

# Corporate Social Responsibility (CSR) and Sustainability in Water Supply: A Systematic Review

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**Abstract:** Although access to clean and safe water is a fundamental human right, millions of people around the world lack this essential resource. Through their CSR initiatives, companies are promoting responsible and sustainable practices to ensure the appropriate use and management of water resources. Using a systematic review and PRISMA framework, this study examined the impact of CSR initiatives on sustainable water supply. A total of 108 articles were identified, and 33 were subjected to further reviews and analysis. This study found that CSR initiatives contribute to sustainable water supply through water conservation, water stewardship, responsible supply chains, and various educational and training initiatives. This study found that CSR initiatives have been effective in transforming behaviors and converting millions of people around the world into water activists. Corporations are also leveraging new technologies to enhance efficiency in their operations and minimize excessive water waste. This study also found that corporations must build responsible business practices through ethical, economic, and environmental responsibility. Although CSR initiatives can be too costly for many organizations, businesses can reduce costs through strategic partnerships and leveraging technological innovations to promote water conservation and hygiene.

**Keywords:** responsible supply chain; water conservation; water education; water stewardship



**Citation:** Silva, J.A. Corporate Social Responsibility (CSR) and Sustainability in Water Supply: A Systematic Review. *Sustainability* **2024**, *16*, 3183. <https://doi.org/10.3390/su16083183>

Academic Editors: Valentín Molina-Moreno, Francisco Jesús Gálvez-Sánchez and Juan Fernando Álvarez-Rodríguez

Received: 25 February 2024

Revised: 4 April 2024

Accepted: 5 April 2024

Published: 10 April 2024



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## 1. Introduction

Water scarcity is a major problem facing nearly 3.6 billion people around the world. The problem is expected to intensify as climate change becomes more prevalent globally. Although water problems are not new, they are becoming more acute as rising temperatures and climate catastrophes become more frequent and intense [1]. Human activities such as farming and urbanization have reduced places that were once preserved as water catchment areas. Even more concerning is the poor water management that generates massive waste with limited replenishment [1,2]. From the devastating droughts in Djibouti to massive floods in Bangladesh, water problems are becoming more frequent and noticeable at the individual level [2,3].

As water scarcity spreads to many places globally, climate change is exacerbating the issue. By 2050, World Vision estimates that more than 50% of the global population will be living in water-scarce areas due to climate change effects [1,4]. According to UNESCO [2], climate change is intensifying both water scarcity and other related hazards such as droughts and floods. The rising temperatures are affecting the precipitation rates and turning more places into drylands. Extreme weather events such as frequent floods are making it even more difficult for communities to access clean water for their domestic consumption. A study by Al-Shaer et al. [5] suggests that the solution to water scarcity has gone beyond community efforts. There is a need for various stakeholders to work together towards achieving a sustainable water supply. Corporations that have joined the efforts to reduce climate change and water scarcity are not only helping local communities but also building a sustainable environment for future success [1].

Through their CSR initiatives, companies are increasingly becoming part of a global effort to make more freshwater available for human consumption and avoid a potential crisis. The growing water demand has prompted many companies to participate in various global water conservation initiatives to avert a potential severe water scarcity that may impose adverse consequences on ecosystems and biodiversity [1]. In addition, many corporations and industrial complexes associate their activities with excessive pressure on water resources that may leave the world without a sustainable source of clean water for human consumption [1,2]. Corporate social responsibility allows organizations to correct their misdeeds through voluntary initiatives that would make more water available for millions of people globally [2]. Given that water supports nearly every form of life, it is not surprising to see it fall among the CSR priorities for top corporations globally.

CSR refers to an organization's ethical commitments and positive contributions to the society and environment [5]. Moreover, CSR also involves voluntary actions that companies take to address their operational issues and build better relationships with the surrounding communities [6,7]. CSR initiatives are not just for building good relationships in the hope of generating more revenue and profits, it is about understanding interconnections between businesses, people, and the planet [8]. For instance, a beverage company that uses a lot of water in its supply chain must ensure there is sufficient water supply to meet long-term needs in the communities where it operates [8,9]. Building a sustainable business environment is also good for long-term profitability. Instead of depleting resources, many corporations are seeking ways in which their operations can exert the least pressure on natural resources while generating sufficient profits for their stakeholders [10]. Corporations also want to make themselves relevant by showing concern for issues affecting society. Companies are also investing in various research and development to develop new technologies for solving societal challenges [10].

The CSR concept has gained significant prominence since the publication of economist Howard Bowen's book *Social Responsibilities of the Businessman* in the 1950s [11]. Bowen became the first economist to introduce comprehensive discussions regarding business ethics and social responsibilities [12]. The various social responsibilities that Bowen discussed included environmental conservation, ethical labor practices, volunteering, and philanthropy [12–14]. Furthermore, the growing challenges such as climate change have made these responsibilities more meaningful to businesses around the world. Businesses now consider their CSR initiatives as part of strategic investments that enable them to address social and economic challenges while improving their corporate image [14–16]. Since the 1980s, companies have mainly focused on solving issues regarding environmental pollution [14].

Taking up the water problem, although more than 71 percent of the Earth's surface is water, only 3 percent is considered fresh and safe for domestic and industrial consumption [1,16,17]. Moreover, more than 45 percent of the global population lives in places with limited access to clean and safe water for domestic use [1,18]. Water scarcity poses significant threats, including droughts and reduced access to clean water for the communities. For humans, survival without access to clean water is nearly impossible. There are also various health concerns that humans may experience if they lack access to clean water [19]. The health concerns include high child mortality rates, poor sanitation, child malnutrition, and thousands of lives being lost annually due to unsafe water [20]. Moreover, the growing exposure to drought situations may expose millions of people around the world to severe health consequences associated with unsafe water.

Water scarcity also impacts agricultural productivity and food security. Over 90 percent of global agriculture depends on seasonal rainfall patterns. Most farmers plant their seeds during rainy seasons and harvest their crops during summer seasons [21]. However, this pattern is becoming increasingly difficult to maintain for those who depend on rainfed agriculture. The growing disruptions in the seasonal rainfall patterns have been associated with climate change [22]. The significant drop in the rainfall patterns not only affects crop production but also the overall yield and food security. Many places around the world have been pushed

to the brink of starvation due to prolonged droughts and low rainfall [23]. The high cost of irrigation also prevents many farmers from using alternative sources of water to maintain their crops [24–27]. Failure to address water scarcity will expose millions of people around the world to various consequences, including preventable deaths.

The Earth's ecosystem and biodiversity are fully dependent on sustainable water supply. Guenther et al. [24] note that water is a crucial piece of the Earth's jigsaw puzzle. Removing water from the puzzle is equivalent to ending all forms of life known today [24,25]. The biggest challenge facing humanity is how to maintain this biodiversity in the face of existential threats such as climate change. Areas that have been dependent on rainfed agriculture would simply have nothing to support their existence [25]. From the ice age periods, many animals and plant species have gone extinct due to changes in weather patterns and difficulties in accessing food [28,29]. Most animals have adapted to the surrounding climate by developing features that enable them to survive extreme weather situations [30,31].

Although water problems have become more prevalent, research on potential solutions has not grown at the same pace. There is still limited knowledge and research on how corporations can use their resources to address the challenges associated with water scarcity. The CSR concept is still widely perceived as a public relations tool, rather than a conduit through which resources can be channeled to the communities that need them most.

Considering the previous research, the primary aim of this systematic literature review is to analyze the impact of CSR on sustainable water supply because previous studies have explored basic steps in these topics. In fact, there are not so many studies that contemplate these topics; rather, it is an isolated research field. In this way, it is intended to fill the gap that exists in the literature, due to the importance of these topics that allow the information to be systematized and have solutions that are easier to identify. To achieve the proposed aim, the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) method is used. This helped us concentrate on specific subject areas: CSR and sustainable water supply, aiming to identify, evaluate, and summarize all available and relevant research evidence. Evidence from this study, including the annexed case studies, may help draw more attention to CSR initiatives and encourage more corporations to join the efforts aimed at addressing water scarcity and environmental sustainability.

The question formulation is "how do CSR initiatives contribute to sustainable water supply?" Through their corporate responsibility initiatives, companies can support local initiatives while fostering effective water management. Many organizations are also transforming their business practices to minimize their impact on the environment, especially their water use in various business operations. This study focuses on the need for various corporations to join their counterparts in prioritizing responsible and sustainable practices to minimize pollution and misuse of essential resources such as water. This paper also examines various strategies that can enable corporations to optimize their CSR initiatives while creating better opportunities for generating more revenues and profit.

## 2. Literature Review

### 2.1. Understanding CSR

The CSR concept requires companies to consider the impact of their business operations on society, the environment, and profits. One must argue that businesses exist for the sole purpose of generating profits [32]. Even investors continuously look for opportunities that will help them generate maximum profits on their investments or assets [33]. However, the CSR concept comes at the intersection between sustainability and profitability. While businesses exist for the sole purpose of making profits for their investors, they cannot do so at the expense of the environment or surrounding communities [33–35]. For instance, businesses cannot deplete resources that communities consider as a source of livelihood. This means logging companies cannot cut down all the forests in a particular community because it would have significant consequences on the region's ecosystem and biodiversity [36]. Instead, logging companies have to replace the trees they cut with new ones to ensure there is a sustainable source of raw materials for their business.

