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# The sustainable development goals, master plans and the school curriculum: an interdisciplinary scoping review

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The Sustainable Development Goals of the United Nations, through the 2030 Agenda, seeks to address the various problems affecting the global population. For this, 17 goals and 162 subgoals were established, agreed by the member countries in 2015 at the COP 21 event in Paris. Therefore, the objective of this Scoping Review was to collect data produced in the world literature, which addressed themes linked to sustainability, education, curriculum, water and basic sanitation, in an integrated way, which dealt more specifically with goals 4 (Quality Education) and 6 (Water and Basic Sanitation) of the UN Sustainable Development Goals. It also aimed to find teaching networks in the most diverse countries, which used the curriculum, to bring the themes proposed by the UN into the classroom. To search for articles published in Portuguese, Spanish, and English, the period from June 2017 to June 2022 was taken into account. In addition, official guiding documents were also investigated. A total of 2,803 potential items were obtained. From this total, around 2,720 were eliminated for not meeting the guiding strings in this research, leaving 83 articles/documents. After further reading, 44 articles/documents met the inclusion and exclusion criteria. Data was found on all continents and in the most diverse countries, with different priorities. The countries that are part of the OECD have worked on these issues intending to improve their indicators. The so-called emerging countries (Brazil, Russia, China, India, South Africa, and Turkey, among others), on the other hand, treat the same data to improve educational metrics and universalize the quality of water supply and sanitation. Finally, in the countries that fall into the peripheral group, the findings were based on a rights guarantee approach, i.e., still from the perspective of implementing and consolidating public policies, such as some Latin American countries, South/Southeast Asia, and the vast majority of sub-Saharan African countries.

## KEYWORDS

education and curriculum, master plan, water, basic sanitation, pollution

## 1 Introduction

At the height of the Industrial Revolution at the end of the 18th century, a movement that culminated in several developments, such as the start of urbanization, migratory movements, especially the rural exodus, consolidation of economic models, focused on capitalism, the search for “development,” among others, the world looks for models that check for its needs, the focus of which is not always the social wellbeing of all. Inequalities exacerbate this non-linearity, be they economic, social, or, more recently, environmental, considering that the least favored are the most affected by the advent of climate change.

Achieving this milestone occurs in different scenarios, territories, methods, and spheres, involving actors from several backgrounds, including governments, public and private institutions, non-governmental organizations, and civil society (Cordeiro et al., 2014). Thus, when actions are set up, and well-articulated, it is possible to reach this goal.

In the following paragraphs, measures that are being implemented as state/nation public policies will be presented, consolidating the search for development in its most diverse concepts, such as the guidelines established in the Sustainable Development Goals (SDGs) of the United Nations (UN), in Goal 4, which addresses educational attainment, and Goal 6, whose purpose is to provide water and basic sanitation for everyone by 2030. These include the Master Plans for Brazil’s municipalities, the action of the Draft Bill 10.257 of 2001, better known as the Cities Statute Law; the United Nations Sustainable Development Goals (SDGs) of 2015; the curriculum guidelines of the Brazilian National Common Core Curriculum (BNCC) of 2018, among others.

It is in this context that Okamoto (2016), Resende (2019), and Freitas (2017) state that the master plan plays a decisive role since it contains direct actions to build social, economic, cultural, and environmental development, i.e., much of what was embodied in the SDGs in 2015.

According to the Pernambuco Municipalities Investment and Economic Development Fund–APAC/CPRH/FIDEM–PERNAMBUCO (2019), of the six municipalities that make up the Hydrographic Basin Médio Capibaribe–Carpina, Feira Nova, Lagoa de Itaenga, Lagoa do Carro, Limoeiro e Passira– five have an active master plan, representing 84% of the total.

As for Goals 4 (Education) and 6 (Drinking Water and Basic Sanitation) of the SDGs–focal points addressed in this paper, consider the statement by Freire (1996), who understands education as liberating, transcendent, and capable of empowering people with an awareness of themselves and others. Also consider what Leff (2019) states, when he says that we have no choice but to act immediately to save the planet since there is no plan B and even less of a planet B, thus future generations will be doomed to extinction. Regarding the statements made by Freire (1996) and Leff (2019), using education to equip people with this awareness is an urgent and necessary action, especially for young students.

To achieve this, governments must adopt human values and sustainability as their guiding principles, seeking to guarantee the right to be and to be part of a planet capable of minimally attending to humanity’s basic needs. However, for these actions to take place effectively and achieve their objectives, they require the support of a series of public policies that transcend governments and are a

pact signed by society. Therefore, it is necessary to build master plans aimed at fulfilling these premises, whose main focus is a healthy environment, with basic sanitation and water for everyone, seeking to eradicate illiteracy and poverty, aware that it is at school, through a curriculum that attends to the present demands and future affairs, that this whole network connects and educates people capable of understanding that the Earth is a common good, whose responsibility is collective.

Freire (1996) stated that “education does not transform the world, education changes people and people change the world.” This requires education to be based on a curriculum that is directed to social construction and reflects a political, historical, economic, cultural, and project-based moment in society (Goodson, 1997); This statement is corroborated by Gadotti and Romão (1997, p. 16), who emphasize that the curriculum is a collective construction and an achievement for all. From this perspective, the elementary school curriculum of the state of Pernambuco, released in 2018, based on the National Common Curriculum Base–BNCC, when it was drawn up for discussion and construction, was engendered by a look at socio-economic sustainability, as Pereira (2017) and Selva (2018) note.

According to Miranda (2014), Pereira (2017), and Selva (2018), with the establishment of the National Education Plan in 2014 and, as of 2018, the National Common Curriculum Base, in alignment with a global sustainability movement, Brazil is beginning a process of reconfiguring its school curriculum in terms of sustainability.

This movement has led to the inclusion of sustainability issues in the BNCC, as the final document from the Brazilian Ministry of Education and Culture points out. In the elementary school version alone, at least twenty-eight references to socio-environmental sustainability. These are references placed in elementary school and occur mainly in Natural Sciences, but also frequently in Social Sciences and other areas (Brasil, 2018).

