

# Implementation and Quality of Corporate Water Reporting Based on GRI 303:2018: A Scoping Review

## Implementasi dan Kualitas Pelaporan Air Korporat Berbasis GRI 303:2018: Sebuah Scoping Review

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**Abstract** - Global water scarcity and climate change urgently demand substantive corporate transparency in water management, yet the extent to which GRI 303:2018 has advanced this goal remains insufficiently mapped in the literature. This study aims to (1) map corporate water reporting patterns, (2) identify implementation challenges, and (3) examine how reporting quality has been operationalized in empirical studies following GRI 303:2018 adoption, using a scoping review approach Arksey & O'Malley framework and PRISMA-ScR covering 8 studies from 2019-2025. Findings reveal a consistent pattern of information asymmetry: companies aggressively disclose water withdrawal (GRI 303-3) while minimally reporting discharge and consumption in water-stressed areas (GRI 303-4/5), consistent with symbolic compliance predicted by legitimacy theory. Key challenges include definitional ambiguity around "water stress" and non-comparable reporting formats across companies, while quality measurement in the literature remains predominantly checklist-based and unable to detect substantive versus symbolic disclosure. This study contributes a unified conceptual map across three dimensions previously studied in isolation: reporting patterns, implementation challenges, and quality operationalization. Together, these dimensions are shown to share the same legitimacy logic, thereby informing more holistic reform agendas for corporate water accountability.

**Keywords:** GRI 303:2018, Legitimacy Theory, Scoping Review, Sustainability Accounting, Water Reporting.

**Abstrak** - Kelangkaan air global dan perubahan iklim menuntut transparansi korporat yang substantif dalam pengelolaan air, namun sejauh mana GRI 303:2018 telah mewujudkan tujuan tersebut masih kurang terpetakan dalam literatur. Penelitian ini bertujuan (1) memetakan pola pelaporan air korporat, (2) mengidentifikasi tantangan penerapan, dan (3) menelaah bagaimana kualitas pelaporan dioperasionalkan dalam studi empiris pasca-adopsi GRI 303:2018, menggunakan pendekatan scoping review berkerangka Arksey & O'Malley dan pedoman PRISMA-ScR atas 8 studi tahun 2019–2025. Temuan menunjukkan pola asimetri informasi yang konsisten: perusahaan agresif mengungkapkan pengambilan air (GRI 303-3) namun minim melaporkan debit limbah dan konsumsi di wilayah stres air (GRI 303-4/5), konsisten dengan kepatuhan simbolis yang diprediksi teori legitimasi. Tantangan utama meliputi ambiguitas definisi "stres air" dan format pelaporan yang tidak terbandingkan antar perusahaan, sementara pengukuran kualitas dalam literatur masih dominan berbasis daftar periksa dan tidak mampu membedakan pengungkapan substantif dari yang bersifat simbolis. Penelitian ini berkontribusi dengan menyediakan peta konseptual terpadu atas tiga dimensi yang sebelumnya diteliti secara terpisah, yakni pola pelaporan, tantangan implementasi, dan operasionalisasi kualitas, yang menunjukkan bahwa ketiganya berakar pada logika legitimasi yang sama, sehingga menginformasikan agenda reformasi akuntabilitas air korporat yang lebih holistik.

**Kata Kunci:** Akuntansi Keberlanjutan, GRI 303:2018, Pelaporan Air, Scoping Review, Teori Legitimasi.

### INTRODUCTION

As a fundamental resource for human well-being, ecosystem balance, and economic activity, the availability and quality of water face mounting pressure driven by population growth, environmental degradation, and climate change (Wang et al., 2021). Corporate economic activities contribute directly to these pressures through water withdrawal, consumption, and

discharge, which can generate risks of scarcity, quality deterioration, and stakeholder conflicts across watersheds (Gilsbach et al., 2022). As a form of transparency and accountability, corporate water reporting has therefore become critically important, as the quality of water-related information not only reflects a company's environmental practices but also its capacity to manage financial, operational, regulatory, and reputational risks (Peng et al., 2025; Sahetapy, 2023). This need for transparency is particularly pronounced in high-risk industries such as the extractive mining sector, where the intensity of water use and the potential for contamination render water reporting a key indicator of a company's commitment to sustainable practices (Bunclark & Scott, 2022). In response to this need, the Global Reporting Initiative published GRI 303:2018 as a water reporting standard designed to shift the focus from mere water withdrawal volumes toward more substantive contextual impacts, including mandatory reporting in water-stressed areas (GRI, 2018). However, the availability of a comprehensive technical standard does not automatically guarantee substantive transparency, as reporting quality may be influenced by legitimacy motives and stakeholder pressures, rendering disclosures either genuinely informative or merely symbolic (Sawitri & Ardhiani, 2023).

A systematic search of academic databases reveals that studies specifically examining the implementation and quality assessment of GRI 303:2018-based water reporting remain scarce. Most available research focuses narrowly on quantitative compliance with the standard, as seen in studies on the mining sector (Ekasari et al., 2021; Qothrunada & Handayani, 2023), service sector Breliastiti et al., (2023), cement sector Prasetyo et al., (2024), and agricultural sector Mufida et al., (2024), without engaging with the depth of content or the validity of disclosed data. This gap underscores the need for a systematic mapping of reporting practices as they have actually unfolded following the standard's adoption.

Departing from the literature gap identified above, this study employs a scoping review approach based on the Arksey & O'Malley (2005) framework, as refined by Levac et al. (2010), and adheres to the PRISMA-ScR reporting guidelines Tricco et al., (2018), covering literature published between 2019 and 2025. The study aims to: (1) map corporate water reporting patterns following GRI 303:2018 adoption; (2) identify the challenges and barriers in its implementation; and (3) examine how prior researchers have operationalized the measurement of water reporting quality. In terms of theoretical contribution, this study provides a conceptual-operational map of how water reporting quality has been defined and measured in the literature. Practically, its findings are intended to offer insights for companies seeking to strengthen their water disclosure governance, as well as to assist investors and regulators in identifying areas of reporting that are susceptible to symbolic compliance.