Companies can demonstrate their CSR actions in three main ways. First, CSR begins with implementing environmentally friendly business activities. Most water utilities achieve this goal by reducing waste in their supply chains. Others focus on energy consumption to minimize their carbon emissions [37]. For instance, water utility companies can invest in technologies that control the flow of water along the pipes and immediately shut down the process when there is leakage [38]. This prevents water loss and financial damages that organizations may suffer due to leakages. The use of renewable energy has also become a significant approach to reducing carbon emissions. Replacing electricity with solar panels may increase the energy supply for large organizations and even minimize dependence on fossil fuels [39]. For companies that use huge volumes of water in their production, such as Coca-Cola, reducing water use and waste even by 10 percent can make a significant difference in water conservation and protection of biodiversity.

Responsible business practices also involve taking responsibility for business actions. Without CSR initiatives or ethics in business, companies may be tempted to behave in ways that promote profitability rather than the well being of local communities [39]. A good example is the case of Monsanto and the city of Anniston in Alabama. For decades, Monsanto deliberately or accidentally deposited toxic waste known as polychlorinated biphenyls (PCB) in the rivers and streams, especially affecting the low-income communities living in Anniston [40]. The company admitted to its fault after lengthy investigations revealed that this reckless action not only affected the aquatic life but also exposed residents of Anniston to carcinogenic chemicals. The company agreed to pay \$700 million to settle two lawsuits that were filed by the affected residents [41,42]. The case of Monsanto shows how companies can become irresponsible if they are not guided by clear ethical frameworks and accountability [43]. It also demonstrates that people have a responsibility to demand certain obligations that companies operating in their neighborhoods should fulfill, including cleaning the environment.

Companies also demonstrate their CSR actions by supporting local communities through various initiatives. Coca-Cola's water stewardship program is one of the most notable initiatives due to its massive impact on local communities [15,42]. In Popo Chico (Mexico), for instance, Coca-Cola has made significant investments in constructing water points and taps where local communities can access clean and safe water [16,43]. Being that the area experiences semi-arid or desert conditions, Coca-Cola has been effective in providing accessible water that local communities can use for domestic purposes. In India, Coca-Cola has been supporting more than 660,000 people through various initiatives [15,43]. The company has also been responsible for increasing water supply across 500 villages [16,43]. Supporting local communities ensures that those who cannot access clean and safe water are protected from potential health consequences, including dehydration, dysentery, cholera, and other health issues associated with water scarcity.

According to Tchobanoglous et al. [40], companies also demonstrate their CSR commitments through ethical business standards and responsible supply chains. Most of the issues related to water scarcity are associated with natural forces such as droughts and desertification [44,45]. However, companies also have their share of blame when it comes to water scarcity [45]. Although many industries depend on water to support their supply chains, very few efforts have been undertaken toward replenishing and restoring water sources that are almost becoming depleted. A study by Sonune et al. [43] shows that nearly every major global corporation has been associated with actions that can be harmful to the environment. Coca-Cola, for instance, has been blamed for massive water consumption and waste within its supply chain [5,15,46]. An appropriate response to such concerns includes demonstrating a strong commitment to ethical standards and responsible business practices. Corporate social responsibility enables companies to demonstrate their commitment to ethical standards and behaviors.

## 2.2. Strategies for Sustainable Impact

Since the CSR approach can take many forms, it also requires significant resources to maintain. Most companies may not fund their CSR activities because they have other

obligations to meet. Some companies have regular CSR activities while others only support their CSR actions once after many years [47]. To overcome the financial pressure, there are various strategies that companies can use to ensure their CSR goals are met with minimal expenditures. It is worth noting that most investors may not support CSR activities that leave them with very little or nothing to take home as dividends [48]. Moreover, many small and medium organizations may not have sufficient resources to support activities outside of their revenue generation streams [49]. The following are a few strategies that may assist organizations in making their CSR initiatives more impactful and sustainable.

The first strategy is known as partnerships for progress. This is where companies partner with local communities, governments, and non-governmental organizations to create sustainable projects. For instance, a local government may identify a suitable site for constructing a dam to increase the water supply to local towns and villages [49,50]. The local government then invites organizations and individuals who are willing to support the project for contributions [50,51]. These kinds of partnerships help in mobilizing resources and labor to support the identified projects. For instance, it becomes easier for a local government to construct a dam without forcing the local communities to pay more taxes, in addition to other financial challenges they face [49,52]. Moreover, working together helps amplify the impact of a CSR activity and raises awareness about challenges facing local communities [49,52]. Businesses can also use the opportunity to expand their networks and attract more investors and employees.

Businesses can either go for long or short-term partnerships depending on the types of projects they are willing to support. Long-term partnerships may focus on issues such as water supply and disease control [50,53]. For example, a company such as Nestle can partner with a local government or non-governmental organization to support ongoing initiatives such as cleaning rivers, building dams, and planting trees to create rainforests [54]. A lot of focus has also been shifting toward creating forests to support sustainable water supply and enabling organizations to offset their carbon emissions. The era of carbon credits has prompted many organizations to seek opportunities where they can support local afforestation projects or purchase lands where they can plant trees for various future benefits [55]. Long-term partnerships may also create economies of scale and reduce expenditures on non-revenue generation activities [56]. Short-term partnerships may be suitable for quick projects aimed at solving specific issues within a community.

Another CSR strategy is leveraging technological innovations that can be a significant game changer in the pursuit of sustainable water supply. Some of the technologies that companies can support through their CSR initiatives include water purification systems, AI-enabled monitoring devices, and data analytics [57]. Some of these technologies may be too expensive for local communities to purchase. Artificial intelligence (AI) monitoring devices can help reduce waste by analyzing the distribution system to identify potential weaknesses that can lead to frequent leakages [58]. Water utility companies rely on artificial intelligence or the Internet of Things (IoT) to monitor their distribution networks and make timely interventions to avoid losing significant amounts of water through spillages [59]. Data analytics may also assist organizations in determining the demand for water and strategies that make water supply more sustainable [60]. Businesses can support local communities by assisting them in purchasing technologies that can help them improve water conservation.

Technological innovations empower local communities and utility companies to make informed decisions and optimize their resource allocation. Sustainability requires companies to marry data with suitable AI insights to make effective decisions [61]. One of the areas affecting water supply is waste and scarcity. Even with the growing scarcity, many companies still experience significant water waste, with very limited portions of water being sent to recycling facilities [62]. To prevent waste, companies can rely on artificial intelligence or the Internet of Things (IoT) to identify potential issues within the water distribution chain. Artificial intelligence may also help in developing suitable programs for separating waste and making recycling more effective [62,63]. Rather than wasting



water, recycling can enable companies to increase water supply and reduce potential shortages [64]. It is also essential for water management companies to apply technology in developing effective plans to outline how future generations will access clean and safe water for domestic and industrial consumption.

Corporations also rely on educational initiatives to promote water conservation and hygiene. Education programs often target simple tasks that local communities can do to promote sustainable water supply [65]. The purpose of educational initiatives is to raise awareness and foster a culture of responsible water use. For instance, a company such as Nestle or PepsiCo can educate local communities about water conservation initiatives, including strategies that can be used to harvest rainwater, construct boreholes, and create sufficient reservoirs [66]. Building a culture of water conservation will protect communities from potential challenges, including diseases and health consequences associated with unsafe water [67]. However, this may take longer to achieve given that educational programs require people to have spare time and attend conferences where they can interact with various water sustainability experts.

For CSR initiatives to be effective and sustainable, companies should uphold transparency and accountability. CSR actions are considered an additional burden to the company and are usually subjected to scrutiny by the investors to ensure their money does not end up supporting irrelevant causes [67,68]. The CSR initiatives must be transparent to build significant trust with the stakeholders and demonstrate a strong commitment to achieving the desired objectives [68]. Moreover, transparent actions are likely to win the support of various stakeholders, including employees who are expected to implement the desired initiatives and strategies [68,69]. The CSR should also be monitored closely to ensure those who receive the funds do not channel them toward irrelevant or fraudulent activities [70]. Studies have shown that most CSR activities fail due to the embezzlement of funds by those entrusted at the local levels. Regular monitoring and reporting would ensure that the CSR funds are used in developing proper initiatives to ensure sustainable water supply.

### *2.3. Challenges of CSR for Water Supply*

Some of the challenges that companies may face while trying to implement their CSR objectives include lack of clarity, limited resources, resistance to change, external problems, and lack of innovation [71,72]. Lack of clarity occurs when the organization fails to explain the objectives for the CSR initiatives and what it means to the organization. Ameyaw et al. [69] argue that companies may struggle to make their CSR objectives more meaningful to their shareholders if they do not provide a clear vision, mission, and core values. It is worth noting that these CSR objectives are additional expenses that shareholders may want their company to avoid, especially when there is no clear need in the market [73]. Although CSR initiatives may help organizations build better reputations for themselves, stakeholders may not give the needed support unless the objectives are clear and measurable [74,75]. Managers may also face challenges in accounting for the resources used in various CSR projects and how they will be recovered.

Companies may overcome this challenge by developing a clear mission, vision, goals, and core values. Clarity depends on how an organization describes its CSR objectives and how it is communicated to the stakeholders. Bhunia et al. [71] suggest a problem-solving approach where an organization explains the specific problem that they plan to solve using their CSR initiative. The problem-solving approach also helps in setting clear objectives and defining measurable outcomes [75,76]. Companies should define the outcomes they want to achieve and how they would be measured. For instance, an example of a clear objective is constructing a dam to increase freshwater supply by 20 percent over the next 5 years. At the end of the stated period, the company can use the measurable goals to determine if the intended objectives were met and the remaining gaps that should be filled through future initiatives [76]. Organizations should avoid ambiguously constructed initiatives that may lead to loss of resources.