## 2 Scoping review methodology (SCR)

Researching a series of other studies in Brazil and several other countries, aimed at analyzing the master plans that guide these territories, focusing on basic sanitation and drinking water, as well as evaluating strategies for possible basic education curriculum redesigns, and bearing in mind the Sustainable Development Goals (SDGs), a Systematic Literature Review (SLR) was carried out. Following the research and methodology proposed by Kitchenham and Charters (2007) and Dermeval et al. (2020) were also considered to broaden the search scope for reliable and trustworthy data specific to this study.

Kitchenham and Charters (2007) developed a script/protocol for Systematic Literature Review (SLR) guidelines. The protocol, organized into pre-defined stages of preparation, consists of planning, conducting, and presenting the review report. Preparing the SLR based on the stages mentioned above allows the researcher to follow a differentiated, detailed, and meticulous path of literature review.

The SLR construction process aims to guarantee the methodological analytical competence of collecting different types of research and is structured around: (re)formulating

research questions; selecting and evaluating a wide range of studies carried out; and finally, synthesizing, interpreting, and considering the results achieved in the research analyzed (Kitchenham and Charters, 2007).

There are currently several options for developing an SLR, the main ones being, according to Amendoeira (2018): (a) Systematic reviews of experience or significance; (b) Systematic reviews of qualitative evidence; (c) Systematic reviews of effectiveness; (d) Systematic reviews of text and opinion/policy; (e) Systematic reviews of prevalence and incidence; (f) Systematic reviews of economic evidence; (g) Systematic reviews of etiology and risk; (h) Systematic reviews of mixed methods; (i) Systematic reviews of diagnostic test accuracy; (j) Umbrella review and (l) Scoping Review (SCR).

The strategy assumed in the following research consists of a Scoping Review (SCR), which must primarily observe the drafting of research questions (QI), pre-defining the Inclusion Criteria (IC) and Exclusion Criteria (EC), as defined by Amendoeira (2018). Thus, the records databases shall be searched (GBD), with the selection of studies/articles/documents for inclusion, the qualitative-methodological evaluation of the studies/articles/documents, data extraction, etc. Finally, the most relevant studies will be analyzed and summarized.

To better explain this scoping review, it is necessary to present the research questions (QI). In this particular analysis case:

(QI1) With the lowest ratio of water availability per capita in the country, what actions should be adopted in the Master Plans of the Médio Capibaribe municipalities, in alignment with the UN's Sustainable Development Goals, to guarantee the supply of water for this and future generations?

(QI2) Is the absence of a complete basic drainage system in the Médio Capibaribe Micro Bacia municipalities capable of compromising the water quality and sediments in the Barragem de Lagoa do Carro?

(QI3) Is it possible, through the reorganization of the school curriculum in the municipalities belonging to the Hydrographic Basin do Médio Capibaribe, following SDGs 4 and 6, to offer education aimed at building an intelligent territory with a view to sustainability?

## 2.1 Research strategy–inclusion and exclusion criteria

During the analysis stages, it was decided to apply inclusion (IC) and exclusion (EC) criteria to gather, prioritize, organize, direct, and guarantee data collection, to address and answer the research questions–(IQ1), (IQ2), and (IQ3). The purpose of defining criteria was to identify studies that provided direct evidence on IQs and to reduce the likelihood of bias, as mentioned in the study of Kitchenham and Charters (2007).

The criteria were widely employed throughout all data mining stages, and in each of these steps, materials were selected according to the inclusion/exclusion criteria (Supplementary Figure 1).

These criteria were essential for data mining within database management systems. This management provided concepts, studies, and research that enabled the evidence to be synthesized in detail by and through systematic analysis.

To identify and map a considerable range of evidence on the field of study, the Scoping Review set out to clarify concepts, search for literature, and identify factors and characteristics associated with the Research Questions and objectives mentioned in the first section of the methodological trail.

Inclusion and exclusion criteria were used to select the most appropriate “search strings” for this Scoping Review. The automatic search strings employed in the four managers used the Boolean logical operators (\*), (AND), (OR) and (NOT).

When searching for aspects associated with each other, The (\*) operator was utilized to access files containing a broad range of information. The (AND) operator was chosen to identify articles that addressed two subjects with different keywords, but which were interrelated.

## 2.2 Study screening

The next step involved selecting materials based on the themes of sustainability, SDGs, development policies, and plans, by successively reading the titles, abstracts, and keywords of the documents retrieved.

Thus, the studies/articles/documents previously collected were assessed. Main aspects like scientific communication quality, the research relevance and character, objectives, impressions and innovative perceptions, general characteristics, and results were regarded.

The selection process also relied on the Joanna Briggs Institute (2017) manual, through two independent reviewers, based on the inclusion and exclusion criteria, in the case of a disagreement between the reviewers, a third reviewer defined whether or not the documents should be included for analysis. The entire process was carried out on the Rayyan Platform (2016).

This search was undertaken in English, Portuguese, and Spanish, between 2017 and 2022. The bibliographic bases used to obtain the (ScR), types of sources and searches achieved through the managers have been grouped in a more synthesized format in Supplementary Figure 1.

Next, the titles and abstracts of the studies/articles/documents were read, to read the previous results of the surveys.

The objective consisted of checking whether the subjects covered were relevant and capable of assisting in obtaining answers to the research questions (QI).

## 2.3 Study evaluation and selection process

The survey with the search strings found 2,803 publications/studies/articles/documents, distributed and presented in Supplementary Figure 1. After successive readings, it became clear that not every material aligned with the research question, then a secondary screening took place, to check for studies/articles/documents, that could have been relevant to the research proposal.

With the criteria applied, 2,803 potential data materials were gathered. From this total, around 2,720 (two thousand seven hundred and twenty) were excluded for not matching

the guiding strings, leaving a total of 83 (eighty-three) studies/articles/documents. A more careful and detailed analysis process was undertaken on the selected studies/articles/documents, based on exhaustive reading and re-reading of the full texts. This procedure aimed to ensure that all the material collected met the criteria previously adopted in the research protocol. Immediately after reading, it was found that 39 papers (studies/articles/documents) did not partially or meet the Inclusion Criteria (IC): 17 (seventeen) papers, and 22 (twenty-two) papers did not meet the Exclusion Criteria (EC).

