. Researchers have used bibliometric analysis to analyze topics [115,116] and countries [113,117,118]. In this study, bibliometric analysis is used to conduct a performance analysis (analysis of the number of articles, citations, and their impact) and science mapping (co-citation, co-authorship, keyword co-occurrence, and bibliographic coupling) [119] using VOS viewer [120].

Authors [121] have noted that SDGs are interdependent, and the accomplishment of one goal is reliant on the success of the others.

Some have utilized network analysis methods [122] to demonstrate the uneven distribution of connections between SDGs. Specific goals have numerous connections to multiple targets, rendering them highly interconnected with other goals. On the other hand, some goals have tenuous connections to the broader SDG system. Two centrality measures are utilized in the analysis of the SDG network: betweenness and eigenvector, both of which are commonly used in Social Network Analysis (SNA) [123]. Betweenness centrality was used to assess the significance of an SDG node as a connecting point for information flow in the network. This metric calculates the number of times a node lies on the shortest path between two other SDG nodes. SDG nodes with high betweenness centrality are crucial bridges linking various network parts. On the other hand, Eigenvector centrality measures a node's influence within the network, considering the centrality of the nodes to which it is connected. This metric considers the number of connections a node has and the centrality of its connected nodes. It indicates that a node's significance is determined by the number of essential nodes to which it is linked. In SDG networks, nodes with high eigenvector centrality are key focal points. The SDG toolkit for deriving centrality measures is used [124]. SNA has proven effective in bibliometric studies, as evidenced by the use of social network analysis for Twitter data [125] and application to research the Analytic Hierarchy Process [126]. The study represents the first time that SNA has been used in the context of SDGs.

Elsevier has developed SDG search queries using various search terms related to each SDG and machine learning algorithms to aid researchers and institutions in tracking and demonstrating progress toward achieving the SDGs. This approach enables each

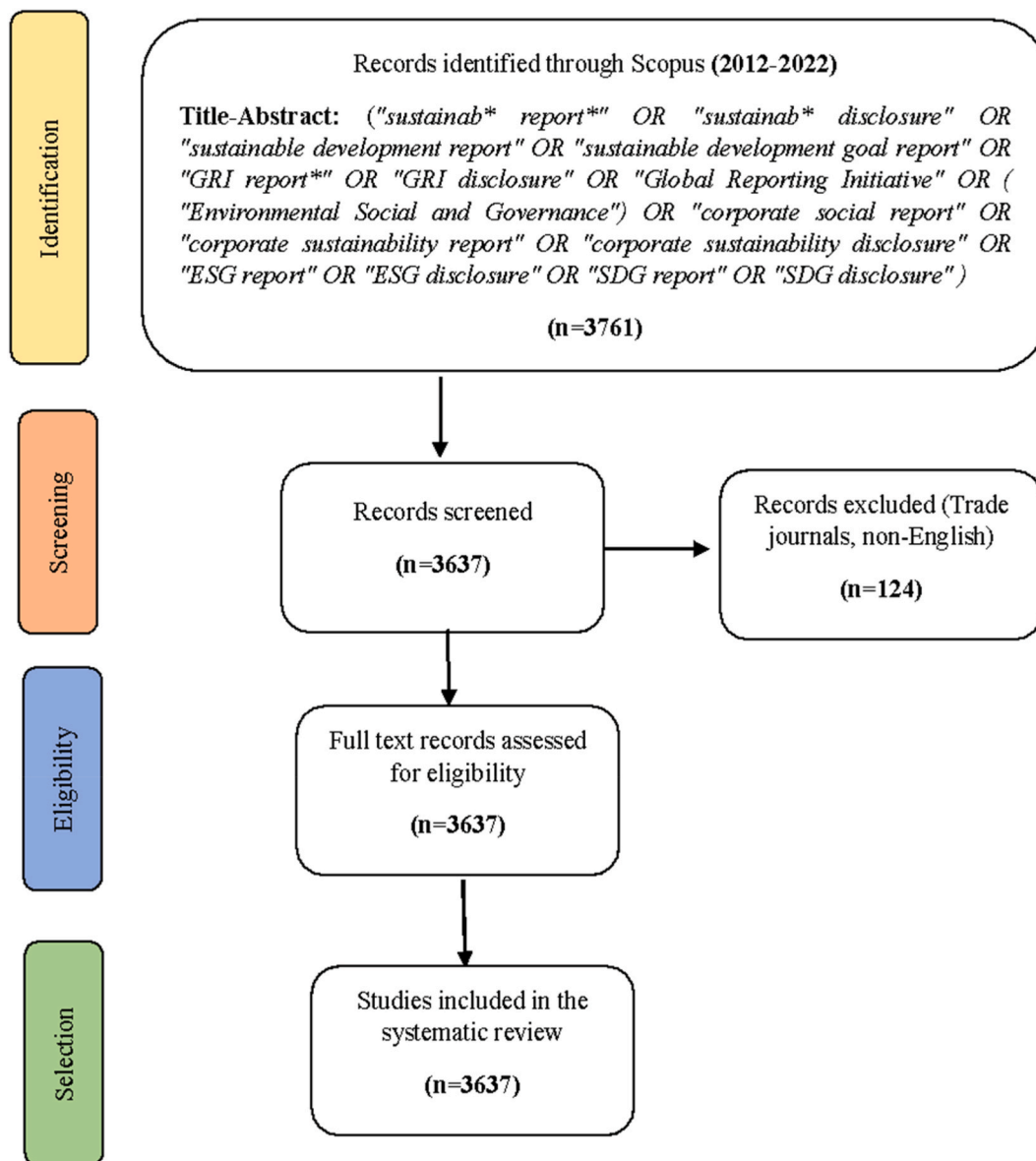


Fig. 1. PRISMA-P 2015 framework.

publication to be accurately mapped to its relevant SDG, facilitating monitoring and evaluating progress toward SDG targets [127]. The Scopus database [15] automatically maps each publication to SDG.

### 3.2. PRISMA protocol

The PRISMA-P 2015 framework (Fig. 2) is used to guide the analysis in this study [110]. This framework outlines five steps for conducting a systematic review: 1) identifying research questions; 2) developing a search protocol including databases, search strings, and inclusion/exclusion criteria; 3) searching the literature; 4) screening the collected literature based on title and abstract and full text; and 5) analysis. The Scopus database was used to search the literature for all published articles related to sustainable reporting from 2012 to 2022 on February 1, 2023. The period from 2012 to 2022 was selected to align with establishing the UN SDGs in 2012. Only articles written in the English language were included. Preprints were excluded from the Search. Applying the PRISMA protocol outlined in Fig. 1, the final selection included 3637 publications.