Another significant challenge that companies may face when implementing their CSR initiatives is limited resources such as funds, skilled labor, time, and technology. Most shareholders may see CSR initiatives as additional expenses and a burden that takes resources away from a company's core business activities [64,76]. While such beliefs may affect the funding of CSR initiatives, they are short sighted and often ignore the potential long-term gains that a company is likely to generate using its CSR initiatives [72,77]. Moreover, too much focus on CSR objectives may deny organizations an opportunity to invest more resources in research and development [38,39,78]. It is worth noting that a business' core objective is to generate revenue and profits for its shareholders. However, the long-term benefits of CSR far outweigh the potential costs and should not be ignored [58,79]. The CSR initiatives assist organizations in building trust and winning the loyalty of the consumers, eventually translating into more revenue.

Companies can overcome this challenge by integrating their CSR into their business strategy and operations, rather than treating it as a separate function. The CSR should be part of an organization's strategic objectives [23,42,80]. Isolating the CSR activities as different functions from the organization's core objectives creates difficulties when engaging stakeholders or sourcing funds [81]. Moreover, integrating CSR into an organization's business strategies helps in creating a culture of ethics and responsibility. It reminds organizations about their responsibility to protect the environment and communities where they operate [49,68,82]. Companies should also allocate sufficient resources to support their CSR activities. In addition, leveraging external partnerships and collaborations can assist organizations in sourcing additional funds and expertise to support their CSR objectives. Bhunia et al. [74] found that companies that use their CSR initiatives to create awareness are more likely to find suitable partners that can help them achieve their goals within a shorter duration.

A third challenge that companies may experience when implementing their CSR initiatives is resistance to change from various stakeholders, including employees, shareholders, and suppliers [23,42,83]. The CSR initiatives may force companies to change their culture and ways of doing business [84]. In most cases, companies may have to change their suppliers or force them to conform to new requirements [61,65,85]. However, not everyone is likely to accept the desired changes, especially if the changes would have a tremendous impact on their operations. Employees and suppliers are likely to resist changes they perceive as risky, costly, or inconvenient [39]. The resistance can cause significant delays and prevent companies from meeting their short and long-term objectives. Resistance can also occur due to poor communication of the CSR objectives and how they will be measured at the end of CSR projects [61,69,86]. Organizations can also face resistance from suppliers who are not ready to comply with the new regulations or environmental policies.

To overcome this challenge, companies need to begin with clear and concise communication of the objectives and measurable outcomes [87]. The rationale and benefits associated with the CSR initiatives have to be communicated to minimize potential resistance from the stakeholders [31,88]. Apart from clear communication, organizations should always vet their suppliers to ensure their business operations are sustainable before penning long-term agreements. Babiak et al. [18] argue that one of the challenges affecting large corporations is suppliers who may be unwilling to change their business operations. In addition, the cost of contracting new suppliers can also make CSR initiatives too expensive to implement [89]. Companies can also overcome resistance to change by involving all stakeholders in discussing, developing, and implementing CSR initiatives [25,90]. Collecting regular feedback from the stakeholders may also help organizations determine areas they need to correct before implementing their CSR initiatives.

Companies may also face various external challenges that can affect their CSR initiatives. Examples of the challenges that companies should anticipate include natural disasters, social unrest, wars, and pandemics [47,49,91]. Sustainable water supply initiatives are more likely to face challenges associated with natural disasters such as droughts, floods, and wildfires [48,55]. Droughts and wildfires are becoming a common experience

in many places around the world due to climate change [92]. Prolonged drought situations affect natural water sources such as streams and creeks that most communities rely on as their source of clean and safe water [59]. Drought can also affect water volumes in major reservoirs that support nearby cities and villages, exposing thousands of people to potential water crises [65,93]. Apart from droughts, CSR initiatives may also face other challenges such as pandemics such as the one that occurred in 2020 [93]. Countries with frequent political and social unrest can also make CSR initiatives very difficult to implement.

Companies can overcome this challenge by anticipating the difficulties they may face throughout the implementation of their CSR project. Companies should monitor external trends and factors that may affect their business activities and develop suitable contingency plans [67]. For instance, if a company anticipates political instability in a country where it plans to construct dams, it may have to delay the project until stability resumes in the country. It may be difficult for companies to deliver in environments where they face significant hostility [44,47]. If possible, organizations may sign long-term deals with suppliers to accommodate potential price changes that can make projects more expensive than anticipated earlier [59,63]. It is also crucial for managers to collaborate with stakeholders to address common or shared challenges [65,94]. Anticipating and monitoring potential external challenges also prevents resistance to change and may help organizations avoid potential losses.

Another challenge that may affect CSR initiatives is the lack of innovation or technologies to support the quest for sustainable water supply. Unlike other business activities, CSR is a dynamic process that may require companies to constantly change their approaches to suit emerging business challenges [67]. There has never been a one-size-fits-all or static concept that companies can use to make their CSR activities more effective or successful [22,75]. However, organizations can find themselves stuck in their daily routines with limited chances to realize their innovation potential [95]. Barriers such as limited resources may affect innovation because they limit funds that organizations can use or individuals who can be hired to implement the desired objectives [75,85]. It may also become more difficult for organizations that are facing other challenges in their mainstream business activities [41,96]. Effective planning may assist organizations in avoiding potential constraints that can limit their innovation capacity and derail their CSR objectives.

To overcome this significant challenge, companies need to encourage a culture of innovation and learning. Most organizations have reward systems that recognize and praise distinctive efforts aimed at solving issues affecting an organization [38,97]. A culture of innovation encourages employees to develop solutions to the issues affecting the organization. A reward system is more effective because it encourages employees to put additional effort into their work and conduct sufficient research [61,98]. Apart from rewards, employees should also be recognized for their unique ideas and initiatives to foster a culture of critical thinking and problem solving [62,77]. Companies need to test their CSR initiatives before they are implemented to identify potential challenges and develop appropriate contingency plans [99]. It is also crucial for local communities to appreciate the CSR initiatives and motivate the workforce to become more creative.

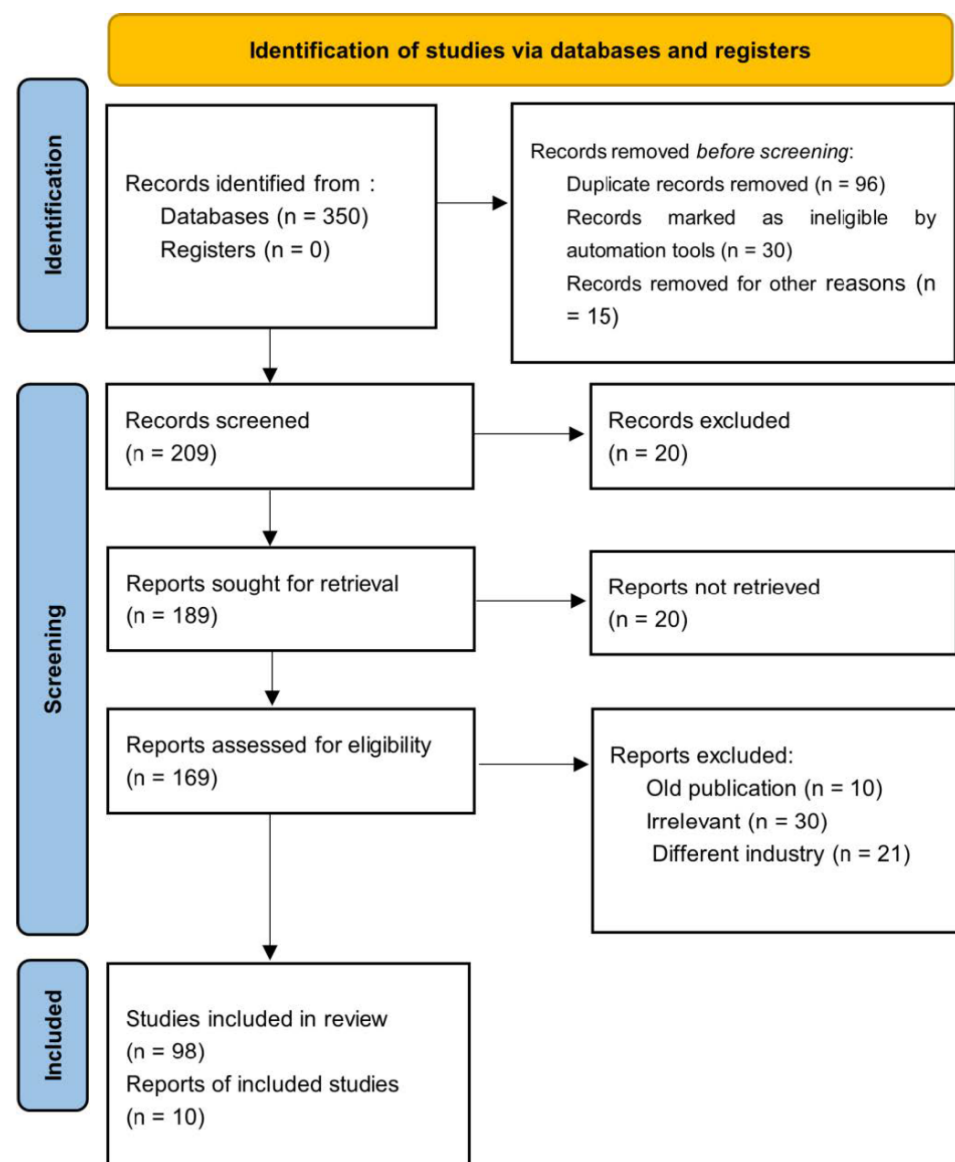
### 3. Methodology

The researcher selected a systematic review of the literature as the most appropriate methodology to analyze the impact of CSR on sustainable water supply. A systematic review is a type of qualitative research design that seeks to identify, evaluate, and summarize findings from various studies related to corporate social responsibility and sustainable water supply [48]. Systematic reviews are crucial because they make the evidence more accessible to decision-makers and can guide future researchers on areas where they need to investigate [49]. Systematic reviews can summarize large amounts of data to provide specific answers to the research questions. This method is more appropriate when researchers are seeking empirical support for a specific intervention such as corporate social responsibility [50]. Researchers can also rely on systematic reviews to identify research gaps and develop suitable studies to



fill the identified gaps. The comprehensive nature of the systematic reviews also assists in reducing selection biases and providing more objective results.