## **LITERATURE REVIEW**

### **Corporate Water Reporting**

The availability and quality of water as a fundamental resource for human well-being, ecosystem balance, and economic activity face increasingly intense pressure driven by population growth, environmental degradation, and the acceleration of climate change, all of which affect the global distribution of water resources (Wang et al., 2021). Corporate economic activities contribute directly to these pressures through water withdrawal, consumption, and discharge, which carry the potential to generate risks of scarcity, quality deterioration, and stakeholder conflicts across watersheds (Ivic et al., 2021). In response to this condition, corporate water reporting has emerged as a crucial accountability mechanism, as the quality of water-related information not only reflects a company's environmental practices but also its capacity to manage financial, operational, regulatory, and reputational risks in an integrated manner (Wicaksono et al., 2021). This urgency for transparency is particularly pronounced in water-intensive industries such as mining, agriculture, and energy, where the materiality of water risk has a direct bearing on long-term business continuity and a company's social legitimacy in the eyes of both local communities

and global investors (Northey et al., 2019). However, this need for transparency does not operate free from interest-driven calculations, as cross-country studies consistently show that companies tend to treat water reporting not purely as an ecological accountability obligation, but as a strategic instrument for stakeholder impression management, ultimately creating a fundamental tension between substantive and symbolic reporting functions (Botha et al., 2022; Gibassier, 2018; Peng et al., 2025).

**Water Reporting Standards: Evolution and GRI 303:2018**

To address the need for standardized water reporting, various reporting frameworks have been developed globally, encompassing GRI 303:2018, the CDP water security questionnaire, the CEO water mandate, ESRS E3, TCFD/IFRS S2, and industry-specific standards such as SASB, each addressing water metrics, risks, governance, and strategy across sustainability reports and other disclosure channels as illustrated in figure 1. Among these frameworks, GRI has been the most widely adopted globally owing to its modular, cross-sector, and jurisdiction-neutral nature, which provides implementation flexibility relevant to companies across diverse geographic and industry contexts. Historically, GRI water reporting standards evolved incrementally from G1 through G4, which dominated reporting with basic water withdrawal volumes lacking contextual depth, before transforming into GRI 303:2018, which represents a paradigmatic shift in disclosure quality expectations as summarized in Table 1 (GRI, 2018).

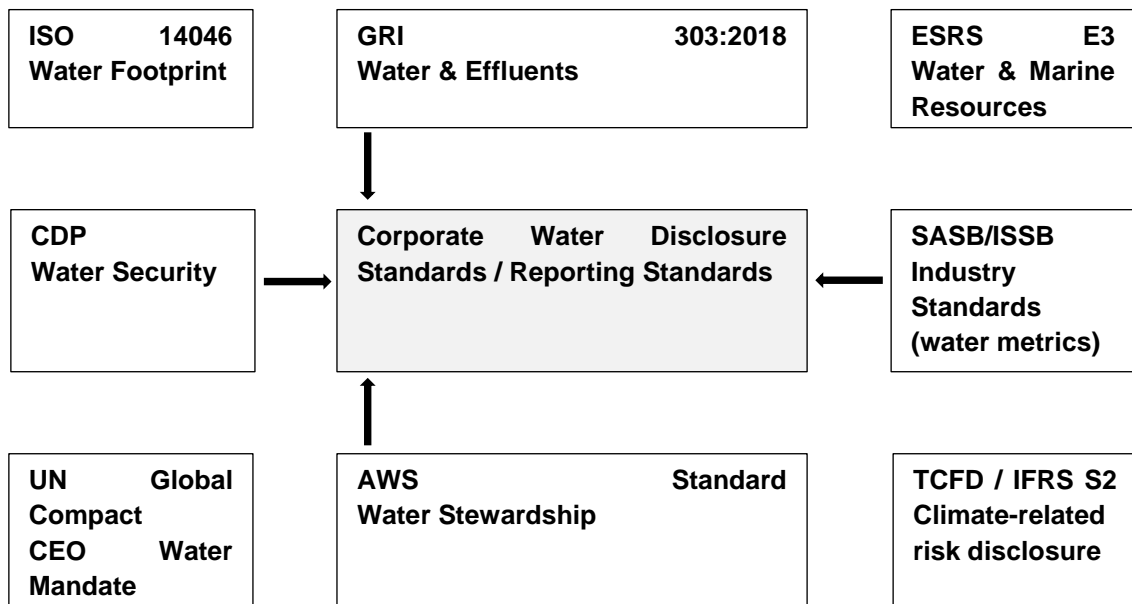


Figure 1. Corporate Water Disclosure/Reporting Standards

GRI 303:2018 specifically mandates the reporting of water impacts in local contexts within water-stressed areas, expands reporting metrics beyond mere withdrawal to encompass consumption and discharge, and promotes analysis of how companies interact with water as a shared resource across the entire value chain, thereby explicitly designed to shift reporting orientation from formal compliance toward more meaningful substantive accountability (GRI, 2018). However, early empirical evidence indicates that technical revisions to a standard do not automatically translate into commensurate changes in reporting behavior, as even with more explicit indicators, actual reporting quality continues to fall short of standard expectations, particularly on indicators reflecting negative impacts such as discharge and consumption in water-stressed areas with reputational implications for companies (He et al., 2023).