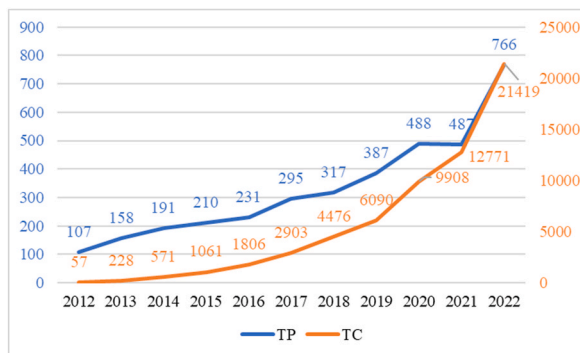
## 4. Results and discussion

### 4.1. Publication and citation trends

Fig. 2 shows the trend in the total number of publications (TP) on SR. From 2012 to 2022, TP and total citations (TC) showed a clear upward trend. The growth rate percentages for TP and TC were relatively stable until late 2015 when the SDGs were formally adopted. After 2015, there was a significant increase in the growth rates of both TP and TC, with TP growing at 36% and TC growing at 49% between 2016 and 2022. The exponential increase in citations, particularly after 2015, coincides with increased global acceptance, societal awareness, and public scrutiny of SDGs and SR initiatives. TP’s CAGR (compound annual growth rate) was 14.67%, and TC’s was 29.69%.

There is a strong relationship between sustainability reporting and the SDG. Table 3 shows the mapping of SR publications to 17 SDGs based on TP. Many organizations that report on their ESG performance use the SDGs as a framework for their sustainability efforts and report on their progress regarding the goals and targets. This allows organizations to demonstrate how their activities align with the SDG and contribute to achieving the goals. SDG 12 has the highest TP:3009, followed by SDG 9 (TP:2185) and SDG 8 (TP:528). Based on TC, SDG 12 has the highest TC:62350, followed by SDG 9 (TC:45222). The mean citations are the highest for SDG 5 (TC/TP:39.3) though TP is low 80, followed by SDG 16 (TC/TP:24.5), suggesting increased importance on Gender Equality and Peace, Justice, and Strong Institutions. SDGs 2, 3, and 14 are observed to have the lowest TP, i.e., TP:40, TP:33, and TP:26, respectively. SDG 12 is directly related to SR, as it promotes sustainable consumption and production patterns and reduces the negative impacts of production and consumption on the environment. Organizations that report on their sustainability efforts are likely to focus on this goal as it relates to reducing their environmental impact and promoting sustainable practices.

















There is a definite relationship between SR and SDG 9 - Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. This signifies that an organization working towards building resilient infrastructure, promoting inclusive and sustainable industrialization, and fostering innovation may disclose information in its SR about the steps to achieve these goals, such as investing in renewable energy and adopting sustainable energy production processes. By disclosing this information, the organization can demonstrate its commitment to SDG 9 and inform stakeholders about how it contributes to achieving this goal. An organization focused on building resilient infrastructure may use sustainability reporting to identify opportunities to reduce greenhouse gas emissions, reduce waste, and minimize the environmental impacts of its operations. By doing so, the organization can contribute not only to the achievement of SDG 9 but also to other SDGs, such as those related to SDG 13, climate action, and SDG 15, life on land. An organization that promotes sustained, inclusive, and sustainable economic growth may disclose information in its sustainability report about its steps to create jobs, support local communities, and promote economic development. This could include information about the organization’s employment practices, training programs, and partnerships with local businesses and



Note: TC= Total Citations; TP= Total Publications

Fig. 2. Publication and Citation trends.

**Table 3**  
SR publications mapped to SDG based on publications.

SDG	TP	TC	TC/TP
 RESPONSIBLE CONSUMPTION AND PRODUCTION	3009	62350	20.7
 INDUSTRY, INNOVATION AND INFRASTRUCTURE			
 DECENT WORK AND ECONOMIC GROWTH			
 PEACE, JUSTICE AND STRONG INSTITUTIONS			
 CLIMATE ACTION			
 LIFE ON LAND			
 REDUCED INEQUALITIES			
 QUALITY EDUCATION			
 AFFORDABLE AND CLEAN ENERGY			
 GENDER EQUALITY			
 CLEAN WATER AND SANITATION			
 NO POVERTY			
 SUSTAINABLE CITIES AND COMMUNITIES			
 ZERO HUNGER			
 GOOD HEALTH AND WELL-BEING			
 LIFE BELOW WATER			
	2185	45522	20.8
	528	9637	18.3
	311	7611	24.5
	254	4845	19.1
	178	2669	15.0
	130	2140	16.5
	123	1557	12.7
	81	1416	17.5
	80	3143	39.3
	57	856	15.0
	53	849	16.0
	51	712	14.0
	40	362	9.1
	33	356	10.8
	26	450	17.3

Note: TC = Total Citations; TP = Total Publications; TC/TP = Total Citations/Total Publications.



















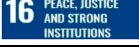
organizations. The organization can demonstrate its commitment to SDG 8 by disclosing this information. SDG 16 is relevant to SR because it focuses on building strong and accountable institutions as a foundation for sustainable development. Organizations may focus on this goal to improve governance and accountability.

#### 4.2. Influential publications and SDG mappings

Table 4 lists influential publications on SR ranked by the number of citations. The top-cited publication in the Journal of Cleaner Production has 657 citations [128]. This paper reviews 178 articles published between 1999 and 2011 in business, management, and accounting journals to identify SR determinants and opportunities for future research. The findings of this review suggest the practical implications for SDG 9, which aims to build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation. Specifically, the review highlights the need for increased reporting on sustainable manufacturing and production practices,



**Table 4**  
Influential publications based on citations.

TC	Authors	Title	Year	Journal	The focus of the paper	SDG mappings
657	Hahn R., Kühnen M.	Determinants of sustainability reporting: A review of results, trends, theory, and opportunities in an expanding field of research	2013	Journal of Cleaner Production	Analysed 178 articles on SR from 1999 to 2011. Focused on analysing the determinants of SR and its impact on adoption, extent, and quality of reporting.	 
617	Friede G., Busch T., Bassen A.	ESG and financial performance: aggregated evidence from more than 2000 empirical studies	2015	Journal of Sustainable Finance and Investment	Analysed 2200 articles to evaluate the relationship between ESG and corporate financial performance (CFP).	
586	Milne M.J., Gray R.	W(h)ither Ecology? The Triple Bottom Line, the Global Reporting Initiative, and Corporate Sustainability Reporting	2013	Journal of Business Ethics	Examined the use of TBL concept as a business goal. The authors question the sufficiency of TBL and GRI to evaluate an organizations contribution to sustainability.	 
440	Michelon G., Parbonetti A.	The effect of corporate governance on sustainability disclosure	2012	Journal of Management and Governance	Evaluates the relationship of board composition, leadership, and structure on sustainability disclosure from the lens of stakeholder theory.	
410	de Villiers C., Rinaldi L., Unerman J.	Integrated reporting: Insights, gaps and an agenda for future research	2014	Accounting, Auditing and Accountability Journal	Provided a synthesis of integrated reporting research by analyzing papers published in the special issue of Accounting, Auditing and Accountability Journal.	 
387	Ali W., Frynas J. G., Mahmood Z.	Determinants of Corporate Social Responsibility (CSR) Disclosure in Developed and Developing Countries: A Literature Review	2017	Corporate Social Responsibility and Environmental Management	Reviewing 76 empirical papers on driving factors of CSR disclosure in developing and developed nations, the authors report that firm characteristics (company size, industry sector, profitability, and corporate governance mechanisms), social, political, and cultural factors are antecedents to CSR disclosure.	 
378	Cho C.H., Laine M., Roberts R.W., Rodrigue M.	Organized hypocrite, organizational façades, and sustainability reporting	2015	Accounting, Organizations and Society	Aims to propose a theory to evaluate voluntary CSR based on organized hypocrite and organizational facades.	 
368	Roca L.C., Searcy C.	An analysis of indicators disclosed in corporate sustainability reports	2012	Journal of Cleaner Production	Identifies 585 indicators used in CSR reports. The results are drawn from the content analysis of 94 Canadian reports from 2008.	 
355	Frias-Aceituno J. V., Rodriguez-Ariza L., Garcia-Sanchez I.M.	The role of the board in the dissemination of integrated corporate social reporting	2013	Corporate Social Responsibility and Environmental Management	Aims to explore the board's role in the integrated CSR in non-financial MNCs by evaluating 568 companies from 15 countries during 2008-10.	 
354	Plumlee M., Brown D., Hayes R.M., Marshall R. S.	Voluntary environmental disclosure quality and firm value: Further evidence	2015	Journal of Accounting and Public Policy	Evaluates the relationship between firm value and quality of voluntary environmental disclosure. The findings indicate a significant positive relationship between firm value and disclosure quality.	  