After the sub-stage of choosing the articles, carried out at three different times with the application of inclusion (IC) and exclusion (EC) criteria, this resulted in a list of 44 (forty-four) database sources (Supplementary Figure 1):

## 2.4 Document selection results

Skimming was used to read the collected materials, a method mentioned in Höfling's (2012) research. The strategy seeks to identify as much information as possible when making initial contact with a material, to find the central theme and set of ideas. Therefore, the researcher can decide if the text is suitable for answering their established paradigms, and whether or not it should be explored in greater depth with a more condensed reading (Höfling, 2012).

The process grouped significant words and subjects in the previously selected material. These are considered exploratory data analysis strategies and involve qualitative and quantitative research. The exploratory nature gave it the characteristics of secondary research (Marconi and Lakatos, 2012). The information was collected through a floating reading (Bardin, 1977) of the studies/articles/documents to group more tangible information and collect reliable data.

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## 3 Results and discussion

As previously mentioned, this work looked for studies/articles/documents set within a six-year interval, in this case between June 2017 and June 2022. Studies/articles/documents were found on practically every continent, except for Oceania, and with a greater incidence on the American continent.

In 2017, only two studies/articles/documents were considered applicable to the criteria proposed to answer the questions and form the list of studies/articles/documents that should be included for analysis. In 2018, four materials met the requirements proposed for selection. For 2019, after applying the inclusion and exclusion filters, seven studies/articles/documents remained to be compiled. When the scope referred to 2020, seven studies/articles/documents were also included after a careful analysis filter. As far as 2021 is concerned, the number of articles/documents considered approved after analysis already totaled eighteen units. Six units were approved after evaluation for the last year, June 2022. Overall, forty-four studies/articles/documents made up the analysis base.

In Karon's article, published in Indonesia in 2017, only the SDG theme was not explained in the paper, while the other points analyzed were covered, i.e., the master plan, education, basic sanitation, and water. Thus, 80% of the subjects screened were found in that article. In Borja's work, also from 2017 and carried out in Brazil, the SDGs, and Education were not part of the author's approach, while the master plan, basic sanitation, and water topics were covered. In this case, even if only partially, both articles have answered what is being sought in the guiding questions of this research (Table 1).

In 2018 (Table 2), among the four studies/articles/documents selected for this work, Ramos from Brazil and Requejo Castro from Spain referred to the SDGs. Cairncross from England and Ngwenya from Botswana did not address the issue. Regarding the master plan and basic sanitation, 100% of the authors brought up the subject as research. In education, only Cairncross did not address the issue. As for water, two authors dealt with the subject (Ngwenya and Requejo Castro), representing 50% of the total, while the other two did not discuss it (Cairncross and Ramos).

In 2019, seven studies/articles/documents were selected for analysis, from four countries, the majority from Latin America, and a few European samples. All authors discussed master plans, sanitation, and water (Silva Pereira, Cardenas, Mendoza, Matus, Sarmiento, De Oliveira, and Feijoo). Only one author, De Oliveira, did not discuss the SDGs, thus, this theme reached a representation of 85%. Regarding education, of the seven studies/articles/documents, only those by Mendoza and Matus did not correlate with the topic, thus, this area was mentioned by 72% of the authors (Table 3).

In 2020, seven studies/articles/documents that met the criteria were also selected, as shown in Table 4. Studies from three continents were analyzed—Africa, America, and Europe. Excluding Heron's paper from Ghana, all works mentioned the SDGs, thus reaching a total of 84% incidence for this theme. Only Marques from Portugal did not discuss the master plans, which in similarity with the previous subject, reached 84% among the other authors. As for education, Borstel from Brazil and Heron from Ghana did not include it in their work, thus a percentage of 68% addressed this topic. The same proportion applies to basic sanitation. On the other hand, 84% of the authors covered the water issue, except Marques, from Portugal.

Eighteen studies/articles/documents were selected in 2021. Publications were found in Africa, America, Asia and Europe. Thirteen papers brought up the SDGs as a topic, representing 72% of the total (Supplementary Table 1). The issues of education, water, and basic sanitation were addressed by twelve materials, representing 67% of the studies/articles/documents. Six papers did not address the subject, representing 33% of the total. However, when it comes to master plans, all authors mentioned this topic. Notably, in the two Portuguese publications and one from the United States of America, water and sanitation were not addressed, while in Kenya and Pakistan, the authors most explored these subjects. The remaining studies showed a prevalence of more than 70% of "yes" answers to all of the points raised, in developing and/or peripheral countries, the most common issues were water and sanitation, due to the lack of services and/or products.

Lastly, 2022 was the final year of analysis, specifically the first semester. Six studies/articles/documents were approved, with publications in America and Asia, involving the United States of

TABLE 1 Overview of the materials selected in 2017 through (SCR).

Country/references	Water/pollution	Basic sanitation	Master plan	SDG	Education
Indonesia/ <a href="#">Karon et al., 2017</a>	Yes	Yes	Yes	No	Yes
Brazil/ <a href="#">Borja, 2014</a>	Yes	Yes	Yes	No	No

Source: [Albuquerque, 2023](#).

TABLE 2 Overview of the materials selected in 2018 through (SCR).

Country/references	Water/pollution	Basic sanitation	Master plan	SDG	Education
England/ <a href="#">Cairncross, 2018</a>	No	Yes	Yes	No	No
Botswana/ <a href="#">Ngwenya et al., 2018</a>	Yes	Yes	Yes	No	Yes
Spain/ <a href="#">Requejo-Castro et al., 2018</a>	Yes	Yes	Yes	Yes	No
Brazil/ <a href="#">Ramos, 2018</a>	No	Yes	Yes	Yes	Yes

Source: [Albuquerque, 2023](#).