Table 1. Evolution of GRI Standards for Water Disclosure

GRI Standard	Key Changes/New Elements from Previous Version
GRI G1, G2, G3 & G3.1 (early stage 2000-2011)	Initial guidelines focused on basic volume data for water withdrawal reporting without detailed explanation of environmental impacts.
GRI G4 (2013)	Stronger emphasis on materiality (focus on "material" topics) with expanded water indicators (EN8–EN10; EN22) covering water sources, significant impacts, and percentage of water recycled/reused.
GRI 303:2016 (modular transition)	Format shifted from guidelines to modular standards, with the water topic (GRI 303) revised to align with best practices and developments in water management/reporting.
GRI 303:2018 (current standard)	Mandates impact reporting in local contexts within water-stressed areas; expands metrics from water withdrawal to consumption and discharge; focuses on how companies interact with water as a shared resource; and promotes impact reporting across the value chain.

Source: GRI website (processed by the authors).

### **Legitimacy Theory as a Critical Lens**

The phenomenon of corporate water reporting is best analyzed through the lens of legitimacy theory, which offers the most productive framework for understanding why the gap between standard design and actual reporting practice persists despite continuous technical updates to standards (Deegan, 2019). The theory fundamentally postulates that companies engage in environmental disclosure not out of genuine ecological accountability, but as a calculated strategy to align corporate values with social norms in order to maintain the "social contract" or license to operate from society, which is a prerequisite for business continuity (Akhter et al., 2023). Within this perspective, disclosure is understood as a calculated response to external legitimacy pressures rather than a genuine reflection of environmental performance, leading companies to rationally prioritize information that builds or maintains a positive image while minimizing exposure to information that could trigger public or regulatory scrutiny (Botha et al., 2022; Kusumawardhani et al., 2023). In this study, legitimacy theory is not positioned as a neutral explanatory framework for describing reporting behavior, but is explicitly employed as a critical lens to interrogate what lies beneath what is reported, such that practices including cherry-picking of disclosed indicators, the dominance of qualitative narratives devoid of measurable data, and reliance on ambiguous water stress definitions are treated not as anomalies, but as predictable consequences of symbolic legitimacy logic. Under this theoretical positioning, the adoption of GRI 303:2018 risks becoming a ceremonial legitimacy practice in which companies adopt the structure of the standard to satisfy external expectations without genuinely internalizing substantive water governance. This theoretical positioning carries direct methodological implications, namely that compliance-based evaluation approaches that merely count GRI item conformance are inadequate to detect symbolic reporting, as they measure precisely the dimension most easily manipulated within legitimacy logic.

### **Sustainability Reporting Quality**

With more explicit indicators oriented toward a company's interaction with water, standards such as GRI 303:2018 are expected to enhance disclosure quality through completeness, measurability, and comparability of information, enabling reports to serve genuine accountability evaluation rather than merely fulfilling normative expectations (Matuszak et al., 2025). However, the empirical literature reveals that research on water reporting remains dominated by checklist-based approaches that equate the quantity of disclosed items with reporting quality, generating vulnerability to corporate practices of projecting an appearance of compliance without substantive content (Adhariani, 2021). The need for credible reporting is particularly critical in water-intensive sectors operating in high water-stress regions, where the materiality of water risk directly affects business continuity, making the inability of checklist approaches to detect substantive reporting quality an increasingly urgent problem to address (Benson et al., 2019; Nurlita et al., 2025). Given

the exploratory and mapping nature of this study, formal hypotheses are not formulated, instead, the conceptual framework presented in figure 2 serves to articulate the theoretical relationships guiding the three research questions. From this urgency emerges a question that cannot be answered through conventional hypothesis-testing research designs. The mapping nature of the inquiry, examining the extent to which existing literature defines and operationalizes water reporting quality and identifying patterns consistent with the predictions of symbolic legitimacy logic, makes scoping review the most appropriate methodological choice.