Note: TC = Total Citations.

energy efficiency, and reducing the environmental impact of industrial processes. Additionally, the study has implications for SDG 12, which aims to ensure sustainable consumption and production patterns.

The study in the Journal of Sustainable Finance and Investment has 617 citations and is mapped to SDG 12 [129]. This study examines the relationship between ESG activities, disclosure, and firm value. It finds that strong ESG practices increase firm value while weak ESG practices decrease it. Specifically, the study pertains to SDG target 12.6, which encourages companies to adopt sustainable practices and integrate sustainability information into their reporting cycle. Additionally, it is connected to target 12.7, which calls for promoting sustainable public procurement practices, and target 12.8, which aims to ensure that companies adopt sustainable practices and integrate sustainability information into their reporting cycle. The study of Milne and other authors [130] critiques sustainability reporting, particularly the modern disconnect between reporting and the urgent issue of sustaining ecological

systems. The triple bottom line concept has become dominant in business reporting, incorporating economic, environmental, and social performance indicators. However, this has led to ecology being side lined and reinforces business-as-usual practices, potentially contributing to greater un-sustainability. This paper further argues that the triple bottom line and the GRI are insufficient conditions for organizations to contribute to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production), which aim to promote sustainable practices and protect the planet. One another study [131] examines the influence of specific Board of Directors features on information integration in leading non-financial multinational firms and finds that growth opportunities, size, management bodies, and gender diversity are important factors. This publication maps to SDG 5 (Gender Equality) as achieving gender diversity on boards is essential to ensure women’s full and effective participation and equal opportunities for leadership. Most influential publications on SR are related to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production), as highlighted in Table 4.

4.3. Prolific countries and their SDG mappings

Using the principles of a quadrant chart, the research productivity (TP) and research influence (TC) of different countries are visualized into four quadrants as follows: (Fig. 3)

1. Low TP and Low TC: Countries in this quadrant include developing countries, viz., India, Malaysia, and South Africa.
2. High TP and Low TC: Canada belongs to this quadrant.
3. Low TP and High TC: Brazil and Indonesia belong to this quadrant.
4. High TP and High TC: Developed countries, viz., the US, UK, Austria, Italy, Germany, and Spain, belong to this quadrant.

Fig. 4 demonstrates the distribution of SR publications across the top five SDGs for each country. SDG12 (responsible consumption and production), SDG9 (industry, innovation, and infrastructure), and SDG8 (decent work and economic growth) are the most frequently referenced SDGs in all countries. All countries have SR publications about all 16 SDGs; however, the United States, the United Kingdom, and Australia have the most significant number of SR publications mapped to SDGs.

4.4. Productive institutions and their SDG mapping

Fig. 5 demonstrates the distribution of SR publications across the top five SDGs for each country. SDG12 (responsible consumption and production), SDG9 (industry, innovation and infrastructure), and SDG8 (decent work and economic growth) are the most frequently referenced SDGs in all countries. All countries have SR publications that pertain to all 16 SDGs; however, the United States, United Kingdom, and Australia have the largest number of SR publications mapped to SDGs.

Fig. 6 illustrates the distribution of SR publications across the top five SDGs for each institution. SDG 12 (Responsible consumption and production) and SDG 9 (Industry, innovation and infrastructure) are all institutions’ most commonly referenced SDGs. Universidade de São Paulo, University of New South Wales, University of South Australia, and University of Valencia have the highest number of SR publications, with each institution mapping their publications to 12 SDG. Academics who want to research these SDGs can either aim to join these institutions or collaborate with these top institutions. National and international policymaking bodies can approach these institutions to get aid in suitable inputs for policy formulations, form action committees, and get resource persons for training suitable personnel or workforce for implementation purposes.

4.5. Top cited journals and their SDG mappings

Table 5 portrays the top ten journals based on citations. Journal of Cleaner Production (JCP) is the leading journal with TC:8732, followed by the Journal of Business Ethics (JBE) and Corporate Social Responsibility and Environmental Management with TC:5243 and TC:4633, respectively. The most impactful journals in terms of TC/TP are the JBE (TC: 5243, TC/TP: 95.3, IF:6.3) and the JCP (TC:8732, IF:11.0). The JCP also has the highest Impact Factor (IF). Green highlighted cells in each column denote the top 3 values in

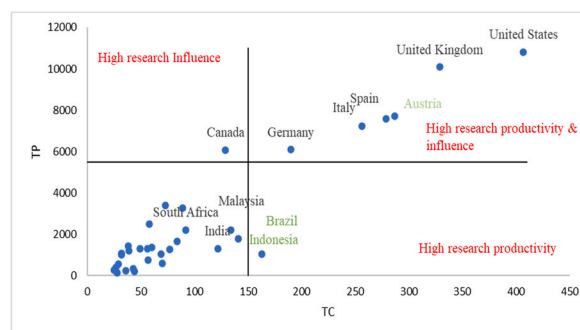


Fig. 3. Distribution of publications and citations based on country.