TABLE 3 Overview of the materials selected in 2019 through (SCR).

Country/references	Water/pollution	Basic sanitation	Master plan	SDG	Education
Brazil/ <a href="#">Avelar et al., 2019</a>	Yes	Yes	Yes	Yes	Yes
Venezuela/ <a href="#">Cárdenas, 2019</a>	Yes	Yes	Yes	Yes	Yes
Colombia/ <a href="#">Mendoza, 2019</a>	Yes	Yes	Yes	Yes	No
Brazil/ <a href="#">Cardoso and Oliveira Santos, 2019</a>	Yes	Yes	Yes	Yes	Yes
Chile/ <a href="#">Matus, 2019</a>	Yes	Yes	Yes	Yes	No
Brazil/ <a href="#">De Oliveira et al., 2019</a>	Yes	Yes	Yes	No	Yes
Spain/ <a href="#">Feijoo, 2019</a>	Yes	Yes	Yes	Yes	Yes

Source: [Albuquerque, 2023](#).

TABLE 4 Overview of the materials selected in 2020 through (SCR).

Country/references	Water/pollution	Basic sanitation	Master plan	SDG	Education
Kenya/Uganda/ <a href="#">George et al., 2020</a>	Yes	Yes	Yes	Yes	Yes
Portugal/ <a href="#">Marques, 2020</a>	No	No	No	Yes	Yes
Brazil/ <a href="#">da Silva Pereira et al., 2020</a>	Yes	Yes	Yes	Yes	Yes
Brazil/ <a href="#">Von Borstel Roesler, 2020</a>	Yes	Yes	Yes	Yes	No
Ghana/ <a href="#">Herron, 2020</a>	Yes	Yes	Yes	No	No
Brazil/ <a href="#">Jannuzzi et al., 2020</a>	Yes	Yes	Yes	Yes	Yes
Colombia/ <a href="#">Bonells et al., 2020</a>	Yes	No	Yes	Yes	Yes

Source: [Albuquerque, 2023](#).

America, Mexico, Colombia, Brazil, and Nepal ([Supplementary Table 2](#)). In two of them, all the questions were answered in the affirmative, i.e., 100% affirmative, which were the subjects of the master plan and basic sanitation. As for the SDG axis, only Bhattarai, from the United States of America, did not consider the subject; Thus, 84% of the studies dealt with the subject. Education, on the other hand, was approached in only two of the six materials analyzed, one was from the United States (Greenland) and the other from Colombia (Sánchez), corresponding to a representation of 32%, while 68% did not mention it. At last, the same proportion can be seen in Water/Pollution, just two works mentioned the theme.

The main focus of the discussion was on the research questions that this review sought to answer.

Considering that water availability per capita is the lowest in the country, what actions need to be adopted in the Master Plans of the municipalities of the Médio Capibaribe, in line with the UN's Sustainable Development Goals, to guarantee the water supply for this and future generations? Is the absence of a complete basic sanitation system in the Micro Bacia do Médio Capibaribe municipalities capable of compromising the water quality and sediments in the Barragem de Lagoa do Carro?

The basic sanitation and access to drinking water data, issues raised in SDG 6, are supported by [UNICEF \(2020\)](#) when it states that the second leading cause of death for children under 5 in the world is diarrhea. WHO data (2020) shows that 88% of these children's deaths could be avoided if they had adequate sanitation, and access to drinking water, and lived in

less unhealthy environments. According to [IBGE \(2023\)](#), 25% of the Brazilian population does not have access to basic sanitation, representing approximately 51 million people. For drinking water, the percentage is 16% for the whole country. [IBGE \(2023\)](#) also provides data showing that Pernambuco has 83% basic sanitation coverage, something close to the national average. However, only 67.9% of the population has access to drinking water, which puts the state in the last position and ranks it as the federation unit with the highest per capita water deficit in Brazil. These considerations regarding basic sanitation, drinking water, health, and life quality, were also pointed out by several authors presented at the screening, such as [Bhattarai et al. \(2022\)](#), [Cronk et al. \(2021\)](#), and [Von Borstel and Cronk \(2020\)](#).

Concerning SDGs 4 and 6, is it possible to develop the reorganization of the school curriculum in the municipalities of the Bacia Hidrográfica do Médio Capibaribe to provide education based on the ideals of intelligent territory and sustainability?

When this question was asked in the survey, of the 44 publications found, 27 included education in their approaches, representing 61%. The perspectives addressed pointed to education as a vector for development in its most diverse possibilities, especially environmental education and the perspective of a sustainable world. They appear mainly in the group of developed and so-called emerging countries. In addition, 17 of the 44 publications, 39%, did not address the issue. Most originate from Europe and North America, with a few instances in Latin America and Asia. 18 out of the 27 papers were also, corresponding to 67%, despite not being part of the common curriculum, environmental education focused on sustainability was presented as a complementary subject. This occurred through elective courses, projects, and/or fairs and exhibitions.

In many peripheral and some emerging countries, the subject of SDG 4, education target, was not addressed in the scope of this research. [UNESCO \(2023\)](#) reports that around 244 million children and adolescents between 6 and 18 are out of school, especially in Sub-Saharan Africa. Furthermore, the data revealed in the Agency's report on the urgent need to overcome school failure is still alarming. In Latin America, in 2022, when the COVID-19 pandemic ended, UNESCO revealed that around 20% of the 170 million students were out of school. In Brazil, this was around 5.5 million, out of 47 million students, i.e., around 12%. This data elucidates why certain publications from these countries have not addressed the issues highlighted in this research concerning education, since they live with challenges to overcome in the most basic issues, namely access, permanence, and school failure. Besides the data provided by institutional organizations, such as the UN, UNESCO, and the Brazilian Education Ministry (MEC), they are also referenced in the publications by [Jannuzzi et al. \(2020\)](#), [Gomes et al. \(2021\)](#), [Parreiras et al. \(2021\)](#) and [Sánchez-Gómez et al. \(2022\)](#).