A systematic review was conducted using a framework known as PRISMA. The PRISMA checklist document is provided in the Supplementary Materials (see Table S1); see also Figure 1. The PRISMA framework enables researchers to identify specific articles based on the specified criteria [48,50]. The inclusion and exclusion criteria help in identifying the most relevant and current articles that can provide specific answers to the research questions. The PRISMA framework makes the selection process more transparent and objective by stating the various inclusion or exclusion criteria used in the study [49]. In what looks like a decision tree diagram, researchers can indicate the various databases used in obtaining articles, the number of articles found, the number of articles rejected due to duplication, and other articles rejected based on years of publication. According to Sekaran et al. [48], researchers can adjust their criteria based on the types of articles found. The researchers can also verify their research questions and hypotheses against the inclusion or exclusion criteria used in the study to enhance consistency.



**Figure 1.** PRISMA flowchart diagram showing the steps in identification, selection, and inclusion of the articles. Source: table created by the author.

### 3.1. Question Formulation

The question formulation was one of the most crucial stages in this study. A systematic review begins with developing an appropriate research question that will be answered using the evidence from the articles. The study aimed to find research articles to answer the question, “How do CSR initiatives contribute to sustainable water supply?” The research question helped in developing the hypothesis and extracting keywords that would be used across the various online databases to obtain appropriate articles. The question formulation stage also sets the tone for inclusion and exclusion criteria needed for evaluating and selecting the most appropriate articles. Question formulation is a crucial step in the literature review because it determines the methods that will be used in data collection.

### 3.2. Source Identification

The researcher conducted an online search using databases such as Scopus, Sustainability, ScienceDirect, and Web of Science. These databases contain the latest and peer-reviewed articles that researchers can use to provide suitable answers to their research questions. Studies published between 2010 and 2023 were deemed appropriate for this study because they provide the most current information. The keywords used in conducting online searches include “sustainability, corporate social responsibility, water supply, and water management”. Boolean operators assist in combining various keywords when conducting online searches to produce more accurate results. For instance, the Boolean operators helped in combining sustainability with corporate social responsibility and water supply. Combining the search keywords minimizes ambiguity and enables researchers to obtain more accurate articles. The researcher also relied on the snowball method to identify more sources using the reference list from the selected articles.

This study used both backward and forward snowball methods to improve the quality of the articles. Backward snowballing is where researchers analyze the reference list of an identified study and exclude articles that do not fall within the inclusion criteria. Backward snowballing is more appropriate when there are limited sources that can be obtained from the direct application of the keywords. Forward snowballing identifies sources based on the citations. The researcher relies on the citation track available on the Scopus website or ScienceDirect to track all the sources that have cited the work. This helps in obtaining more relevant and most recent peer-reviewed articles. Sources were also obtained using information regarding the authors, years of publication, and citations. The most cited articles are preferable because they show significant trust among researchers. Researchers eliminated potential biases by objectively following the keywords and only rejecting articles that fall outside the inclusion criteria.

### 3.3. Source Selection and Evaluation

The source selection involves identifying and selecting the most appropriate articles to answer the research question. The PRISMA framework helped in narrowing the search and selecting suitable articles for the study. The PRISMA method involved four stages beginning with the source identification. For this study, the most relevant articles were obtained using keywords such as “corporate social responsibility” and “sustainable water supply”. Combining the keywords in the search engines helps in finding the most suitable articles using Boolean operators [49]. Both backward and forward snowballing techniques were used to enhance the source identification process. Authors’ names and citations also helped in identifying articles from various online databases.

The second phase involved screening the articles to ensure they fall within the inclusion criteria. According to Snyder [50], the screening process can be cumbersome and time-consuming unless the researchers adopt suitable techniques to make the work easier. The most common screening techniques used by the researchers include reviewing the article title and abstract before moving to the full text [49,50]. The abstract often contains summarized background information, methods, findings, and conclusions. Researchers can use the information to determine whether or not the findings provide appropriate answers

to the research question [48]. In some cases, the researcher contacted the investigators to clarify areas with insufficient information. The screening helped in eliminating records and prioritizing the ones with the most relevant answers to the research question.

The third step involved using the inclusion criteria to determine whether an article should be included in the study or rejected. The inclusion criteria included relevance to the research question, recent publication (within the last 10 years), primary study, clear methodology and findings, sample size, and geographic characteristics. These inclusion criteria were developed based on the research purpose and the desired outcomes. The aim was to identify articles that demonstrate how CSR initiatives have been used to enhance sustainable water supply. This study also considered articles that outline challenges that affect the application of CSR initiatives in driving sustainable water supply. The inclusion criteria helped in eliminating various articles that were either duplicates or slightly irrelevant to the study's title and objectives.

The final phase involved turning the inclusion criteria into metrics that can be used to evaluate the articles during the screening process. The researcher found that it was difficult to eliminate certain articles without being a victim of information bias and other forms of biases [49]. To avoid this challenge, the researcher developed metrics that were used to evaluate each article and assign a score that would be used in ranking [50]. Articles were assigned numbers between 1 and 10 based on their relevance to the topic and study objectives. The PRISMA framework proved effective in the selection and evaluation of all the articles. A flow diagram showing the application of the framework is shown above (Figure 1).

### 3.4. Data Analysis

Thematic analysis was the chosen approach for analyzing all the articles and providing effective answers to the research question. The main steps in thematic analysis include familiarization, coding, generating themes, reviewing themes, defining themes, and developing the final write-up. The PRISMA model covered most of the steps that should be observed under thematic analysis. For instance, familiarization occurred during the screening and evaluation of the articles to determine their eligibility. A total of 33 articles that were selected for analysis met the inclusion criteria and were used in developing the final write-up. The next phase after familiarization involved developing codes as they emerge in the abstract and full-text review. The method of analysis used in this study involved developing themes and searching for codes in the abstracts and full-text reviews. While this method may appear to operate in reverse, it is appropriate when there are themes already developed from the main topic or research question.

It was also crucial for the researcher to examine the reliability and validity of the study to ensure the evidence can be used in supporting future decisions. Once the studies were selected based on the inclusion and exclusion criteria, it was crucial to assess the risk of bias using the GRADE (Grading of Recommendations, Assessment, Development, and Evaluations) tool. GRADE is more appropriate when assessing the risk of bias in systematic reviews because it examines the features of the design, conduct of the study, and empirical evidence to determine whether there is a high, low, or moderate risk of bias. The GRADE tool also conducts a full-text review to ensure the content and methodology align with the stated empirical evidence. The assessment of bias helps in eliminating various concerns that can affect the validity and reliability of the study.

## 4. Results

The PRISMA model helped in evaluating and filtering the articles to ensure only the most relevant ones were included for further analysis. Content validity helped in creating the following table with minimal or no errors in the arrangement and analysis. The aim was to determine the impact of CSR on sustainable water supply. The summarized findings appear in Table 1.

Table 1. Selected article.

Title	Type of Document	Authors and Date	Findings
Environmental corporate social responsibility of firms in the mining and oil and gas industries: Current status quo of reporting following GRI Guidelines.	Journal Article	Guenther et al., 2006 [24]	Found that companies within the oil and gas industry have developed various CSR initiatives to support local community projects, including building reservoirs to improve water supply.
Corporate social responsibility and the environment: A theoretical perspective.	Journal Article	Lyon et al., 2008 [17]	This article describes various CSR initiatives aimed at protecting the environment and improving water supply. The article demonstrates how CSR initiatives support local community projects such as building dams, hospitals, and cleaning rivers to improve water supply and hygiene.
Corporate social responsibility in the oil and gas sector.	Journal Article	Frynas, 2009 [25]	The author describes the oil and gas industry as one of the major sources of pollution and carbon emissions. Companies in the oil and gas industry try to build better reputations using their CSR initiatives, such as cleaning rivers, educating communities about water conservation, and encouraging young people to advocate for sustainable water supply.
A revised approach to water footprinting to make transparent the impacts of consumption and production on global freshwater scarcity.	Journal Article	Ridoutt and Pfister, 2010 [38]	This study found that CSR initiatives have made significant contributions towards addressing water scarcity challenges in various communities around the world. Leading companies in CSR initiatives include Coca-Cola, Unilever, PepsiCo, and Nestle, among others.
CSR and environmental responsibility: Motives and pressures to adopt green management practices.	Journal Article	Babik and Trendfilova, 2011 [18]	This study argues that CSR initiatives enable companies to demonstrate a strong sense of responsibility towards the environment. The article also indicates how companies use their CSR initiatives to enhance water supply in areas with severe water scarcity.
Impact of Corporate Social Responsibility on Financial Performance of Corporations: Evidence from Pakistan.	Journal Article	Iqbal et al., 2012 [46]	This study investigated the impact of corporate social responsibility on financial performance. The findings indicate that CSR initiatives improve long-term financial performance through consumer loyalty as a measure of reciprocity.
The Corporate Social Responsibility-financial performance link in the US restaurant industry: Do economic conditions matter?	Journal Article	Lee et al., 2012 [73]	This study also examined the impact of CSR on financial performance in the restaurant industry. The outcomes indicate hotels and restaurants demonstrate CSR initiatives through responsible business practices, including reduced water consumption.
Methods and tools for managing losses in water distribution systems.	Journal Article	Mutikanga et al., 2012 [94]	This study found that most water utility organizations are implementing AI in their supply chains to monitor water distribution, identify leakages, and reduce losses. AI is an effective method for proactive water management.