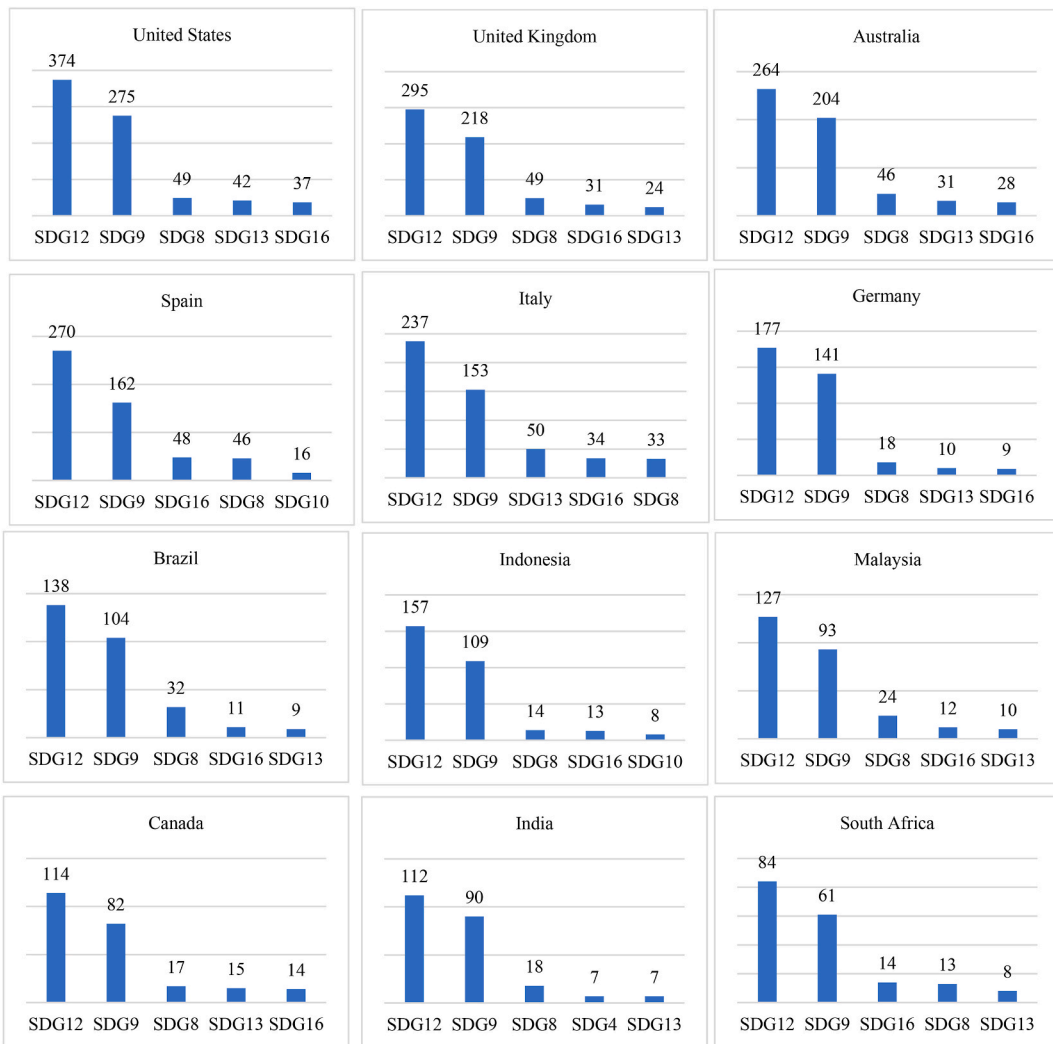


Fig. 4. Publications mapped to top five SDG by country.

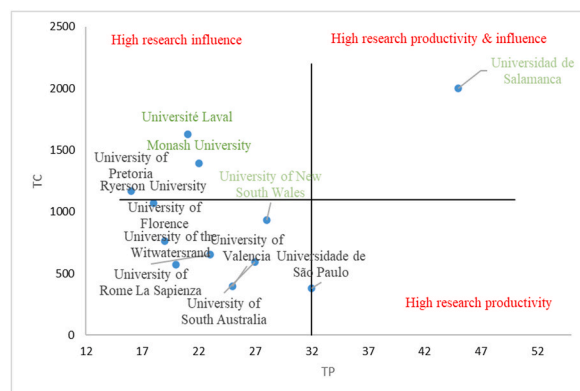


Fig. 5. Distribution of publications and citations based on the institution.

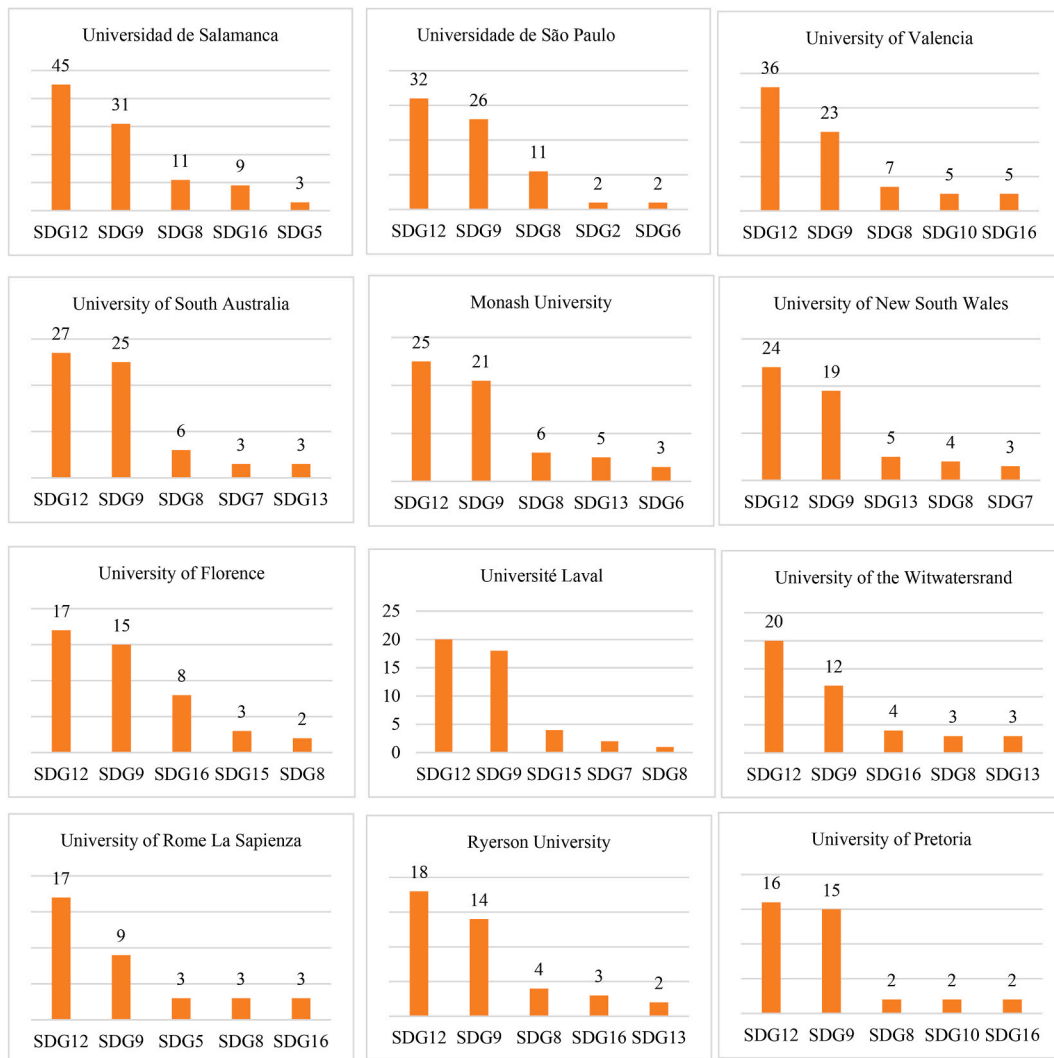


Fig. 6. Publications mapped to the top five SDGs by the institution.

that column. JCP also has the highest number of publications mapped to SDG. Among the top-cited journals, SDG 12 (Responsible Consumption and Production), SDG 9 (Industry, Innovation, and Infrastructure), SDG 8 (Decent Work and Economic Growth), and SDG 16 (Peace, Justice, and Strong Institutions) are the most frequently mapped.