## 4 Final thoughts

When viewed from a holistic perspective, the analysis of the materials extracted from this scoping review, from 2017 until 2022, in the several databases indexing academic productions and/or official documents from governments and institutions, it is clear that the themes sought are part of the most recent contemporary discussions in the most diverse countries on practically every continent. That's because they have followed the scope of the UN's Sustainable Development Goals, since 2015, as a result of COP 15 in Paris, and they have to work hard to achieve compliance by 2030. However, it is understood that partial or total compliance with all or some of the goals within the established deadline will depend very much on each country's social, economic, and climatic reality.

Regarding the developed countries, when the subject of water is addressed, it is almost entirely linked to supply matters and not necessarily to the pollution factor, since this point has already been overcome. However, this does not apply to the countries in Asia, Latin America, and especially Africa, where even though most of them have a good supply of fresh water, the availability and distribution are not universal. This also happens when it comes to basic sanitation. The range of basic sanitation services and drinking water supplies in Europe and North America, reach numbers close to 98%, meanwhile, in Latin America, with rare exceptions, such as Chile and Uruguay, the other countries, still have a long path to go through. This is not so different for Asian countries, except for Japan, the Four Asian Tigers, and others. The same is almost entirely seen on the African continent. The [ONU \(2019\)](#), shows that in Sub-Saharan Africa, the reach of basic sanitation is only 25%.

In the SDG linked to education, it can be seen that the discussions follow the same approach as in the previous paragraph, i.e., developed countries are deepening the debate on how to innovate and achieve better results than those they already have, especially those that are part of the OECD group, while developing and/or peripheral countries have chronic education problems. These problems extend from education access to problems as school failures, low teaching quality, and dropouts. This perception is seen in every continent, except for Europe, parts of America, and parts of Asia. According to [UNESCO \(2023\)](#), More than 244 million children and teenagers are out of school, mostly in Africa, including Latin American and Asian countries.

Therefore, the issues discussed in several countries were different. This phenomenon was previously discussed when analyzing the publications, but it is necessary to explore it further. Each country has its peculiarities within the context aligned in this study. The most developed nations are at a stage of improving their actions. They seek innovations in several areas, such as improving life quality in urban and rural areas, increasing life expectancy, encouraging births, and ensuring social welfare. Therefore, when the data was collected, water, pollution, master planning, education, etc., although they are part of the research, do not appear as structural problems to be faced, since they have already been dealt with since the second half of the 20th century, especially in the post-war period.

However, it is a different story for developing countries. Regarding the data previously gathered, actions considered to be at a transitional stage are observed, i.e., depending on the country, such as Brazil, China, and India, which have continental territories,

it can be seen that the issues vary according to the region, which shows great levels of inequality within the country itself. Yet, water, basic sanitation, and education are the main topics approached in this study. This can be attributed to the fact that they are still the Achilles heel of developing countries, which despite having a robust economy, in many cases ranking at the top of global economies, suffer from chronic structural problems that greatly affect the achievement of the SDGs.

Looking at the issues debated in the more peripheral countries, basic sanitation, and water are the most discussed. It's only natural that these issues assume the leading role in research, given that hunger, water, and decent housing are still a utopia. Thus, it is unusual to find the main topics discussed in developed countries, or at least they are not the main target for developing countries.

The challenges and solutions found will depend on the social and economic status that each country enjoys. Those who make up the OECD, for example, work to maintain a standard of delivery of a public service that for years has already met what is set out in the SDGs. This occurs, naturally, because they have a very consolidated educational structure, which ends up reverberating in other segments, such as employment, income, housing and, finally, access to drinking water and complete basic sanitation. Furthermore, it is important to emphasize that the level of financing of OECD members in education is on average three times greater than that of emerging countries and five times that of underdeveloped countries. This level of investment tends to maintain a virtuous cycle of good services for the population, as well as achieving established goals.

Therefore, among the forty-four studies, documents, and articles selected, involving five of the six continents, there is still a lack of research and publications that serve as a basis for decision-making by public authorities. Naturally, this only partially applies to North America, Europe, and, in some cases, Asia, and is more prevalent in the peripheral countries.

In view of the above, there is an urgent need to think/rethink the curriculum as an instrument of transformation. Bring to the center of the discussion the issue linked to quality education, as aimed at SDG 4, which generates impact inside and outside the school, seeking to understand and meet the demands of the present, without compromising the needs of the future. Reiterating what Goodson (1997) says, when he states that the curriculum needs to adapt to the reality of each context, and must be dynamic and at the same time contemporary, in order to play its role as an agent of change.

## References

Ahmed, J., Wong, L. P., Chua, Y. P., Hydrie, M. Z. I., and Channa, N. (2022). Drinking water, sanitation, and hygiene (WASH) situation in primary schools of Pakistan: the impact of WASH-related interventions and policy on children school performance. *Environ. Sci. Pollut. Res.* 29, 1259–1277. doi: 10.1007/s11356-021-15681-w

## Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in this article/[Supplementary material](#).

## Author contributions

CD: Investigation, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. AC: Conceptualization, Investigation, Supervision, Validation, Writing – original draft, Writing – review & editing. JA: Conceptualization, Supervision, Validation, Writing – original draft, Writing – review & editing. JC: Supervision, Validation, Writing – original draft, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/feduc.2024.1452475/full#supplementary-material>

Albuquerque, C. V. (2023). *Caracterização Ambiental do Rio Cotunguba no Município de Feira Nova -PE, a partir da Análise dos Metais Traços nos Sedimentos de Fundo*. Dissertação de Mestrado. Instituto Tecnológico de Pernambuco - ITEP.

Amendoeira, J. (2018). O estudo de caso como método de investigação em enfermagem. *Revista da UIIPS* 6, 102–107.