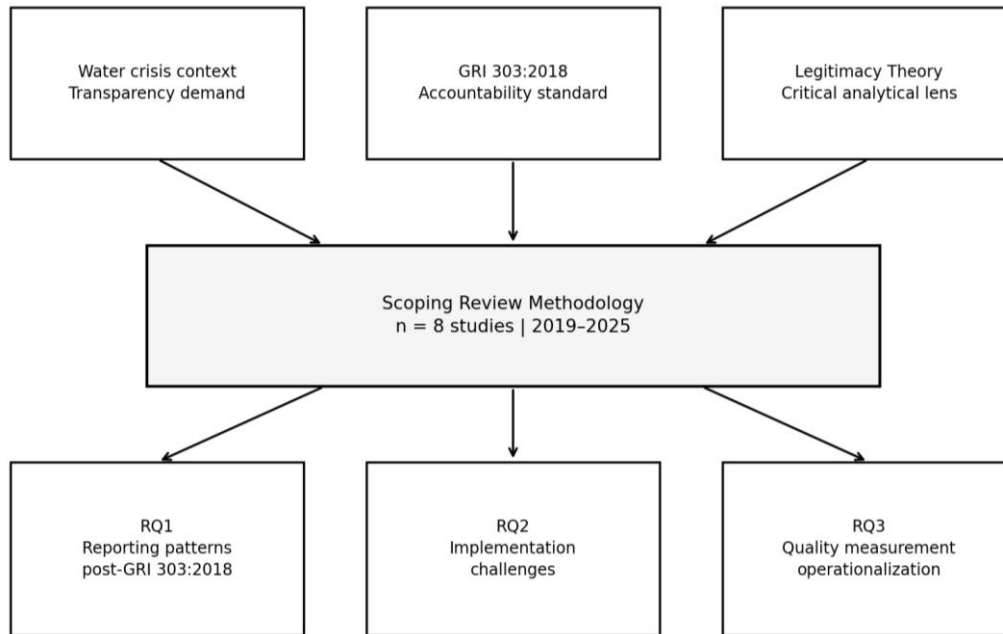


Figure 2. Conceptual Framework of the Study

## RESEARCH METHOD

This study was conducted between January and March 2026, employing a scoping review method to systematically and comprehensively map the literature on the practices, challenges, and operationalization of quality in GRI 303:2018-based corporate water reporting. The population of this study consists of all academic literature published between 2019 and 2025 addressing corporate water reporting under GRI 303:2018, with a final sample of 8 articles selected through a staged screening process. A scoping review is a form of evidence synthesis used to identify and map the breadth of available evidence on a topic, field, concept, or issue that remains emerging or has not yet been comprehensively mapped in the literature (Pollock et al., 2024). The research protocol adopts the five-stage methodological framework developed by Arksey & O'Malley (2005) and refined by Levac et al. (2010) as the model guiding the entire research process from question formulation to result reporting. This study also adheres to the preferred reporting items for systematic reviews and meta-analyses extension for scoping reviews (PRISMA-ScR) reporting guidelines Tricco et al., (2018) to ensure transparency in the literature selection process and the reproducibility of the research.

The selection of scoping review as the research design is grounded in epistemological considerations regarding the nature of the topic and the research questions posed, whereby the primary objective of this study is the conceptual mapping of an evolving literature landscape rather than hypothesis testing or the estimation of causal effects, which falls within the domain of systematic literature review (Munn et al., 2018). The topic of GRI 303:2018 implementation post-adoption is a field that only began receiving significant academic attention between 2022 and 2023, meaning there is insufficient accumulated evidence for a statistically meaningful meta-analysis or SLR. This research protocol specifically adopts the five-stage Arksey & O'Malley

(2005) framework as refined by Levac et al. (2010) given its status as the most established and widely adopted framework for scoping reviews in the social and management sciences, offering a logical, replicable structure that allows readers to verify every methodological decision made at each stage. The integration of PRISMA-ScR guidelines Tricco et al., (2018) atop this framework provides an additional layer of reporting standards now commonly expected in scoping review publications in internationally reputable journals. The selection of Scopus and Google Scholar as search databases was equally deliberate. Scopus was chosen as the largest multidisciplinary database indexing reputable journals through rigorous peer-review processes, ensuring a minimum academic quality standard for all literature entering the selection stage. Google Scholar was selected as a complement given its broader coverage of Indonesian-language literature and national journal publications relevant to the research context, as the majority of empirical studies on water reporting in Indonesia have not yet been fully indexed in Scopus.

The first stage involved formulating the research questions to define the focus and guide the search strategy comprehensively. The primary focus of this study is to explore how GRI 303:2018 has been adopted by companies and how prior literature has operationalized water reporting quality using this standard across diverse industry and geographic contexts. The core research questions are: first, how have prior researchers operationalized the measurement of GRI 303:2018-based water reporting quality in their studies; second, what challenges or barriers have been encountered in its implementation; and third, what patterns of water reporting practice have emerged following the publication of GRI 303:2018 from the perspective of legitimacy theory. The simultaneous formulation of all three questions also constitutes part of the novelty of this study, as most available research addresses only one question in isolation without mapping their interconnections as a cohesive landscape (Nurlita et al., 2025). These questions subsequently guided the determination of search keywords, inclusion criteria, and the thematic analysis framework in the subsequent stages.

Table 2. Sources, Keywords, and Literature Criteria

Source	Keywords	Literature Criteria
POP - Scopus POP -Google Scholar	Key words: "GRI 303 water disclosure"; title words: "water disclosure" OR "water accounting" OR "water reporting"	<ul style="list-style-type: none"> <li>• Written in Indonesian or English;</li> <li>• Discusses GRI 303:2018 implementation;</li> <li>• Situated within a corporate reporting/disclosure/accounting context;</li> <li>• Is a <i>peer-reviewed</i> journal article or Master's/Doctoral thesis; Published between 2019-2025</li> </ul>

Source: processed by the authors.

The second stage, identification of relevant studies, was carried out using the publish or perish (POP) software to systematically retrieve metadata from reputable databases including Scopus and Google Scholar. Searches were conducted using a layered keyword strategy as presented in Table 2 to maximize the relevance of results. The study restricted its search to publications from 2019 to 2025, beginning one year after the release of GRI 303:2018 in order to capture studies from the early adoption phase through to the period in which the standard has been fully in effect. This time-range restriction constitutes a deliberate methodological decision, as studies published prior to 2019 could not logically address the specific implementation of GRI 303:2018, which only came into effect in that year. The search was not restricted by country or sector in order to enable more comprehensive mapping of the diversity of contexts in which the standard has been applied.