Table 1. Cont.

Title	Type of Document	Authors and Date	Findings
Assessing Sustainable Behavior and its Correlates: A Measure of Pro-Ecological, Frugal, Altruistic and Equitable Actions.	Journal Article	Tapia-Fonllem et al., 2013 [57]	This study found that sustainable behaviors that improve water supply include reducing water loss, recycling and reusing wastewater, and building mega reservoirs to harvest rainwater and support communities during scarcity. The study also suggests personal initiatives such as checking toilet leaks, taking shorter showers, and installing water-saving showers can enhance sustainability.
Integration of water footprint accounting and costs for optimal chemical pulp supply mix in paper industry.	Journal Article	Manzardo et al., 2014 [82]	This study found that most corporations have leveraged technology in their CSR approaches to drive performance and create additional water sources. Integrating water footprint into organizational operations also minimizes potential water losses.
Environmental corporate social responsibility (ECSR) as a strategic marketing initiative.	Journal Article	Nik Ramli Nik et al., 2014 [21]	This study found that environmental corporate social responsibility (ECSR) is both effective in strategic marketing and in improving water supply in communities with scarcity. ECSR also ensures organizations have sufficient water supply to support their operations.
Groundwater modeling for need assessment of command scale conjunctive water use for addressing the exacerbating irrigation cost inequities in LBDC irrigation system, Punjab, Pakistan.	Journal Article	Basharat and Tariq, 2015 [89]	This study describes how various Indian communities are using groundwater for irrigation and domestic use. Groundwater has become a significant source for addressing exacerbating irrigation cost inequities for low-income communities.
Sustainability of Water Safety Plans Developed in Sub-Saharan Africa.	Journal Article	Rondi et al., 2015 [90]	This study examined various sustainability and water safety plans that have been developed across sub-Saharan Africa to improve water supply. Through CSR initiatives, major corporations across sub-Saharan Africa have partnered with local administrations to build dams, boreholes, and clean rivers to make more clean and safe water available for domestic and industrial use.
Circular economy and the opportunity cost of not ‘closing the loop’ of water industry: the case of Jordan.	Journal Article	Abu-Ghunmi et al., 2016 [80]	This study found that CSR initiatives support a circular economy by closing loops created by income inequalities. Most CSR initiatives target communities with higher chances of facing water scarcity based on their geographical locations and income challenges.
A fuzzy approach for the allocation of risks in public–private partnership water-infrastructure projects in developing countries.	Journal Article	Ameyaw and Chan, 2016 [69]	This article supports the implementation of public–private partnerships when funding water infrastructure projects to make them more impactful. Most developing countries can benefit from such initiatives because they have significant populations at high risk of experiencing water scarcity.



Table 1. Cont.

Title	Type of Document	Authors and Date	Findings
Integrated, Decentralized Wastewater Management for Resource Recovery in Rural and Peri-Urban Areas.	Journal Article	Capodaglio, 2017 [54]	This article supports decentralized wastewater management to target rural areas with disproportionately larger populations at risk of facing water scarcity, starvation, and health challenges. Decentralized wastewater management also assists local communities in understanding the value of water conservation.
LCA of greywater management within a water circular economy restorative thinking framework.	Journal Article	Dominguez et al., 2018 [76]	This study encourages a renewed focus on a water circular economy to drive sustainable water supply. Corporations can rely on their CSR initiatives to support local communities in building sufficient sewerage treatment plants to convert wastewater into clean and safe water for domestic and industrial use.
Managing Water Sustainability: Virtual Water Flows and Economic Water Productivity Assessment of the Wine Trade between Italy and the Balkans.	Journal Article	Miglietta and Morrone, 2018 [27]	This study describes how people in Italy and the Balkans are using virtual water flows and productivity assessments for effective management of water sustainability. The study demonstrates how technology can help in monitoring water flows, identifying potential leakages, and reducing losses.
Water Footprint in Supply Chain Management: An Introduction.	Journal Article	Vlachos and Aivazidou, 2018 [70]	This study argues that incorporating water footprint in supply chain management is effective in driving sustainability. Water footprint measures and records the amount of water used to produce each product or service. This enables organizations to reduce their water consumption and promote sustainable water supply.
Integrated Supply Network Maturity Model: Water Scarcity Perspective.	Journal Article	Yatskovskaya et al., 2018 [30]	This study argues that the network maturity model can assist corporations in addressing water scarcity by monitoring the water flow, addressing areas of waste, and recommending solutions. The supply network maturity model is based on experience and timely interventions.
Materiality analysis in sustainability reporting: A tool for directing corporate sustainability towards emerging economic, environmental and social opportunities.	Journal Article	Calabrese et al., 2019 [4]	Achieving a sustainable water supply can be made easier using materiality analysis and reporting. Organizations require materiality analysis tools to direct their CSR initiatives to specific areas where there is a need.
Sustainability-oriented capabilities for eco-innovation: Meeting the regulatory, technology, and market demands.	Journal Article	Demirel and Kesidou, 2019 [13]	This study argues that organizations can achieve sustainable water supply by meeting regulatory obligations and market demands and leveraging technology to create an innovative business model. The study argues that CSR initiatives should be part of an organization's mission and core values.
Filtration Process and Alternative Filter Media Material in Water Treatment.	Journal Article	Cescon and Jiang, 2020 [11]	This study suggests wastewater treatment and reuse as an effective strategy for achieving sustainable water supply. Wastewater treatment ensures that nothing goes to waste while creating additional water and minimizing pressure on the natural sources.

Table 1. Cont.

Title	Type of Document	Authors and Date	Findings
Greenhouse gases and circular economy issues in sustainability reports from the energy sector in the European Union.	Journal Article	Janik et al., 2020 [100]	Greenhouse gas emissions remain a significant challenge associated with climate change and rising global temperatures. To achieve a sustainable water supply, organizations need to channel their CSR initiatives towards addressing problems associated with greenhouse gas emissions. Without greenhouse gas emissions, the global water supply is likely to grow, bringing rainfall even to places that have been condemned to desertification for centuries.
Communicative action and supportive behaviors for environmental CSR practices: An attitude-based segmentation approach.	Journal Article	Li et al., 2020 [23]	This study supports environmental CSR practices as an effective strategy for achieving a sustainable water supply. The ESCR activities include reducing carbon emissions, building dams and sewerage treatment plans, and supporting local communities to access clean and safe water.
Investigating the relationship between corporate social responsibility and market, cost, and environmental performance for sustainable business.	Journal Article	Suganthi, 2020 [6]	This study investigated the relationship between CSR and environmental performance for sustainable businesses. The study shows ways in which corporate social responsibility supports various environmental initiatives, including planting trees, removing plastic waste from the rivers, and minimizing chemical exposure by safely disposing their toxic industrial waste.
Corporate Environmental Impact: Measurement, Data and Information.	Journal Article	Freiberg et al., 2021 [101]	This study supports the incorporation of data analytics in measuring the impact of corporate social responsibility. Data analytics enable companies to measure their impact and make adjustments to address areas of need.
Environmental Corporate Social Responsibility (ECSR) on the Example of Polish Champion Oil, Gas and Mining Companies.	Journal Article	Suska, 2021 [34]	This study argues that oil and gas companies should invest more resources in CSR initiatives to address challenges created by their business activities. Greenhouse gas emissions contribute significantly towards climate change and declining water supply in many places globally.
Sustainability Reporting beyond the Business Case and Its Impact on Sustainability Performance: UK Evidence.	Journal Article	Al-Shaer and Hussainey, 2022 [5]	The authors suggest sustainability reporting and using case studies to demonstrate the impact of CSR initiatives on the local communities. This may encourage more corporations to spare part of their profits to support local communities and improve their business activities.
A systematic review of circular economy research in the construction industry.	Journal Article	Osobajo et al., 2022 [64]	This study supports the circular economy achieved by treating wastewater and making the effluent available for reuse at home and in industries. The circular economy ensures there is sufficient water supply to support communities through severe scarcity and other challenges.

Table 1. Cont.

Title	Type of Document	Authors and Date	Findings
Sustainable Water Management with Design and Economic Evaluation of Recycling Greywater at Abu Dhabi University—A Case Study on Decentralization.	Journal Article	Madhuranthakam et al., 2023 [102]	Sustainable water supply can be achieved by recycling wastewater (greywater) using the latest technologies to remove suspended chemicals and organic waste. Creating alternative sources of clean and safe water reduces pressure on natural resources and prevents a potential scarcity or crisis.
Sustainable Approaches for Wastewater Treatment: An Analysis of Sludge-Based Materials for Heavy Metal Removal from Wastewater by Adsorption.	Journal Article	Rajakaruna et al., 2023 [35]	This study examined various sustainable approaches to wastewater treatment and reuse. The study found various sustainable approaches, including wastewater repurposing, the use of clean energy sources, and decentralizing wastewater treatment to rural areas. Corporations can also partner with non-governmental organizations to build better sewerage plants.
Statistical Analysis of Climate Trends and Impacts on Groundwater Sustainability in the Lower Indus Basin.	Journal Article	Ahmed et al., 2024 [88]	The authors suggest using groundwater as a strategy for enhancing supply in areas with water scarcity. The various CSR activities should focus on addressing various factors associated with climate change to limit the effects on water sources. Groundwater provides sufficient supply to meet domestic and even industrial needs.