Fig. 7 shows the bibliographic coupling of journals in sustainability reporting (SR). This illustrates the intellectual association among the top-cited journals in SR research. For this analysis, only sources with at least five publications were considered. There are three clusters. Cluster 1 (red) has 15 journals based on their similarity in referencing patterns, with the most publications in the Sustainability journal (TP:199). The other journals in this cluster with high TP are Corporate Social Responsibility and Environmental Management (TP:97) and Business Strategy and the Environment (TP:70). These journals have the highest citations, with TC:4633 and TC:3912, respectively. This cluster has strong links to Sustainability, Corporate Social Responsibility, and Environmental Management. Cluster 2 (green) has 12 journals with the highest publications for CSR, Sustainability, Ethics, and Governance (TP:109). However, this journal has one of the lowest citations (TC:240). The JBE has the highest citations (TC:5243) with TP:55 and has the highest link strength. The other journal with the highest link strength in this cluster is the Sustainability Accounting, Management, and Policy Journal. There are eight journals in Cluster 3 (blue). The JCP has the highest TP (147), TC (8815), and link strength.

Table 6 shows the top 5 journals in each cluster with the highest TP, TC, and TC/TP ratio. In Cluster 1, the Sustainability journal has the highest TP (199), while the Corporate Social Responsibility and Environmental Management journal has the highest TC (4633). Although the TP is lower in the Business Strategy and The Environment journal, its TC/TP ratio is the highest (55.9), indicating the impact of its publications. In Cluster 2, CSR, Sustainability, Ethics, and Governance have the highest TP but the lowest TC (240). The TC/TP ratio for the JBE is the highest in the cluster (96.4) due to its high TC of 5243. In Cluster 3, the JCP has the highest TP (147), TC (8732), and TC/TP ratio (59.4), making it the top journal in this cluster.

**Table 5**  
Top cited journals and their SDG mappings.

Journal Name	TC	TP	TC/TP	IF	Top five SDG mappings
Journal of Cleaner Production	8732	147	59.4	11	
Journal of Business Ethics	5243	55	95.3	6.3	
Corporate Social Responsibility and Environmental Management	4633	97	47.8	9.2	
Business Strategy and the Environment	3841	70	54.9	10.8	
Accounting, Auditing and Accountability Journal	3049	54	56.5	4.8	
Sustainability	2902	199	14.6	3.8	
Sustainability Accounting, Management and Policy Journal	1393	55	25.3	3.9	
Meditari Accountancy Research	1028	40	25.7	3.5	
Social Responsibility Journal	845	50	16.9	3.7	
CSR, Sustainability, Ethics and Governance	240	109	2.2	-	

Note: TC = Total Citations; TP = Total Publications; TC/TP = Total Citations/Total Publications; IF= Impact Factor.

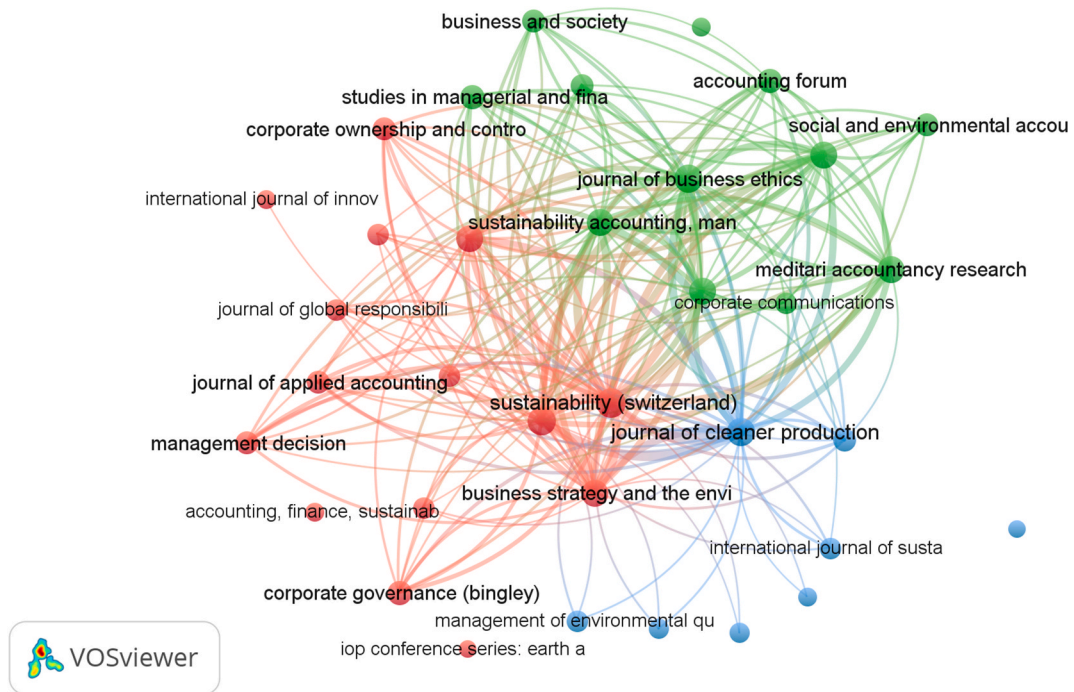


Fig. 7. Interconnection between journals publishing papers on SR.

Table 6  
Clustering of journals.

	Journals	TP	TC	TC/TP	Focus area
Cluster 1 (red)	Sustainability	199	2902	14.6	Sustainability & sustainable development
	Corporate Social Responsibility and Environmental Management	97	4633	47.8	Social and environmental responsibilities of businesses
	Business Strategy and The Environment	70	3912	55.9	Business strategies for improving the natural (green) environment
	Social Responsibility Journal	50	845	16.9	Strategy, business ethics and corporate social responsibility
	Corporate Governance	20	486	24.3	Strategy and corporate governance
	CSR, Sustainability, Ethics and Governance	109	240	2.2	Corporate Social Responsibility, Corporate Governance and Sustainability Management
Cluster 2 (green)	Journal of Business Ethics	55	5243	95.3	Ethical issues related to business
	Sustainability Accounting, Management and Policy Journal	55	1393	25.3	Accounting and finance, social and environmental accounting
	Accounting, Auditing and Accountability Journal	54	3049	56.5	Accounting, auditing and accountability issues and their impacts on policy, practice and society
	Meditari Accountancy Research	40	1041	26.0	Social impacts of accounting, sustainability accounting, CSR, and integrated reporting
Cluster 3 (blue)	Journal of Cleaner Production	147	8732	59.4	Cleaner Production, Environmental, and Sustainability research and practice
	Sustainable Development	15	393	26.2	Sustainable development and sustainable development goals
	Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis	11	64	5.8	Agriculture
	Environmental Quality Management	11	50	4.5	Theories, applications, and social systems of resource recovery and concentrate management for a sustainable future
	International Journal of Sustainable Development and World Ecology	10	166	16.6	Socioeconomic and environmental sustainability on the Earth

Note: TC = Total Citations; TP = Total Publications; TC/TP = Total Citations/Total Publications.