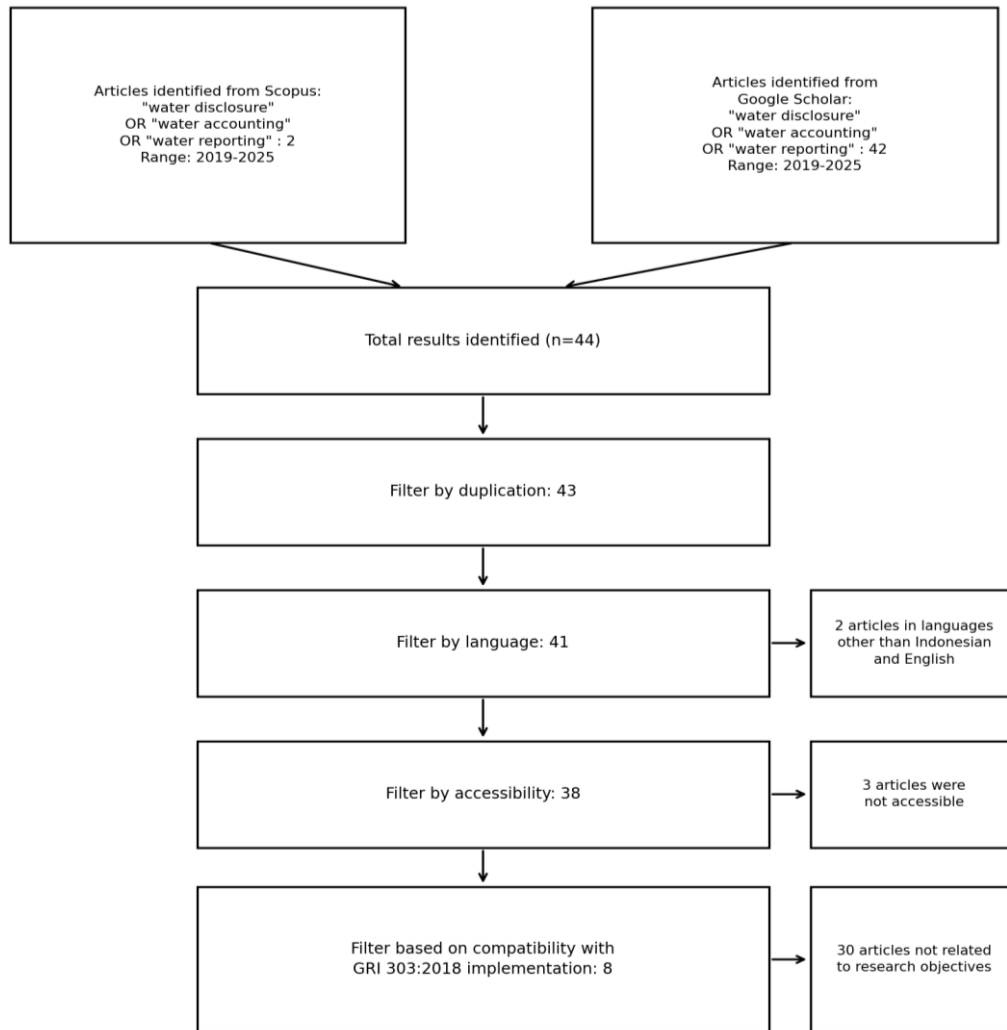


Figure 3. Literature Selection Process (PRISMA-ScR Flow Diagram)

The third stage, literature selection, was conducted by evaluating all search results against the inclusion and exclusion criteria detailed in table 2 through systematic title and abstract screening at the initial stage. Rigorous filtering was applied to ensure that only literature with substantive relevance to the research topic and meeting academic quality standards was included, while literature failing to meet these criteria was excluded with documented reasons. This process produced a staged reduction from 44 records identified in the initial search to 38 eligible records following the removal of duplicates and filtering by language and accessibility, which were subsequently narrowed to a final 8 records through full-text reading. The entire selection process and its outcomes are visualized in a PRISMA flow chart as presented in figure 3 to ensure transparency and traceability of selection decisions.

In the fourth stage, data mapping, information was systematically extracted from all articles that passed the selection process, covering study characteristics including author names, publication year, country and sector of the research object, data collection and analysis methodology, and substantive findings relevant to the three research questions formulated. Extraction was conducted using a standardized mapping matrix to ensure consistency and completeness of information retrieval across all 8 articles, while also facilitating inter-study comparisons in the subsequent analysis stage. The extracted data were then organized in table 3 as the basis for characteristics analysis and thematic synthesis in the findings and discussion section. Finally, in the fifth stage, thematic analysis was conducted by providing a descriptive overview of overall research trends in GRI 303:2018-based water reporting, and by identifying and mapping the gap

between standard expectations and the reality of reporting practices as revealed through cross-study synthesis. This thematic analysis goes beyond merely summarizing individual findings from each article, actively interpreting emerging patterns through the critical lens of legitimacy theory as positioned in the literature review, thereby producing a synthesis with interpretive value that transcends simple description. This approach is consistent with the spirit of scoping review, which aims not only to compile evidence but also to generate deeper conceptual understanding of the research landscape being mapped (Levac et al., 2010).

## FINDINGS AND DISCUSSION

### Findings

#### Study Selection Results

Figure 3 illustrates the literature screening process summarized in the PRISMA flow chart. An initial search across the Scopus and Google Scholar databases using publish or perish software yielded 44 records thematically relevant to the topic of GRI-based corporate water reporting. Following the removal of duplicates, language filtering, accessibility screening, and full-text verification, 38 records were deemed eligible to proceed to the next selection stage. Through full-text reading and the application of strict inclusion and exclusion criteria, a final set of 8 articles relevant for analysis in this study was obtained as detailed in table 3. This selection protocol was specifically designed to capture studies that substantively address the implementation or quality of water reporting within the GRI 303:2018 framework, rather than those that merely cite the standard as a reference, ensuring that every article included bears direct relevance to the three research questions formulated.