- Anthonj, C., Githinji, S., Höser, C., Stein, A., Blanford, J., Grossi, V., et al. (2021). Kenyan school book knowledge for water, sanitation, hygiene and health education interventions: disconnect, integration or opportunities? *Int. J. Hygiene Environ. Health* 235: 113756. doi: 10.1016/j.ijheh.2021.113756
- APAC/CPRH/FIDEM-PERNAMBUCO (2019). *Bacias Hidrográficas de Pernambuco*. Available online at: <https://www.apac.pe.gov.br/bacias-hidrograficas> (accessed July 28, 2022).
- Avelar, A. B. A., da Silva-Oliveira, K. D., and da Silva Pereira, R. (2019). Education for advancing the implementation of the sustainable development goals: a systematic approach. *Int. J. Manag. Educ.* 17:100322. doi: 10.1016/j.ijme.2019.100322
- Bardin, L. (1977). *Análise de conteúdo*. Lisboa: Edições, 70.
- Bhattarai, B. R., Regmi, B. P., Gupta, A., Aryal, B., Adhikari, B., Paudel, M., et al. (2022). Importance of advanced analytical techniques and methods for food quality control and pollution analysis for more sustainable future in the least developed countries. *Sustain. Chem. Pharm.* 27:100692. doi: 10.1016/j.scp.2022.100692
- Bocanegra, E. (2021). Proyecto OIEA IWAVE en América Latina en apoyo del ODS 6 agua segura para todos de manera sostenible. *Boletín Geol. Minero* 132, 87–98. doi: 10.21701/bolgeomin.132.1-2.009
- Bonells, U., Felipe, C., Londoño, C., Alejandra, M., Rojas, A., Efrén, L., et al. (2020). Lectura del avance del ODS 6 en América Latina y el Caribe. *Rev. Espacios* 41:262. doi: 10.48082/espacios-a20v41n47p19
- Borja, P. C. (2014). Política pública de saneamento básico: uma análise da recente experiência brasileira. *Saúde Sociedade* 23, 432–447. doi: 10.1590/S0104-12902014000200007
- Brasil, (2018). *Lei de Promulgação dos Resíduos Sólidos no Brasil*. Available online at: <https://www.camara.leg.br/noticias/1058976-projeto-prorroga-em-cinco-anos-o-prazo-para-fim-dos-lixoes-nas-cidades-com-ate-50-mil-habitantes/> (accessed December 03, 2020).
- Cárdenas, C. (2019). Corresponsabilidad, sustentabilidad Hídrica Y Objetivo de Desarrollo Sustentable (Ods) 6. *Agroindustr. Sociedad Ambiente* 1:12.
- Cairncross, S. (2018). The public health benefits of urban sanitation in low and middle income countries. *Utilit. Policy* 51, 82–88. doi: 10.1016/j.upol.2018.03.001
- Cardoso, A. S., and Oliveira Santos, R. A. (2019). Indicadores de sustentabilidade e o ideário institucional: um exercício a partir dos ODM e ODS. *Ciência Cult.* 71, 50–55. doi: 10.21800/2317-66602019000100014
- Carvalho, A. C. C. (2021). Caráter Transversal da Água: Uma Abordagem das Políticas de Abastecimento de Água e Saneamento Básico em Angola Face ao Cumprimento do Objetivo 6 Da Agenda 2030 da ONU. Available online at: [Repositorio.unesc.net/bitstream/1/9224/1/Ana%20Carina%20Gon%C3%A7alves%20Cristiano%20de%20Carvalho.pdf](https://repositorio.unesc.net/bitstream/1/9224/1/Ana%20Carina%20Gon%C3%A7alves%20Cristiano%20de%20Carvalho.pdf) (accessed April 25, 2024).
- Cordeiro, A. M. R., Paredes, L., and Figueiredo, F. (2014). “Ecoterritório: Uma perspectiva (In)Definida Sobre A importância da geografia física como fator de desenvolvimento territorial,” in *Riesgos, Vulnerabilidades Y Resiliencia Socioambiental Para Enfrentar Los Cambios Globales*” Santiago (Chile), 03 Al 05 De Diciembre 2014. (accessed April 25, 2024).
- Cronk, R., Guo, A., Fleming, L., and Bartram, J. (2021). Factors associated with water quality, sanitation, and hygiene in rural schools in 14 low-and middle- income countries. *Sci. Total Environ.* 761:144226. doi: 10.1016/j.scitotenv.2020.144226
- da Silva Pereira, C., Sousa Rodrigues, M. O., dos Santos Barros, C. L., de Almeida, B. L. N., and de Andrade Diogo, M. L. S. (2020). Identificação de impactos ambientais provocados pelo lançamento de resíduos sólidos e líquidos no Rio Itapecuru. *Nat. Conserv.* 13, 58–66. doi: 10.6008/CBPC2318-2881.2020.002.0006
- de Alencar Machado, C. R., Sousa, D. P. B., and Da Silva, G. C. S. (2021). A busca por soluções para a poluição hídrica: um estudo de caso sobre tratamento de efluentes. *Brazil. J. Dev.* 8, 1–8. doi: 10.34117/bjdv8n2-371
- De Meneses, A. K. M., and De Fátima Martins, M. (2021). Conexões entre as temáticas Objetivos de Desenvolvimento Sustentável (ODS), indicadores de sustentabilidade e gestão municipal sustentável: uma revisão sistemática da literatura contemporânea. *Res. Soc. Dev.* 10:e57810515309. doi: 10.33448/rsd-v10i5.15309
- De Oliveira, D. A. M., Gallardo, A. L. C. F., Ribeiro, A. P., Knies, C. T., and Zajac, M. A. L. (2019). Adaptação baseada em ecossistemas para promover cidades resilientes e sustentáveis: análise de programas de revitalização de rios urbanos de São Paulo. *Rev. Brasil. Gestão Desenvolvimento Regional* 15, 220–235.
- De Souza Coelho, A. L. (2021). Problemas socioambientais e deficiência no saneamento básico: bacia rio iguaçu- sarapuá. *Technol. Cult.* 5:36.
- Dermeval, D., Paiva, R., Bittencourt, I. I., Vassileva, J., and Borges, D. (2020). Authoring tools for designing intelligent tutoring systems: a systematic review of the literature. *Int. J. Artif. Intellig. Educ.* 28, 1–49.
- Feijoo, G. (2019). A Xestión da auga nos fogares e unha condición sine qua non da cidade sustentábel do futuro. *Rev. Int. Comun. Desarrollo* 4, 120–131. doi: 10.15304/ricd.4.15.8109
- Ferreira, M. I. P. (2022). *Água Como fio Condutor dos ODS: Avaliando o Bem-Estar com um Sistema Holístico de Indicadores de Sustentabilidade Aplicados à Gestão de Recursos Hídricos*. Brazil: Escola Nacional de Administração Pública.