#### 4.6. Social network analysis of SDG network

This study stands out for its application of SNA to examine the SDG network of SR publications, providing insights into the centrality of SDGs. Fig. 8 displays the eigenvector network, highlighting the significance of various SDGs within the network. According to the network analysis, SDG 9 (industry, 0.082) and SDG 7 (climate, 0.081) are the most influential SDGs with the highest eigenvector centrality value. This indicates they have the most extensive connections to other SDGs within the network. Furthermore, SDG 6 (clean



Fig. 8. Most influential SDGs based on Social Network Analysis.

water, 0.068) is ranked as the third most influential SDG, further highlighting its centrality within the SDG network.

Fig. 8 portrays an SDG network based on betweenness centrality, highlighting the central role of SDG 9 (industry, 0.015) and SDG 7 (energy, 0.013). Betweenness centrality is a measure that gauges the importance of a particular node in a network based on the position it occupies in the pathway between nodes. High betweenness centrality indicates that a node significantly influences the flow of information between nodes. In this case, SDG 9 and SDG 7 exhibit high betweenness centrality, which may indicate their prominent role in interlinking several other SDGs. Fig. 9 shows the central role of SDGs 9 and 7 and their linkages with other SDGs. The strongest linkages exist between industry (SDG 9) and responsible consumption and production (SDG 12), between industry (SDG 9) and work (SDG 8). This finding correlates to Table 3, which illustrates the papers with the highest number of citations and their frequent association with SDGs 9 and SDG 12.

Moreover, Fig. 10 shows the central role of SDG 9 and 7 and that the strongest linkages exist between industry and consumption (SDG 9, 12), between industry and work (SDG 9, 8), and between work and consumption (SDG 8, 12).

Sustainability reporting (SR) plays a critical role in tracking and supporting the achievement of SDGs 7 and 9, which are closely linked to sustainable energy and industrialization. SDG 7 aims to ensure universal access to affordable, reliable, and modern energy services (Target 7.1), increase the share of renewable energy in the global energy mix (Target 7.2), double the global rate of improvement in energy efficiency (Target 7.3), and enhance international cooperation to facilitate access to clean energy research and technology (Target 7.4). Whereas SDG 9 aims to increase the development and adoption of clean and environmentally friendly



Fig. 9. The central role of SDGs based on Social Network Analysis.





#### 4.7. Thematic structure with SDG mappings

Fig. 11 shows the co-occurrence of keywords in SR. This analysis set the threshold at 20, resulting in 115 keywords grouped into three clusters. The most frequently used keywords in Cluster 1 (red) are stakeholder engagement, financial reporting, and ESG disclosure. In Cluster 2 (green), the keywords closely aligned with each other are SDGs, environmental management, and supply chains. Finally, the most prominent keyword in Cluster 3 (blue) is SR, linked with CSR and GRI. Tables 6–8 shows the top three most cited publications in the SR field, their focus, the number of citations, and their SDG mappings. The central theme that emerged in Cluster 1 (red) is stakeholder engagement, corporate governance, and accountability, while in Cluster 2 (green), it is SDGs and climate change. While in Cluster 3 (blue), it is SR and GRI.

##### 4.7.1. Cluster 1 (red): Stakeholder engagement, corporate governance, accountability

Table 7 summarizes the publications in Cluster 1 (red), which focuses on a theme related to stakeholder engagement, corporate governance, and accountability. Frias-Aceituno et al. [131] examine the influence of certain features of the board of directors on the degree of information integration presented by leading non-financial multinational firms, contributing to SDG 5 (gender equality), SDG 12 (responsible consumption and production) and SDG 16 (peace, justice, and strong institutions). Another author [31] investigated the relationship between corporate governance and triple-bottom-line sustainability performance through agency and stakeholder theories, supporting SDG 9 (industry, innovation, and infrastructure) and SDG 12 (responsible consumption and production). Amran et al. [86] examine the role of the board of directors in SR quality in the Asia-Pacific region, contributing to SDG 8 (decent work and economic growth), SDG 9, and SDG 12. These highly cited studies focus on stakeholder engagement, financial reporting, corporate strategy, governance approach, decision-making, performance assessment, environmental economics, ESG disclosure, and accountability, all of which are critical for achieving SDGs 9, 12, and 16. The cluster analysis shows that in 2017, SR authors focused on corporate strategy and stakeholder engagement, supporting SDG 8 and SDG 12. In 2018, the focus shifted to financial reporting, decision-making, accountability, and performance assessment, aligning with SDG 12. In 2018, the focus was on the ESG disclosure and governance approach, supporting SDG 12 and SDG 16.

##### 4.7.2. Cluster 2 (green): Sustainable development goals (SDG), climate change

As shown in Table 8, in Cluster 2 (green), the focus areas are related to SDGs and climate change. The most cited publications in this cluster are [14,133,134]. The author, Fritz, proposes a roadmap for integrating citizen science into formal reporting mechanisms for SDG 12, which aims to ensure sustainable consumption and production patterns. The other authors [14] investigated the relationship between early adoption of SDG reporting and a series of organizational factors related to SDG 8 on decent work and economic growth, SDG 9 on the industry, innovation, and infrastructure, and SDG 12. Six global modeling frameworks [134] to show that the significant reallocation of investment required to transform the energy system will not be initiated by countries' Nationally Determined Contributions, which is crucial for achieving SDG 9 on industry, innovation, and infrastructure is also studied. These studies highlight the importance of SDGs, environmental management, economic and social effects, environmental impact, climate change, supply chains, planning, investments, greenhouse gases, and environmental protection in achieving the SDG. The period-wise cluster analysis shows that in 2014 and 2015, SR authors focused on gas emissions and industry. In 2016, there was a shift in focus to benchmarking in the first half of the year, followed by a shift to information management and environmental management. In 2017, there were more studies by SR authors on SDGs, the economic and social effects of SR, and supply chains and SR. During 2018–2020, the themes further involved SR and climate change, focusing on social sustainability and carbon emission. SDG 12 (Responsible Consumption and Production) is the most frequently addressed goal among the top-cited articles, followed by SDG 9 (Industry, Innovation, and Infrastructure).