## 5. Discussion

### 5.1. Water Conservation

This study found that corporations enhance water sustainability by adhering to the triadic framework of environmental, ethical, and economic responsibility. Environmental responsibility examines an organizational capacity to protect the environment from potential harm emerging from business activities [78]. Environmental responsibility enables businesses to use natural resources as raw products in their business operations without the risk of depletion. Ethical or philanthropic responsibility requires corporations to examine the impact of their business activities on the surrounding populations [79]. Incorporating ethics in business operations enables organizations to avoid behaviors that can risk people's lives and damage the organization's reputation. An ethically responsible business also creates a culture that encourages employees to uphold business core values in their activities [80]. Economic responsibility reminds organizations about their core objective of generating revenue and profits for the business owners, shareholders, and other stakeholders [78,81]. Businesses must generate sufficient income to support their daily operations and meet other obligations, including paying salaries and servicing debts.

There are many factors to consider when formulating an appropriate question for this study.

According to Ameyaw et al. [69], CSR initiatives enhance the achievement of sustainable water supply through conservation. The primary aim of water conservation is to increase the amount of water available for current and future use. Conservation efforts try to reduce pressure on natural resources by reducing waste, minimizing pollution, and creating alternative water sources [69,81]. Natural water sources such as streams and rivers are becoming less sustainable due to prolonged droughts and massive waste by nearby communities and companies [82]. Some rivers are also choking on heavy plastic waste that remains a significant menace to aquatic life. To ensure rivers remain sustainable, one of the CSR initiatives has been aimed towards minimizing waste. This includes leveraging modern technology to monitor water use and improve demand–supply management. Some corporations have also created recycling facilities to minimize water waste from areas such

as car wash facilities and industrial production [83]. Coca-Cola is one of the corporations that has established water recycling facilities to provide sufficient water for cooling its machines and reducing waste.

Another significant water conservation strategy is creating alternative sources to minimize pressure on natural resources. Many places do not have a sustainable supply of freshwater because a lot of it goes to waste and there are very limited efforts to replenish the natural sources [3,83]. An example of an alternative water supply is wastewater recycling and reuse. Wastewater from toilets, car wash, and the kitchen can be collected and directed to a reservoir where it is treated and channeled back to the community for reuse [3,82]. For a long time, wastewater recycling and reuse have been described as one of the most effective strategies for enhancing sustainable water supply for the coming decades and centuries. The wastewater recycling market has also been growing steadily, showing a significant rise in demand around the globe [3]. In 2022, for instance, the industry was valued at \$54.7 billion. However, the industry has been growing at a compound annual growth rate (CAGR) of 5.2% and is expected to reach \$89.7 billion in 2032 [3]. This significant growth rate indicates significant interest from global players who are determined to achieve sustainable water supply.

Wastewater recycling and reuse have been effective in reducing air pollution, water pollution, and tapering the need for landfills. However, one of the areas where wastewater reuse is becoming more effective is the sustainable water supply [3,84]. Water used in kitchens or bathrooms often goes to waste despite various technologies that have been made available to convert them back to reuse. Wastewater recycling undergoes various stages, including primary sedimentation, biological processes for removing organic impurities, and chemical processes to remove potential toxicants [86]. The recycled water, known as effluent, can be discharged back to mainstream use to support agriculture through irrigation [3,87]. It can also be channeled to factories for cooling machines and supporting other production requirements. The treated water can be used at home for watering lawns, flushing toilets, and cleaning floors [88]. Nutrients obtained from wastewater can also be converted to organic fertilizers to support crop production. Instead of allowing massive water to go to waste, local communities can create alternative sources through recycling and reuse.

However, wastewater recycling is highly technical and can be too costly for various communities. Through their CSR initiatives, companies are assisting local communities in creating wastewater treatment facilities to boost water supply for domestic and industrial use [89]. Various non-governmental organizations have partnered with corporations to provide sustainable wastewater treatment facilities in areas that experience water scarcity. The John Oliver Memorial sewage treatment plant in Danbury, Connecticut is one of the major examples of wastewater treatment facilities created through CSR initiatives [3,90]. Construction of the facility began in 2019 and was completed in late 2020. The facility has sufficient capacity to treat more than 950,000 L of water daily and make the effluent available for reuse [3,91]. The sewage treatment plan enables the communities living around Danbury to transform their wastewater into other products that can be used for domestic and industrial purposes.

At a \$127 million budget, the John Oliver Memorial sewage treatment plant demonstrates how companies are willing to sacrifice their profits for the benefit of their surrounding communities [3]. The Danbury municipality only paid a small part of the cost and left the rest to various organizations that came in to support the project. CSR initiatives demonstrate the passion that organizations have for improving the lives around their businesses [3]. The willingness to sacrifice part of an organization's profit to support local communities demonstrates passion and something that consumers can only repay through loyalty [3,87]. Water conservation through wastewater treatment supports communities and even prevents the spread of potential waterborne diseases [88]. The treated water can support various activities, reducing the pressure on the natural sources. Treated water also

enables communities to access various by-products such as fertilizer, biogas, and electricity among other benefits.

Various companies have also demonstrated their commitment to making more treated wastewater available for consumption by providing affordable technologies and tools that can be used at home or in industries. For instance, Ecolab has become a global leader in providing water hygiene and infection prevention solutions throughout the world [89]. The Minnesota-based company operates in more than 170 markets globally and has become a significant player in providing various products used by local communities to clean their water and make it safe for drinking [90]. Apart from Ecolab, another company known as the Veolia Group has also become a global player in providing wastewater treatment solutions. The aim is to assist as many communities as possible to access clean and safe water for their domestic and industrial purposes [91]. Toshiba Water Solutions is another organization that has been working with local communities in India and Africa to provide wastewater treatment solutions [92]. The above companies are among the numerous organizations that have dedicated their efforts to providing wastewater treatment solutions to achieve a sustainable water supply.

Wastewater treatment solutions can be expensive and difficult to acquire among low-income communities. Through various CSR initiatives, many corporations are supporting local communities to acquire various technologies and solutions they require for wastewater treatment [93]. Apart from sourcing technologies, corporations are also supporting local communities in constructing sufficient sewage treatment facilities with assistance from the local municipalities. Although wastewater treatment facilities can be used for generating electricity, it is an elaborate and costly process that many communities may not be able to afford [23,93]. Instead, partnerships with non-governmental organizations have enabled many communities to acquire solar panels that can be used to power treatment plants. Apart from the partnerships, some corporations engage local community leaders and work with them toward sourcing funds and constructing wastewater treatment facilities [11,94]. The CSR initiatives improve the relationships between corporations and the surrounding communities, enhancing the chances of generating more profits for supporting other initiatives.

Water conservation drives have been part of CSR initiatives among major organizations around the world. To understand how water conservation supports communities, India provides one of the best examples. This is a country with access to only 4% of the world's freshwater supply, despite its huge population of 1.4 billion people [15,90]. Water scarcity has been a major problem affecting various communities across India, with the most affected cities being Bangalore, Chennai, and New Delhi. However, the problem is even worse in villages where communities depend on water for irrigation and agricultural production [15,16]. Achieving sustainable water supply has been a major problem facing the country [16,72]. However, the various CSR initiatives across the country are turning the tide and giving hope to communities that have been devastated by droughts for decades.

Hindustan Unilever is among the Fast-moving Consumer Goods (FMCG) companies that require a heavy water supply to manufacture various products. The FMCG industry is among the heavy water consumers that require a constant supply of freshwater for production [94]. Companies within the FMCG industry have been making significant contributions to increase freshwater supply and reduce pressure on natural resources. The Hindustan Unilever Foundation is the company's division that runs various CSR initiatives across India [95]. When it comes to water conservation, the Hindustan Unilever Foundation has achieved significant milestones, making it one of the leading corporations with the most impactful CSR initiatives. The company's CSR initiatives focus on water conservation, community-based water governance, and efficient use of water in agriculture [96]. The company believes that agriculture is a major consumer of freshwater from the nearby rivers or lakes. However, due to poor irrigation methods, most water ends up going to waste with limited agricultural produce to show for it [97]. The traditional irrigation methods also draw excess water from the nearby rivers and lakes and do very little to replenish the wasted water.



To address this challenge, Hindustan Unilever partnered with another organization known as Maharashtra Institute of Technology. The aim was to transfer the company's technology to rural areas where it can support local communities to improve irrigation and minimize water waste [82,83,90]. This innovative scheme diverts water from the nearby streams and rivers to irrigate the surrounding farms. The technology enables the community to monitor the amount of water needed to irrigate the farms and stops the machine when the daily quotas are met [92]. This prevents water waste and reduces pressure on natural water sources such as rivers and streams. The new irrigation scheme also enables farmers to determine the exact quantities they need for specific crops [21,29,81]. The traditional irrigation methods or one-size-fits-all approach has proven ineffective for most local communities because it ends up destroying crops and the much-needed water that should be conserved for sustainable use.

This scheme has been a significant success based on the information provided by the Hindustan Unilever Foundation. Among its significant achievements is 450 billion liters of water conserved through improved demand–supply irrigation management [3,7,11]. Instead of using the traditional irrigation system, the new approach encourages farmers to leverage technology in their irrigation schemes and reduce water waste. Through the improved irrigation scheme, the Hindustan Unilever Foundation has been teaching the local communities how to improve crop yield, even with limited water supply [15]. This success has been demonstrated by more than 650,000 tons of additional crop yield generated through the improved irrigation system [3,33]. The scheme has also created significant employment opportunities for individuals who are working in the farms and factories that produce the technology used in the farms for irrigation [3,84]. The Hindustan Unilever Foundation project demonstrates how local communities can enhance sustainable water supply through technology-based water conservation strategies.