- Freire, P. (1996). *Pedagogia da Autonomia*, 36 Edn. São Paulo: Paz e Terra.
- Freitas, A. M. G. (2017). Plano diretor no Brasil. *Cadernos Hist Educ.* 16, 18–29.
- Gadotti, M., and Romão, J. E. (1997). *Autonomia da Escola: Princípios e Propostas*. São Paulo: Cortez.
- George, T. E., Karatu, K., and Edward, A. (2020). An evaluation of the environmental impact assessment practice in Uganda: challenges and opportunities for achieving sustainable development. *Heliyon* 6:e04758. doi: 10.1016/j.heliyon.2020.e04758
- Gomes, M. M. R., Craveiro, M. F. M., and Banha, F. M. E. (2021). *Ser Observador da ONU... Experiência de Educação no Âmbito dos ODS. Humanismo, Direitos Humanos e Cidadania Global*, Lisbon, 107.
- Goodson, I. F. (1997). *A Construção Social do Currículo*. Rio de Janeiro: Coleção Educa.
- Greenland, S., Saleem, M., Misra, R., and Mason, J. (2022). Sustainable management education and an empirical five- pillar model of sustainability. *Int. J. Manag. Educ.* 20:100658. doi: 10.1016/j.ijme.2022.100658
- Herron, C. (2020). *Programa de Apoio para la GIRH del ODS 6 - Paquete de Apoyo para la etapa 1*. Available online at: [Policycommons.net/artifacts/2170680/programa-de-apoyo-para-la-girh-del-ods-6/2926366/](https://policycommons.net/artifacts/2170680/programa-de-apoyo-para-la-girh-del-ods-6/2926366/) (accessed April 25, 2024).
- Höfling, E. D. M. (2012). “Estado e políticas (públicas) sociais,” in *Políticas Públicas e Educação. 5ª reimpressão*, Campinas: Caderno Cedes. doi: 10.1590/S0101-32622001000300003
- IBGE (2023). *Censo Brasil 2023*. Available at: [https://censo2022.ibge.gov.br/panorama/?utm\\_source=ibge&utm\\_medium=home&utm\\_campaign=portal](https://censo2022.ibge.gov.br/panorama/?utm_source=ibge&utm_medium=home&utm_campaign=portal) (accessed May 10, 2024).
- Jannuzzi, C. A. S. C., Sugahara, C. R., Ferreira, D. H. L., Falsarella, O. M., and Mariosa, D. F. (2020). Olhar interdisciplinar da sustentabilidade na busca de fontes de informação sobre a água no Brasil. *Sustentabilidade* 1, 1–15. doi: 10.24220/2675-7885v1e2020a5162
- Joanna Briggs Institute (2017). *EBP Resources and Publications: Tools*. North Adelaide: Joanna Briggs Institute.
- Karon, A. J., Cronin, A. A., Cronk, R., and Hendrawan, R. (2017). Improving water, sanitation, and hygiene in schools in Indonesia: a cross-sectional assessment on sustaining infrastructural and behavioral interventions. *Int. J. Hygiene Environ. Health* 220, 539–550. doi: 10.1016/j.ijheh.2017.02.001
- Kitchenham, B., and Charters, S. (2007). *Guidelines for performing Systematic Literature Reviews in Software Engineering. Technical Report EBSE 2007-001, Keele University and Durham University Joint Report*. Keele: Keele University.
- Leff, H. (2019). Ecotechnological productivity: the emergence of a concept, its implications and applications for sustainable development. *Bioecon. Rev.* 2.
- Lindgren, S. (2021). Cookstove implementation and education for sustainable development: a review of the field and proposed research agenda. *Renewable Sustain. Energy Rev.* 146:111184. doi: 10.1016/j.rser.2021.111184
- Marconi, M. A., and Lakatos, E. M. (2012). *Técnicas de pesquisa*. 5. ed. São Paulo: Atlas.
- Marques, M. F. C. (2020). *Agenda2030: Objetivos do Desenvolvimento Sustentável (ODS) da ONU: Desafios ao Desenvolvimento Tecnológico e à Inovação Empresarial. Tese de Doutorado*. Lisboa: Instituto Superior de Engenharia de Lisboa.
- Martins, M. S., Kalil, R. M. L., and Dalla Rosa, F. (2021). Community participation in the identification of neighbourhood sustainability indicators in Brazil. *Habitat Int.* 113:102370. doi: 10.1016/j.habitatint.2021.102370
- Matus, S. S. (2019). *Desafios Hídricos en Chile y Recomendaciones Para el Cumplimiento del ODS 6 en América Latina y el Caribe*, Santiago.
- Mendoza, C. (2019). Análisis de la sostenibilidad para el sector de agua potable y saneamiento básico en el sector rural de bucaranga, basados en el compes 3810 y cumplimiento del ods 6. Available online at: [Repositorio.uts.edu.co:8080/xmlui/handle/123456789/7434](https://repositorio.uts.edu.co:8080/xmlui/handle/123456789/7434) (Accessed April 25, 2024).
- Menezes, K. M., Rodrigues, C. B. C., and Candito, V. (2021). “Os Objetivos de Desenvolvimento Sustentável articulados à aprendizagem baseada em projetos: possibilidades para a educação em saúde,” in *Anais do XIII Encontro Nacional de Pesquisa em Educação em Ciências*, Brasília. doi: 10.28998/2175-6600.2021v13nEsp2p453-464
- Miranda, M. A. (2014). *O Plano Nacional de Educação e a Busca Pela Qualidade Socialmente Referenciada. Revista Educação e Políticas em Debate – Uberlândia*.
- Monteiro, P. Y., Carvalho, M. A. T. B., and Dos Santos Pinheiro, I. R. (2021). *Saneamento básico e direito à cidade: um estudo sobre a micro bacia do Rio São Joaquim. X Seminário de Integração Científica*, Salvador, 44.
- Moraes, S. G., and Cabral, N. R. A. J. (2021). *A Importância do Enquadramento dos Corpos Hídricos Para a Agenda de Desenvolvimento Sustentável e Restauração dos Ecossistemas. Semana Internacional do Meio Ambiente*, Santa Catarina, 369. doi: 10.36592/9786587424965-17
- Ngwenya, B. N., Thakadu, O. T., Phaladze, N. A., and Bolaane, B. (2018). Access to water and sanitation facilities in primary schools: A neglected educational crisis in Ngamiland district in Botswana. *Phys. Chem. Earth Parts A/B/C* 105, 231–238. doi: 10.1016/j.pce.2018.03.006