##### 4.7.3. Cluster 3 (blue): sustainability reporting, global reporting initiative

Table 9 shows Cluster 3 (blue), with 824 publications and 14,938 citations, which leads to the theme of sustainability reporting and global reporting initiatives. Hahn and Kuhn's [128] publication examine the determinants of sustainability reporting and identifies gaps and opportunities for further research in SDG 9 and SDG 12. Milne and Gray's study [130] critiques the disconnect between sustainability reporting and the ecological systems it aims to protect, emphasizing the importance of SR for SDG 9. Roca and Search's [135] study identifies indicators disclosed in corporate sustainability reports, which is relevant for SDG 9 and SDG 12, as it sheds light on the effectiveness of SR in promoting sustainable practices and responsible production and consumption. This cluster's primary focus areas of publications include SR, CSR, GRI, environmental reporting, corporate governance, content analysis, integrated reporting, disclosure, legitimacy theory, and NFR. The cluster analysis from 2015 to 2017 focuses on environmental reporting, legitimacy theory, and SR, while 2018–2019 sees a shift towards corporate governance, disclosure, and integrated reporting. It is observed that, like the SR theories, cluster publications also predominantly map to SDG 8, 9, and 12. Two prominent theories - legitimacy theory and institutional theory are strongly associated with this cluster. Though the institutional theory is limited to cluster 3 only, the legitimacy theory links to all the prominent keywords of cluster 3 and to cluster 2 (stakeholder engagement).

## 5. Conclusions and future research directions






Factors including firm size, industry, age, ownership structure, corporate governance structure, board composition, and financial performance have influenced SR adoption by companies. As the deadline for achieving the SDGs approaches, all stakeholders, including businesses, are increasing their efforts and resources toward this goal. As a result, reporting on actions taken towards the SDG

**Table 7**  
Analysis of Cluster 1: Stakeholder engagement, corporate governance, and Accountability.

Top keywords	Cluster central theme	TP	TC	TC/TP	Top three cited publications, key focus, and citations	SDG mappings
stakeholder engagement financial reporting corporate strategy governance approach decision making performance assessment environmental economics ESG disclosure accountability	stakeholder engagement, corporate governance, accountability	744	19787	26.6	Frias-Aceituno, J.V., et al. (2013) Role of board TC = 356 Hussain, N., et al. (2018) Corporate governance and sustainability TC = 354 Amran, A., et al. (2014) Governance structure TC = 286	    







Note: TC = Total Citations; TP = Total Publications; TC/TP = Total Citations/Total Publications.

**Table 8**  
Analysis of Cluster 2: SDGs and Climate change.

Top keywords	Cluster central theme	TP	TC	TC/TP	Top three cited publicationskey focus, and citations	SDG mappings
sustainable development goals environmental management economic and social effects environmental impact climate change supply chains planning investments greenhouse gases environmental protection	SDGs, climate change	821	19769	24.1	Fritz, S. et al. (2019) SDG & Citizen science TC = 205 Rosati, F., (2019) SDG & Sustainability Reports TC = 204 McCollum, D.L., (2018) SDG & Energy TC = 186	    

Note: TC = Total Citations; TP = Total Publications; TC/TP = Total Citations/Total Publications.

**Table 9**  
Analysis of Cluster 3: Sustainability reporting and Global Reporting Initiative.

Top keywords	Cluster central theme	TP	TC	TC/TP	Top three cited publications, key focus, and citations	SDG mappings
sustainability reporting corporate social responsibility global reporting initiative environmental reporting corporate governance content analysis integrated reporting disclosure legitimacy theory non-financial reporting	sustainability reporting, global reporting initiative	824	14938	18.1	Hahn, R., (2013) Determinants of SR TC = 658 Milne, M.J., (2013) GRI TC = 587 Roca, L.C., (2012) Indicators in SR TC = 370	     

Note: TC = Total Citations; TP = Total Publications; TC/TP = Total Citations/Total Publications.

is also increasing. There has been a similar growth in the number of publications related to SR, making it essential to consolidate and present a comprehensive overview of this area. The current study evaluated the literature on SR since the 2012 Rio SDG summit, examining its evolution, social structure, intellectual configuration, and thematic areas. It also mapped the contributions of institutions, journals, and countries to individual SDGs, one of the first efforts in this area. The study examined the mapping of various SR theories, such as Stakeholder, Legitimacy, Institutional, Agency, and Signaling, for specific SDGs. By exploring the relationship between these theories and the SDGs, a better understanding of how different theories can guide SR practices to contribute towards achieving specific SDGs, such as SDG 7, is gained. It aims to ensure access to affordable, reliable, sustainable, and modern energy for

all, or SDG 9, which promotes sustainable industrialization, innovation, and infrastructure.

To summarize, a steady increase is observed in interest in the field of SR, as reflected in the growth in publications from 107 articles in 2012 to 766 in 2022. There has also been a significant increase in citations, from 57 in 2012 to 21419 in 2022. Most influential publications regarding citations are mapped to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production). The UK, followed by the USA and Australia, are the leading countries in total publications in sustainability reporting. Australia addresses 13 SDGs, the most of any nation, followed by the United Kingdom, Spain, and Italy, which focus on 12 SDGs. SDG 12 (Responsible Consumption and Production), SDG 9 (Industry, Innovation, and Infrastructure), and SDG 8 (Decent Work and Economic Growth) are the most referenced SDGs across all countries. An analysis of bibliographic coupling among countries shows that developed countries like the USA, the UK, and Australia dominate in terms of publications. However, emerging economies like Indonesia, Malaysia, and India have also increased their contributions since 2019.

An analysis of institutions in research on SR reveals that the Universidad de Salamanca in Spain has the highest total citations per publication, indicating a significant impact of their research. SDG 12 and SDG 9 are the most mapped SDGs in all institutions. The highly cited journal in SR is the Journal of Cleaner Production which has the highest number of publications mapped to SDG. Many influential publications on SR focus on SDG 9 and SDG 12. A keyword co-occurrence analysis identified three main clusters, with themes of stakeholder engagement, corporate governance, and accountability; SDG and climate change; and SR and GRI. All 3 clusters have highly cited publications mapped to SDG 9 and SDG 12. This study uses SNA to analyze the SDG network of SR articles, utilizing betweenness and eigenvector centrality measures. This is the first time such an approach has been used to investigate the SDG network. The findings revealed that SDG 9 and SDG 7 were the network's most influential and central SDGs. SNA, in this context, can provide valuable insights into the connections and interdependencies between SDGs, helping to prioritize efforts and resources toward achieving the SDGs.

The study's practical significance is that the SR-SDG linkages, as presented here, provide insights to the various business stakeholders on how companies/business entities are fulfilling their environmental and social protection commitments. For instance, the paper highlights that an organization focused on building resilient infrastructure may use sustainability reporting to identify opportunities to reduce greenhouse gas emissions, reduce waste, and minimize the environmental impacts of its operations. By doing so, the organization can contribute to achieving specific goals, such as SDG 9, and several other SDGs, such as those related to SDG 13, climate action, and SDG 15, life on land.