## 5.2. Water Stewardship

Water stewardship refers to using water in ways that make it environmentally sustainable, equitable, and economically viable. The growing water scarcity has made stewardship more meaningful to various communities because it enhances sustainable water supply [19,41,97]. Coca-Cola is one of the companies with massive water consumption in its supply chain. Water is one of the most critical raw materials for the company's value chain. However, the company is also concerned about the growing water scarcity and the possibility of affecting future business operations, notwithstanding the detrimental effects on the local communities [15,16,33]. The company has rolled out an elaborate water stewardship program through its Coca-Cola Foundation. The company's stewardship program supports the relationship between water and communities, water and the company's value chain, and partnering for a purpose [16,98]. Under its water and communities, the company acknowledges that nearly 4 billion people around the world are facing severe water scarcity and require an immediate response to prevent detrimental consequences.

Under its Partnering for Progress program, Coca-Cola has made significant steps in developing strategic partnerships to access more funds and reach out to various communities globally. Since the program began, the company has partnered with various organizations, including the World Wildlife Fund, Nature Conservancy, and the 2030 Water Resources Group [15,93]. The company is committed to expanding its strategic partnerships with other organizations with shared goals and objectives. In 2007, the company became part of the United Nation's CEO Water Mandate, which provides information on various aspects of conservation and stewardship [97]. The partnerships enable Coca-Cola to optimize its CSR initiatives by providing access to more resources, skills, and technology. Coca-Cola's CSR initiatives support local communities in India, Mexico, Africa, the Middle East, and other parts of the world [16,98]. The company also demonstrates the significant impact of partnerships on achieving the desired CSR goals. Partnerships also help organizations minimize their expenditures on CSR drives by encouraging collective responsibility.

The three main goals of water stewardship can be summarized using the three Rs: reduce, reuse, and reserve. The reduced aspect of water stewardship examines various strategies that organizations can use to minimize water waste and consumption [53]. The reduction can be achieved in many ways, including performing regular audits of water use, protecting systems against water waste, minimizing water use in cooling machines, and monitoring the processes to make prompt interventions whenever there are leakages [63]. Reducing water loss has also been made easier using artificial intelligence technologies such as the Internet of Things (IoT). The IoT can help in monitoring water use, and process efficiency, and identifying potential issues that should be addressed [72]. Unlike traditional mechanisms, the use of artificial intelligence helps in planning and preventing waste through spillages. Corporations should create a culture that discourages water misuse to protect natural resources from potential depletion.

The second aspect of water stewardship is reuse. According to Alamgir et al. [96], water reuse is an effective approach that protects natural resources by reducing waste. Instead of wasting billions of liters of water from manufacturing facilities, companies can create wastewater treatment facilities to return more water to circulation [70,97]. Various organizations have created wastewater treatment facilities with the help of local partners to minimize waste and enhance sustainable water supply. In Topo Chico, Mexico, Coca-Cola has a water treatment plant that supplies billions of liters of water every year to the surrounding communities free of charge [71]. The company developed the facility as one of its ways of appreciating the support from the Topo Chico area where the company has established one of its bottling facilities [15,27]. Coca-Cola argues that its wastewater treatment facilities generate more than 173 billion liters of water that the company re-channels back to circulation through bottling services [15,93,97]. The company's wastewater treatment facilities demonstrate a strong commitment to reducing waste and enhancing sustainable water supply.

The third aspect of water stewardship involves water preservation or conservation. According to Shah et al. [97], sustainable water supply can only be achieved by minimizing waste and reducing pollution. For communities that are struggling with severe water scarcity, companies can rely on their CSR initiatives to provide long-term solutions such as building large reservoirs for storing water and enhancing accessibility [29,96,98,99]. Part of the water stewardship mission is to use water in ways that make it socially equitable. Living in areas that experience severe water scarcity is usually associated with social problems such as poverty [72,83,102]. Building reservoirs enhances equitable water distribution by enabling low-income populations to access safe drinking water for domestic purposes. The reservoirs may also help local communities to minimize various health challenges associated with water scarcity [90,98,99,102]. CSR initiatives have also been significant tools for educating local communities about water conservation and waste reduction.

According to Yalçıntaş et al. [95], climate change remains the most significant threat facing water supply around the world. Nearly 40% of the current water scarcity problems can be attributed to climate change effects, including prolonged droughts, flooding, and poor rainfall patterns. The Peruvian "Water Security and Climate Change Adaptation Project" is addressing the challenge by converting the glacier-fed river basins into sustainable water sources [2,98,102]. This project has won the support of local communities that are assisting government agencies and corporations to identify glaciers that have been swept down to the river basins and convert them into dams [2,98,103]. The project has doubled the water supply for the surrounding communities and nearby urban areas [2,103]. The support from various corporations has enabled the Peruvian government to adopt innovative technologies for melting glaciers and cleaning the water to make it safe for both domestic and industrial applications [2,104]. The initiative is designed to increase water supply across the country by more than 20 percent over the next 5 years.

In South Africa's Cape Town, water supply to the city's over 4 million residents has become a significant challenge. The city has been grappling with various challenges, including pollution, frequent damage, and climate change [104]. Being a port city, Cape

Town should not consider water scarcity as one of its major problems. However, its massive ocean water has not been readily available for drinking and industrial use due to various issues, including pollution. Moreover, the city has not invested sufficient resources for water desalination, making the seawater difficult to consume for the surrounding communities [104]. However, there is one initiative that has attracted global attention and may be used in other parts of the world. The city implemented a proactive initiative to avoid a period known as “Day Zero”. According to Shah et al. [97], Day Zero refers to the period when taps run completely dry. The proactive initiatives include demand management, infrastructure upgrades, and behavior change campaigns. The behavioral change programs were particularly effective in minimizing domestic water waste, especially in areas such as watering gardens and cleaning pavements.

Turning water problems into solutions has been a major slogan for CSR initiatives around the world. In India, for instance, the Jal Jeevan Mission has made a strong commitment to provide all households in Kerala and other cities with safe and adequate drinking water through individual household tap connections by 2024 [105]. This CSR initiative has been making waves across India and promises universal access to water supply. Through this initiative, various people living in places with inadequate water supply across India have been assisted using functional household taps [105]. The individuals and corporations behind the Jal Jeevan Mission emphasize community participation, technological innovation, and decentralized water management [105]. The mission has prioritized the use of artificial intelligence to help in surveillance, monitoring, and control of water supply to avoid waste [105]. Through AI, the management can accurately predict water consumption, detect problems within the transportation pipes, and provide timely solutions to avoid the mass wastage of water.

The Earth is one of the most beautiful planets with adequate water bodies, including rivers, lakes, and oceans. Despite water covering more than 70% of the Earth’s surface, its supply to the human population remains inadequate [95]. The CSR initiatives are among the global efforts to make safe and clean water accessible to those who need it most [98]. The Pacific Water and Wastewater Association (PWWA) is among the non-profit organizations working round the clock to enhance water supply around the world. The PWWA was established in 1994 to tackle water challenges using collective resources [106]. The organization has mobilized resources from various governments and corporations around the world to support its initiatives. The organization is also conducting education and awareness to develop more water activists around the world [106]. Its major programs include benchmarking, capacity building of utilities and governance, an annual conference and expo, a young water professional program, and a ministerial forum.

Even with growing CSR initiatives, there is a need for collective or communal support to enhance sustainability. According to Khan et al. [93], sustainable water management is still elusive in various cities and local administrations. Even water utilities have failed to adopt innovative technologies to reduce waste associated with spillages, theft, and damages or sabotage. In Mexico, the “National Program for Water Sanitation” is driving sustainability by addressing water scarcity challenges in marginalized areas [81,98]. Being a significantly large country with more than 30 percent of the population facing imminent water scarcity, the national program for water sanitation has become a game changer for many communities. The program has been effective in mobilizing resources and building facilities to enhance rainwater harvesting and small-scale treatment plants, and developing suitable technologies to enhance equitable water supply [107]. The Mexico project has made clean and safe water available to more than 20,000 households across marginalized areas where water scarcity remains a significant challenge.

According to Alamgir et al. [96], tackling urban water challenges remains a significant challenge for various municipalities. A lot of water waste occurs due to poor management of transportation materials, including pipes and household taps. The problem can be exacerbated by the informal settlements where surveillance, monitoring, and control become too difficult due to rampant theft and destruction of the water infrastructure [97,105]. In Nairobi, Kenya,

the city's water utility company has made significant efforts to enhance the supply of safe drinking water to those who need it most. The Nairobi Water and Sewerage Company is tackling the challenge using innovative financing models, building water kiosks, and partnering with local organizations to enhance monitoring and reporting of damages to any part of the water infrastructure [108]. This enables timely response to water spillages and improving the infrastructure to minimize waste. The water kiosks bring water closer to the people and offer a cost-effective mode of supply to the informal settlements.

### 5.3. Responsible Supply Chain

The CSR initiatives have largely been associated with financial support to local communities. The common paradigm is that corporations can only demonstrate their passion for solving issues affecting communities through financial support [93,96]. While most CSR initiatives involve financial support, there is more that companies can do without spending significant resources in supporting local communities in the markets where they operate. In addition, small and medium organizations have not been active in supporting CSR initiatives due to limited resources [61,73]. The organizational structures for small and medium companies leave major decisions in the hands of fewer people, minimizing the general concern for the common good [75,94]. Researchers have done a tremendous job in transforming the paradigm to focus on the specific actions that companies can implement within their supply chains to enhance sustainability [96,98]. Even small and medium organizations can focus on various activities and decisions they should make to enhance sustainability.