- Okamoto, P. T. (2016). *Guia Prático dos Prefeitos*. Brasília-DF: SEBRAE.
- ONU (2019). *Saneamento Básico: O mundo tem 2 bilhões de pessoas sem acesso ao saneamento básico*. Available at: <https://agenciabrasil.ebc.com.br/geral/noticia/2019-03/falta-saneamento-basico-para-2-bilhoes-de-pessoas-no-mundo-diz-onu> (accessed April 25, 2024).
- Parreiras, M., Kramer, J., Bizzo, E., and Montano, P. (2021). *O potencial de contribuição do uso da tecnologia na educação para o Objetivo de Desenvolvimento Sustentável 4 (ODS 4)–Educação de qualidade: o caso da Iniciativa BNDES Educação Conectada*, Vol. 28. Rio de Janeiro: Banco Nacional de Desenvolvimento Econômico e Social, 87–132.
- Pereira, T. C. P. (2017). *A Base Nacional Comum Curricular do Brasil*. Brasília: MEC.
- Ramos, C. (2018). *Educação para os Objetivos de Desenvolvimento Sustentável: contribuições do ensino de ciências pautado na Base Nacional Comum Curricular. Trabalho de Conclusão de Curso*. Curitiba: Universidade Tecnológica Federal do Paraná.
- Requejo-Castro, D., Giné Garriga, R., and Pérez-Foguet, A. (2018). *ODS 6 en el aula de ingeniería desde la experiencia en proyectos de cooperación*. Barcelona: Universitat Politècnica de Catalunya.
- Resende, D. M. (2019). *Desafios dos Municípios de Pequeno Porte na Elaboração e Implementação de Planos Diretores Participativos em Minas Gerais*. São Luiz: Fundação João Pinheiro, Escola de Governo Professor Paulo Neves de Carvalho.
- Sánchez-Gómez, J. S., Roza-López, D. P., Salazar-González, R. C., Pinzón-Flórez, A., Moreno, A., et al. (2022). *Propuesta Metodológica Para la Medición del ODS 4 en Colombia*. Available online at: <https://repositorio.uniandes.edu.co/entities/publication/78357ba2-bc00-4a76-8031-50363a4e5a11> (accessed April 25, 2024).
- Selva, A. C. V. (2018). *Currículo de Pernambuco Ensino Fundamental*. Recife: CEPE.
- Sharma, H. B., Vanapalli, K. R., Samal, B., Cheela, V. R. S., Dubey, B. K., Bhattacharya, J., et al. (2021). Circular economy approach in solid waste management system to achieve UN-SDGs: Solutions for post-COVID recovery. *Sci. Total Environ.* 800:149605. doi: 10.1016/j.scitotenv.2021.149605
- Silva, J. S., Limeira Filho, A. A., and Martins, M. D. (2022). Avaliação da governança na implementação dos ODS: Levantamento bibliográfico das contribuições teóricas ao tema (2015-2021). *Res. Soc. Dev.* 11:e59611326932. doi: 10.33448/rsd-v11i3.26932
- Soares, S. C., de Oliveira Peres, K., de Oliveira Zanini, E., and von Borstel Roesler, M. R. (2021). Resiliência climática e a questão hídrica como desafio contemporâneo/climate resilience and the water issue as a contemporary challenge. *Int. J. Environ. Resilience Res. Sci.* 3, 1–14. doi: 10.48075/ijerrs.v3i1.26444
- Tomás, H. M., Afonso, M., and Marques, M. (2021). Aprender sobre...educar para...o uso sustentável da água: uma proposta metodológica de ensino com base no uso da água no passado. *Água Território* 18, 89–106. doi: 10.17561/at.18.5365
- UNESCO (2023). *Relatório Saneamento Básico Alusivo ao Dia Mundial da Água*. Available at: <https://news.un.org/pt/story/2023/03/1811712#:~:text=Em%20um%20planeta%20com%208,equivalente%20a%203%2C6%20bilh%C3%B5es> (accessed August 22, 2023).
- UNESCO, CEPAL, UNICEF (2022). *La Encrucijada de la Educación en América Latina y el Caribe. Informe Regional de Monitoreo ODS4-Educación 2030*. Paris: UNESCO.
- UNICEF (2020). *La encrucijada de la educación en América Latina y el Caribe. Informe Regional de Monitoreo ODS4-Educación 2030*.
- Von Borstel Roesler, M. R. (2020). *Em defesa e Proteção dos Direitos ao Meio Ambiente, à Água Potável e ao Saneamento Básico: Percepções Aproximativas à Bacia Hidrográfica do Alto Iguaçu e Afluentes do Rio Ribeira. A Cidade e os Problemas Socioambientais Urbanos*, Ghana, 769.
- Von Borstel, R., and Cronk, M. R. (2020). *Em defesa e proteção dos direitos ao meio ambiente, à água potável e ao saneamento básico: percepções aproximativas à Bacia Hidrográfica do Alto Iguaçu e Afluentes do Rio Ribeira. A Cidade e os Problemas Socioambientais Urbanos*, 769.