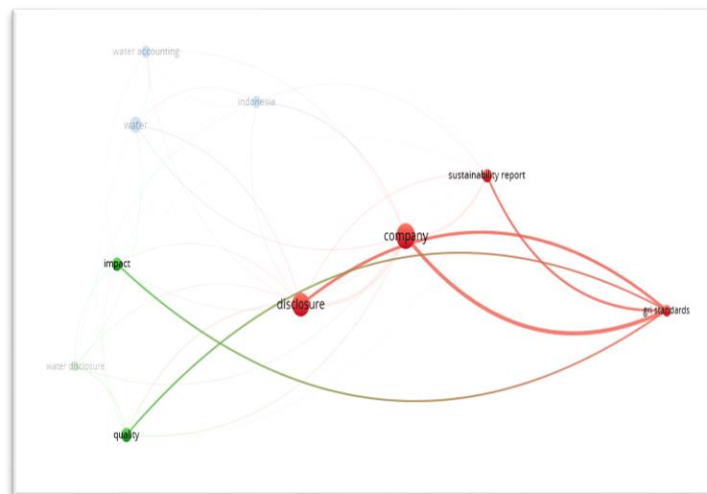


Figure 4. Network Visualization

#### Bibliometric Analysis and Research Trends

Given that the topic of GRI 303:2018 implementation remains relatively new in the academic landscape, bibliometric analysis was conducted on the initial search dataset of 44 records to broadly map the research landscape prior to applying stricter inclusion criteria. This mapping was carried out using VOSViewer software, enabling visualization of keyword relationships, temporal trends, and topic density as presented in figures 4, 5, and 6.

The network visualization results from VOSViewer in figure 4 reveal a significant topic gap, whereby the term "GRI standards" exhibits stronger associations with general keywords such as company, sustainability report, disclosure, impact, and quality, while its relational link strength with specific keywords such as water, water disclosure, or water accounting remains comparatively weak, demonstrating that available GRI-related literature has yet to focus substantially on water disclosure and reporting.

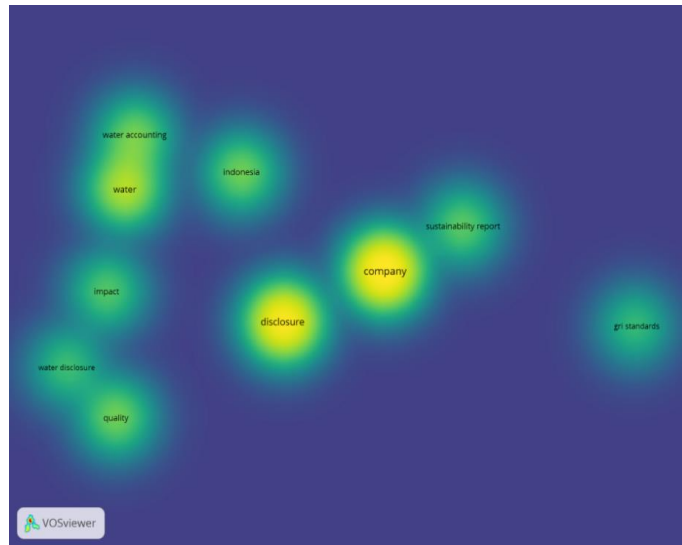


Figure 5. Density Visualization

This is further reinforced by the density visualization in figure 5, which shows that general corporate disclosure topics (company and disclosure) display high color density, indicating research saturation, while the specific topic of GRI-based water reporting exhibits markedly lower color density (low density). This finding confirms that research on the application of GRI 303 standards to corporate water reporting practices remains an underexplored area in both global and national academic literature.

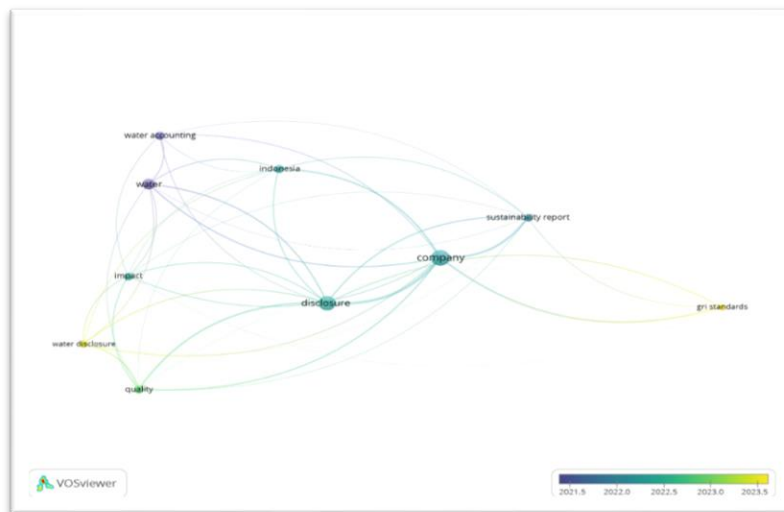


Figure 6. Overlay Visualization

These findings are further supported by the overlay visualization in figure 6, which shows that specific terminology such as quality, GRI standards, and water disclosure only began appearing significantly in the academic literature during the 2022-2023 period.

#### Characteristics of Selected Literature

A systematic characteristics analysis was conducted on the 8 articles that passed the selection process and became the focus of this scoping review, in order to understand the existing research landscape prior to substantive synthesis. The analysis reveals that the majority of studies were published within the past two years, specifically 2024 to 2025, as detailed in Table 3, indicating a lagging academic response to the effective implementation period of GRI 303:2018 and simultaneously confirming the relevance of this study as a mapping exercise conducted during a period of still-active scholarly development.