That said, the study is not free from limitations. We used only bibliometrics to analyze research in the field of SR based on data extracted from the Scopus database only. This can lead to biases. Bibliometrics rely on metrics such as citations, which can be influenced by factors such as the journal's prestige in which the research is published or the language in which the research is written. This can result in a distorted view of the field. Bibliometrics does not consider the context in which the research was conducted or the specific research questions being addressed. This can make it challenging to interpret the results of the analysis accurately. The limitation of bibliometric analysis based on search terms is that the results may be influenced by the specific terms used in the Search. The search was limited to a single database - Scopus. Alternative databases like Web of Science or Dimensions could be explored to include additional articles for review. The methodology is limited to bibliometrics only. A combination of qualitative interviews with experts, in addition to the bibliometric methods, could add novel dimensions to the outcome. Nevertheless, the study is unique in several ways as discussed earlier. To establish the practical utility of the analysis, we also attempted to identify the emerging topics in the SR research by exploring the prominence percentile, which indicates the momentum of a particular topic based on the citations, Scopus views count, and CiteScore values [136]. Table 10 lists the emerging topics in the SR domain based on the prominence percentile.

Based on Table 9, we briefly describe how SR can bring essential changes in these areas and how that would make it a prominent topic of future research.

### 5.1. SR and cause-related marketing, CSR, and corporate philanthropy

SR can significantly achieve several SDGs, including SDG 12 (responsible consumption and production) and SDG 13 (climate action). Research could explore the impact of SR on consumer behavior, particularly by linking it to cause-related marketing or corporate philanthropy initiatives, contributing to the achievement of SDG 12. SR can also shape CSR and help communicate CSR initiatives to stakeholders, contributing to SDG 8 (decent work and economic growth) and SDG 17 (partnerships for the goals). Investigating the relationship between SR and corporate philanthropy, including alignment with SDGs and potential positive correlations with sustainability performance, can also contribute to achieving SDG 1 (no poverty) and SDG 10 (reduced inequalities).

**Table 10**  
Emerging topics related to SR research.

Topics	Prominence percentile
Cause-Related Marketing; Corporate Social Responsibility; Corporate Philanthropy	99.94
Supply Chain; Environmentally Preferable Purchasing; Green Practices	99.93
Sustainability; Environmental Management Systems; Eco-Management and Audit Scheme	99.75
Role of Directors; Corporate Governance; Board Independence	99.69
Education For Sustainability; Higher Education Institutions; Sustainable Development	99.66
Voluntary Disclosure; Firm; International Financial Reporting Standards	96.28
Green Computing; IT Adoption; Sustainable Development	90.54

Finally, examining the impact of external assurance on the credibility and reliability of sustainability reports can contribute to achieving SDG 16 (peace, justice and strong institutions) by promoting transparency and accountability.

### 5.2. SR and supply chain management, environmentally preferable purchasing, and green practices

Research could investigate the impact of SR on supply chain management and whether it drives improvements in sustainability performance, contributing to the achievement of SDG 12. The relationship between SR and environmentally preferable purchasing can also be explored, contributing to SDG 12 by promoting sustainable procurement practices. Companies using SR to communicate green practices and motivate stakeholders to adopt sustainable practices can contribute to SDG 8 (decent work and economic growth) and SDG 13. Using blockchain and IoT systems to track and measure sustainability performance can also contribute to achieving SDG 9 (industry, innovation, and infrastructure) and SDG 17 (partnership for goals). Further, Big Data can be critical in optimizing energy use and reducing adverse environmental impacts. For example, through building automation systems, data can be collected and fed back to the system to optimize the running status of electrical, thermal, and cooling equipment. Such practices can enhance energy efficiency and reduce harmful environmental repercussions [137].

### 5.3. Sustainability reporting and corporate governance, board independence, and the role of directors

Research on SR and corporate governance could explore the use of SR by companies to improve corporate governance and oversight of sustainability performance by the board of directors, contributing to SDG 16 (peace, justice and strong institutions). Investigating the relationship between board independence and the quality of SR can contribute to SDG 16 by promoting transparency and accountability in corporate practices. Exploring the role of directors in SR and their involvement in a company's sustainability strategy and performance can contribute to SDG 8 (decent work and economic growth) and SDG 17 (partnership for goals). Additionally, examining the use of sustainability reporting to engage with stakeholders, including shareholders, and its impact on stakeholder trust and confidence can contribute to SDG 17 by promoting partnerships and collaboration for sustainable development.

### 5.4. SR and education for sustainability, higher education institutions, and sustainable development

Research could explore the use of SR by higher education institutions to promote education for sustainability, contributing to SDG 4 (quality education). The impact of SR on the sustainability performance of higher education institutions and their ability to meet the SDGs can contribute to SDG 12 (responsible consumption and production) and SDG 13 (climate action). Investigating SR role in supporting sustainable development in the local community can contribute to SDG 11 (sustainable cities and communities) and SDG 17.

### 5.5. SR and voluntary disclosure, firm performance, and international financial reporting standards

As there is a strong positive relationship between voluntary sustainability disclosure and firm performance, as evidenced by the literature, it will also help build trust and engagement among stakeholders contributing to SDG8 (decent work and economic growth) and SGG17. Using SR by firms to improve corporate governance and oversight of sustainability performance can also contribute to SDG 16 (peace, justice and strong institutions). Investigating the impact of international financial reporting standards on the quality and reliability of SR can contribute to SDG 16 by promoting transparency and accountability.

Although SR research has focused on addressing several SDGs, there is still a need to strengthen this research, particularly about SDG 1 (No Poverty), SDG 6 (Clean Water and Sanitation), and SDG 14 (Life Below Water), which are important for social and environmental security. Additionally, the resurgence of COVID-19 in various countries may also affect companies' motivation to adopt SR practices. Future research on understanding SR in the context of COVID-19 would be valuable. There is a strong need for empirical studies in sustainability reporting (SR), but progress toward this goal has been slow [138]. While companies and government organizations focus on these SDGs, it is unclear why they have not been more widely addressed in the research. Researchers in the future should address this gap in the literature.

According to the Global Risk Report, the top three risks are related to the environment: climate action failure [139], extreme weather events, and biodiversity loss [140]. The global community will likely prioritize addressing these risks in the future, and the research community needs to guide how to do so. Given this, focusing on SDGs related to these risks is essential. The resurgence of new variants of the COVID-19 virus may also strain various countries' financial and political resources and limit their ability to take climate action. New management techniques will allow the market's current demands to be met by the renewable energy industry, especially after the emergence of the COVID-19 pandemic. This could also influence the actions taken by companies and their sustainability reporting and disclosures [141]. Therefore, the impact of new virus variants on SR and disclosures could be a priority for research. Most SR research has focused on analyzing published reports. However, it is also essential to qualitatively analyze the SR process, as institutional environments and standards vary across regions [142]. To capture this variation and understand the underlying principles of SR, it is suggested that qualitative research on SR reporting be conducted. This could provide insights into the factors that influence the adoption and implementation of SR practices and help to identify best practices that can be applied in different contexts.

In conclusion, SR is an essential and growing field of research. Interestingly, research on SR exhibits a distant and weak connection with environmental impact. The need for stronger connections between SR and environmental consequences are called for. Following earlier studies [101], this study also reports the need for knowledge enrichment in the SR-stakeholder linkage. There is also a gap

witnessed in sectoral research like NGOs and public sector undertaking, as observed from this study [142], which calls for the attention of researchers.

## Declarations

### Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

### Data availability statement

Data will be made available on request.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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