Sustainable water supply requires companies to consider transforming their operations to reflect their mission, vision, and core values. The responsible supply chain focuses on cutting waste, minimizing pollution, and enhancing efficiency [93,99]. For sustainable water supply, companies need to begin with reducing their water consumption and enhancing efficiency in their operations. Companies that need huge volumes of water in their operations have to create alternative sources to minimize pressure on the nearby rivers and lakes [83,102]. Reducing water consumption should be part of an organization's short-term objectives to become leaner and less susceptible to environmental challenges [102]. Responsible supply chains also encourage other organizations to improve their business practices and minimize pollution [11,29,93]. Some organizations have developed regulations that they use when selecting their suppliers. One of the key considerations includes the supplier's social responsibility and accountability. Building responsible supply chains can lead to cost reduction, minimal operational disruptions, strengthened licenses, and assurance to the shareholders that the business is ready for long-term investments.

Responsible supply chains are capable of self-correction and realignment of activities to enhance sustainability. PepsiCo has demonstrated a strong capacity to become a responsible supply chain using various initiatives [16]. The company is one of the largest water consumers with more than 90 percent of water going into the production of carbonated soda [16]. The company is also using a significant amount of water in irrigating crops that are used as key ingredients in most of its products. However, PepsiCo is transforming water use through various initiatives, including internal efficiency and working with farmers to produce most of its inputs. The company has leveraged various innovative technologies to enhance efficiency in all its business operations, especially the manufacturing of carbonated soda and other beverages [16,21]. The technology helps in monitoring water use, identifying watersheds, and enabling prompt interventions to minimize waste [16]. The company is also reducing the use of water for irrigation by allowing farmers to produce most of its raw materials used in the production of key beverages.

### 5.4. Water Education and Training

Another significant CSR initiative is water education and training. Most corporations integrate water education into their various CSR initiatives to empower local communities. Water education initiatives should target communities facing severe water scarcity [94,97]. The aim is to provide information regarding water conservation strategies, maintaining

water hygiene, and empowering youth about water justice. Those who live in arid and semi-arid regions receive rainfall once a year and several months of dryness and high temperatures [103]. The heavy rainfall seasons may come with various benefits but a less educated community may not understand how to take advantage of the opportunity to conserve more water to support them during dry seasons. Water education should enable local communities to create their own solutions, including building reservoirs where they can store excess water for use during severe scarcity [81,103]. Educational initiatives should also convert youth into water justice advocates for their communities. This will raise awareness regarding water scarcity challenges affecting one's geographical area and ask for intervention from both public and private agencies.

Montgomery et al. [98] argue that water education has not been effective enough because many individuals and corporations are still involved in harmful practices that enhance water scarcity. For instance, water utilities have been accused of overexploiting groundwater and leaving various communities exposed to water shortages. One of the major challenges associated with groundwater overexploitation is the lowering of the water table, making it difficult for many communities to access the essential resource [98,105]. There is a need for intensified behavioral change campaigns to convert more passive users into water activists. The positive effects of behavioral water campaigns have been observed in places such as Cape Town, where the initiative helped avert a potential Day Zero [104]. Many corporations should join efforts to encourage more people around the world to minimize harmful practices, such as using clean water for watering gardens, washing cars, and cleaning pavements [107]. Instead, reclaimed wastewater or rainwater may be used for various domestic activities to minimize pressure on natural sources.

## 6. Conclusions

This study examined the impact of CSR initiatives on sustainable water supply using a systematic review approach. The systematic review was chosen because it is comprehensive, reproducible in further studies, and precise in stating the outcomes. Moreover, the systematic reviews provide an immersive experience into the body of literature while summarizing and critically assessing the extant evidence. A total of 210 articles were obtained from various online databases, including Scopus, Sustainability, ScienceDirect, and Web of Science. The research was conducted using a framework known as PRISMA. The four steps involved in the PRISMA framework included identifying sources, screening the sources, developing inclusion and exclusion criteria, and eliminating articles that do not match the inclusion criteria. The PRISMA framework enhanced transparency in the article selection and evaluation process, leading to stronger validity and reliability. Out of the 350 articles, a total of 108 were found to be eligible for inclusion. Out of the 108 articles, 33 were subjected to further reviews and analysis to provide answers to the research question.

This study found that CSR initiatives contribute to sustainable water supply through conservation, water stewardship, developing responsible supply chains, and creating educational and training initiatives. Water conservation initiatives enhance sustainable supply by reducing waste, building reservoirs, and prioritizing wastewater treatment and reuse. This study found that corporations have leveraged their technological advancements in supporting wastewater treatment and recycling more water back into circulation. This reduces pressure on the natural resources and enables those who experience severe water scarcity to overcome the challenge. Water stewardship examines how water can be used in ways that are socially equitable, sustainable, and economically viable. Water stewardship can be achieved by focusing on reducing water waste, treating and reusing wastewater, and building better reservoirs. Water stewardship also involves educating local communities and providing better technologies to support their conservation efforts. Building a responsible supply chain involves transforming business activities to reflect organizational ethics, mission, vision, and core values. Another important CSR initiative involves raising awareness about water conservation and empowering youth about water sustainability and justice.



## 7. Study Limitations

Systematic reviews have become popular because they are explicit, rigorous, and reproducible. While these qualities have withstood the test of time, they do not eliminate potential challenges that researchers may face when conducting reviews involving several articles. The main challenge this study faced was the high risk of bias. The specific challenges included selection bias, inadequate blinding, attrition bias, and selective outcome reporting. Selection bias was bound to affect activities such as the search and elimination of various articles for more accurate and precise studies. The biases can lead to selective outcome reporting where the researcher only focuses on the studies with statistically significant data or the ones that suit their interest. This study reduced selection bias by ensuring that the studies included had comparable methodological quality and necessary data to justify selection. The GRADE tool also helped in evaluations and reducing confounding biases.

The researcher also faced challenges regarding inconsistencies, statistical heterogeneity, and imprecision in various articles used in this study. Whenever there were inconsistencies or statistical heterogeneity, the researcher had to rely on the inclusion checklist to eliminate potential errors that could affect the study outcomes. However, it may be difficult for any researchers to guarantee full removal of all inconsistencies in the selected articles. There is also a higher chance of repeating certain mistakes made by the primary researchers in their articles. If not identified and removed, various imprecisions in the primary studies can lead to type I or type II errors in systematic reviews. These limitations are of great concern because they can affect the overall quality of the study.

Regarding the limitations of the literature on the impact of CSR on sustainable water supply, it was found that previous studies have explored basic steps in these topics. What is more, there are not many studies that contemplate the topics of CSR and sustainable water supply; rather, it is an isolated research field. In this way, this systematic review fills the gap that exists in the literature, due to the importance of these topics that allow the information to be systematized and offer solutions that are easier to identify.

## 8. Implications and Future Directions

The future of clean and safe drinking water remains uncertain due to various threats, including overexploitation of groundwater, excessive pollution, and climate change. There is a growing need for collective efforts by both public and private players in the water industry. As water becomes increasingly commercialized by corporations, those who live in areas with imminent scarcity may soon experience days or months without clean water for drinking or domestic use. Stakeholders in the water industry have to take specific measures to protect the essential resource from overexploitation and pollution. It is also clear that the solution to water scarcity cannot be entirely abdicated to corporations through their CSR initiatives. Since water scarcity is a multifaceted issue that can only be addressed using multiple solutions, future researchers should examine how CSR initiatives can help in the following areas.

**Sustainable water management:** Future researchers should treat various strategies for improving water infrastructure as a key priority. Studies have shown that water conservation and efficiency have become key components of sustainable management. However, there is limited knowledge of various strategies that municipalities and water utility companies can use to improve the water infrastructure to enhance efficiency. For instance, future researchers should examine how solar desalination and smart irrigation systems can be used to enhance water efficiency and control. As the largest water consumers, the agricultural sector may benefit greatly from these studies and solutions.

**Water reclamation:** Rainwater harvesting and recycled wastewater have become effective strategies for improving water supply and reducing pressure on groundwater and other natural water sources. Future researchers should examine strategies and technologies for improving groundwater recharge to minimize scarcity. Researchers should also examine potential solutions for rainwater harvesting to minimize concerns such as dust contamination and lead poisoning.

Pollution control and wastewater treatment: Poor sanitation makes water not only unsafe for drinking but also for industrial or domestic use. This explains why addressing water pollution and measuring water quality are essential for keeping people safe and healthy. Future researchers should examine how corporations may help in improving sewage systems, rainwater deacidification, and increasing the capacity of wastewater treatment facilities. Future research should also focus on current mistakes made by wastewater treatment facilities owned by various corporations or municipalities and how to avoid them in the future.

Education and awareness: Education is one of the best tools for averting a potential water crisis. However, it has not been used effectively since only a small population around the world understands the basic concepts of water conservation and wastewater reclamation. A lot of wastewater generated at home goes to waste due to a lack of knowledge and resources. Efforts to reclaim sewage water have also met skepticism from those who consider it unclean and unsafe even after undergoing rigorous processing. Researchers should examine various strategies that can be used to reach many people around the world and convert them into water activists rather than just passive users.

In summary, future researchers should examine ways of making CSR initiatives more effective through technological innovations, mobilizing resources, and reaching more populations around the world. Through CSR initiatives, corporations have demonstrated that they can become part of the solution rather than the problem. Many people blame corporations for the commercialization of water and the overexploitation of groundwater. Corporate social responsibility allows companies to recover damages and help more people around the world to access clean and safe water. However, such efforts may not count as effective and sustainable solutions, if they do not spread around the world, to maximize the outcomes.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/su16083183/s1>, Table S1: PRISMA 2020 checklist [109].

**Funding:** This work was funded by Secretaría de Investigación y Posgrado—Instituto Politécnico Nacional, Project 20240598: Responsabilidad Social Empresarial y Sostenibilidad en el abastecimiento de agua.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Not applicable.

**Conflicts of Interest:** The author declares no conflicts of interest.

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