Table 3. Characteristics of Selected Studies

No	Study Title & Author (Year)	Country & Research Object	Data Collection Method	Data Analysis Method
1	An analysis of water disclosure quantities: evidence from agricultural companies in Indonesia  Wahyuningrum et al. (2025)	Indonesia  Agricultural sector (118 units of analysis)	Documentation (annual & sustainability reports 2016–2022)	Qualitative: content analysis
2	Water disclosure in Indonesian agriculture: the roles of ownership and political connections  Wulandari et al. (2025)	Indonesia  Agricultural sector (16 companies)	Documentation (annual & sustainability reports 2019-2023)	Quantitative: multiple panel data regression
3	Do water accounting disclosure matter for water resource sustainability?  Fidiana et al. (2025)	Indonesia  25 SRI-Kehati Index issuers	Documentation (annual & sustainability reports 2024)	Qualitative: synchronous semantic content analysis
4	Examining the extent and quality of corporate water management disclosures in extremely high-water stress countries  Farooq et al. (2024)	Cross-Country (12 jurisdictions)  Top 100 companies in high water stress region	Documentation (sustainability & annual reports 2016-2020)	Mixed: content analysis and water disclosure index (qualitative) and panel data regression (quantitative)
5	Disclosure of water accounting in non-cyclical consumer sector companies in Indonesia  Kosasih et al. (2024)	Indonesia  Consumer Non-Cyclicals sector (BEI)	Documentation (sustainability reports 2021–2022 and 15 Scopus- and SINTA-indexed journal articles)	Mixed: Content analysis (qualitative) and GRI conformance scoring (quantitative)
6	Will the revisions to GRI 303 improve corporate water reporting? The challenges of defining and operationalising “water stress”  Hewawithana et al. (2023)	Global  Companies (Global Fortune 250)	Documentation of sustainability/integrated reports (2019)	Qualitative: in-depth textual analysis of “water stress” definitions vs. GRI standards
7	Disclosure of Sustainable Water Management Practices: A Comparative Study Between NTPC and Tata Power  Modak & Bhowmik (2023)	India  Power generation sector (NTPC Ltd. & Tata Power)	Documentation (sustainability reports 2019-2021)	Qualitative: content analysis comparing disclosure items of both companies against GRI
8	Investigating water disclosure practises in the platinum mining industry  Smit et al. (2021)	Global (predominantly South Africa: also North America & Russia)  Platinum mining sector	Documentation (integrated & sustainability reports 2017–2018)	Qualitative: content analysis to measure GRI compliance levels

Source: Processed by the Authors.

Geographically, the research is dominated by developing country contexts, particularly Indonesia with 5 articles (Wahyuningrum et al., 2025; Wulandari et al., 2025; Fidiana et al., 2025; Kosasih et al., 2024), India with 1 article (Modak & Bhowmik, 2023), and South Africa within a global

platinum mining context with 1 article Smit et al., (2021), alongside one cross-country study focused on high water-stress jurisdictions (Farooq et al., 2024). Methodologically, content analysis is the most dominant approach used to measure reporting quality, whether through quantitative index or scoring approaches or qualitative-interpretive ones, while one study employs panel data regression to identify disclosure determinants Wulandari et al., (2025) and another uses qualitative comparative analysis (Modak & Bhowmik, 2023). This geographic composition, dominated by developing countries, carries important theoretical relevance, as it indicates that water reporting issues are most critical in regions vulnerable to water resource availability risks while simultaneously possessing still-developing sustainability regulatory infrastructure, where external legitimacy pressures tend to serve as the dominant motive over genuine accountability commitments.

## **Discussion**

### **Operationalization of Reporting Quality Measurement**

This study identifies sharp methodological variation in how researchers measure water reporting quality, reflecting a debate between compliance-based approaches that emphasize the quantity of items fulfilled and meaning-based approaches that prioritize the substantive depth of information. The majority of studies in the sample, including (Smit et al. 2021; Wahyuningrum et al. 2025; Wulandari et al. 2025), operationalize quality through a disclosure index/checklist proxy, counting the presence of GRI items using binary scores (0/1) as a quality representation. This approach aligns with the early premise of legitimacy theory, which assumes that greater disclosure volume corresponds to greater legitimacy. However, it fails to capture whether the information presented is accurate or merely boilerplate. Wahyuningrum et al. (2025) specifically developed two distinct indices to capture water reporting quality in the Indonesian agricultural sector and found that most companies disclose fewer than 50% of applicable water indicators, with "water policy" as the most frequently disclosed category while "water data reliability" was the least, a pattern indicative of corporate preference for items that can be claimed without external verification.

More recent studies, by contrast, attempt to move beyond simple checklist approaches. Farooq et al. (2024) developed a multidimensional GRI 303-based index comprising 19 items with inter-coder reliability validation to ensure scores reflect genuine water management quality rather than mere textual presence. Meanwhile, (Hewawithana et al. 2023; Kosasih et al. 2024) employed qualitative-interpretive approaches including NVivo-assisted analysis and critical textual analysis to assess narrative depth. Fidiana et al. (2025) adopted the most critical stance, using synchronous semantic content analysis to evaluate the alignment between report rhetoric and field reality, finding that the most commonly used water sustainability success measure among SRI-Kehati companies was "the absence of community complaints" a proxy conceptually far removed from the substantive accountability standards demanded by GRI 303:2018.

### **Water Reporting Practice Patterns Post-GRI 303:2018**

Cross-study synthesis reveals that the adoption of GRI 303:2018 has yet to fully drive substantive transparency, instead producing asymmetric and ceremonial reporting patterns consistent with the predictions of the critical legitimacy theory lens applied in this study. The most conspicuous pattern recurring across sectors and geographic contexts is the practice of information cherry-picking: companies aggressively report on the relatively easy and reputationally "safe" indicator of water withdrawal (GRI 303-3), while minimally disclosing indicators reflecting negative ecological impacts such as water discharge (GRI 303-4) and water consumption in water-stressed areas (GRI 303-5). This is documented consistently across sectors, as evidenced by Smit et al. (2021) in their study of 13 platinum mining companies, which found that full compliance with GRI 303-4 (water discharge) stood at only 29%, far below GRI 303-3 (water withdrawal) at 38% and GRI 303-5 (water consumption) at 49%, with several companies claiming that "no water bodies are discharged into the environment" without providing measurable data to support the assertion.

These findings parallel those of Modak & Bhowmik (2023) in the Indian power generation sector, where both NTPC and Tata Power consistently failed to report on water-stress context indicators (GRI 303-3(ii), 303-4(iii), and 303-5(ii)) despite operating in areas with high water availability risk. The dominance of qualitative narratives devoid of measurable quantitative data also emerges as a strong trend, as demonstrated by Fidiana et al. (2025), who found that most SRI-Kehati companies present policy descriptions and normative commitments as the primary substance of their water reports. (Wahyuningrum et al. 2025; Kosasih et al. 2024) similarly confirm that companies in Indonesia's agricultural and consumer non-cyclicals sectors prefer simple policy-based indicators over measurable and comparable water performance data. Furthermore, Wulandari et al. (2025) reinforce this argument by demonstrating that the breadth of disclosure in Indonesia is strongly influenced by political connections and ownership structure. Collectively, these patterns confirm the predictions of the critical legitimacy theory lens: companies formally adopt the GRI 303 structure to satisfy stakeholder expectations while strategically selecting information that minimizes reputational risk, thereby creating an illusion of transparency in which reports are narratively voluminous yet lacking in the material data genuinely needed for ecological accountability evaluation.

### **Challenges and Barriers to GRI 303:2018 Implementation**

Beyond symbolic reporting patterns, the analyzed literature consistently identifies two mutually reinforcing clusters of barriers to GRI 303:2018 implementation: conceptual barriers related to the definition of water stress, and technical barriers related to data comparability. Hewawithana et al. (2023) provide the most in-depth analysis of the conceptual barrier, finding that although GRI recommends tools such as WRI aqueduct and the water risk filter to identify water-stressed areas, both tools employ different combinations of risk indicators, user-customizable weightings, and data sources with varying levels of granularity, resulting in potentially significant divergence depending on the methodological choices made by individual companies. This ambiguity creates a gap which, viewed through the critical lens of legitimacy theory, companies will rationally exploit by selecting calculation methods that minimize their disclosed water risk exposure to investors and regulators - a perception management tactic that impedes genuine transparency and reduces inter-company data comparability.

Technical comparability barriers are found consistently across all studies analyzing more than one company, as in Modak & Bhowmik (2023), who identify inconsistent reporting formats between companies within the same sector, with each company using non-standardized units, reporting periods, and data coverage. Farooq et al. (2024) reinforce these findings from a cross-country perspective, showing that in high water-stress jurisdictions, water disclosure levels and quality improved only marginally between 2016 and 2020. Finding also shows that without coercive external regulatory pressure, whether through corporate governance quality or stringent stock exchange regulations, companies tend not to invest resources in addressing the technical complexities of water balance accounting. Both clusters of barriers are mutually reinforcing within legitimacy logic: conceptual ambiguity provides room for non-standardized reporting, while technical non-standardization provides justification for companies to delay or simplify disclosure under the pretext of data capacity limitations, concealing their true objective of minimizing exposure to more rigorous public scrutiny.

### **CONCLUSION**

This study mapped how post-adoption empirical literature defines and operationalizes water reporting quality under GRI 303:2018, identified implementation challenges, and examined prevailing reporting practice patterns through the critical lens of legitimacy theory. The overarching finding is that adopting a more comprehensive technical standard has proven insufficient to drive a meaningful shift from symbolic compliance toward substantive accountability, as companies consistently deploy legitimacy logic to selectively reconstruct water-

related information in ways that minimize reputational risk while maintaining the appearance of formal compliance. The cherry-picking pattern, characterized by aggressive disclosure of reputationally "safe" indicators such as water withdrawal (GRI 303-3) alongside minimal reporting on negative-impact indicators such as water discharge (GRI 303-4) and consumption in water-stressed areas (GRI 303-5), represents a predictable consequence of symbolic legitimacy logic rather than a mere technical anomaly. Meanwhile, the literature remains dominated by checklist-based approaches that equate item quantity with substantive quality, producing a significant methodological gap between how researchers measure quality and how companies manipulate disclosure quantity to manufacture an illusion of transparency. This study therefore contributes conceptually by providing a unified map across three dimensions previously studied in isolation, consisting of reporting patterns, implementation challenges, and quality operationalization variations, demonstrating that all three are rooted in the same underlying logic, such that any effective water reporting reform agenda must address them simultaneously. Topics that remain largely underexplored include data validity-based evaluation of water reporting quality beyond mere item presence, comparative studies across water reporting standards, the actual impact of water reporting on on-the-ground water management practices, and water reporting analysis in water-intensive sectors with limited attention. The primary limitations of this study include the restricted sample of 8 studies resulting from inclusion criteria specific to post-adoption GRI 303:2018 research, an imbalanced sector representation dominated by agriculture and mining, and the confinement of analysis to a single reporting standard, all of which simultaneously constitute relevant directions for future research. The most pressing future research agenda includes the development of quality measurement frameworks that move beyond quantitative checklists toward in-depth content analysis or natural language processing (NLP) to interrogate the validity of corporate narrative claims, as well as cross-country comparative studies stratified by physical water risk level to clarify how environmental conditions shape corporate legitimacy motivations. Broader theoretical integration, such as combining legitimacy theory with Institutional theory or stakeholder theory, would also provide a more holistic account of the external and internal pressures shaping corporate water accountability. At the practical level, companies are advised to reduce information asymmetry by enhancing transparency on negative-impact indicators, particularly water discharge and consumption in water-stressed areas, while simultaneously investing in more accurate data management systems and adopting objective global benchmarks for defining water stress. Finally, for regulators and standard-setters, more prescriptive technical guidance on the operational definition of water-stressed areas is warranted, as such clarification is critical to minimizing the subjective interpretive gaps that companies frequently exploit to manipulate risk perception and thereby structurally strengthen corporate water reporting accountability.

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