



# Global indicators of progress on climate change education: Non-state actor data collaboration for SDG 4

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## ABSTRACT

Despite their limitations as proxy measures, indicators can serve as leverage points in encouraging policy change. Facing the global urgency of climate change and increasingly recognizing the role of education in providing the social and political impetus for climate action, indicators on climate change education can help. However, despite the encompassing of climate change education in several Sustainable Development Goal (SDG) targets, the associated global indicators currently rely on country self-reported and otherwise inadequate data. This paper describes a collaborative process of developing publicly available third-party data sources to support more robust indicators of climate change education, including in relation to the SDGs.

## 1. Introduction

The impacts from climate change are being felt more than ever with July 2023 having been the warmest month globally ever recorded and 2023 "almost certain" to be the warmest year ever measured (Rhode, 2023). It will take massive effort from every sector to slow global warming and adapt to the consequences of the climate changes already well underway. Scholars and practitioners have long pointed to education as a critical component of climate action (Bangay and Blum, 2010). This was explicitly recognized in three Sustainable Development Goal (SDG) targets - 4.7, 13.3, and 12.8 - adopted in the 2030 Agenda for Sustainable Development in 2015. At the same time, the impacts of climate change are undermining progress on all 17 SDGs (Fuso Nerini et al., 2019), including the global goal on education (Pal et al., 2023). Climate change education and action is thus a critically important component of achieving all targets of SDG 4, especially as the environmental, demographic, and social consequences of climate change increase in prevalence and urgency.

The SDG targets and associated indicator framework are intended as tools to encourage and leverage action on sustainability (McKenzie and Benavot, 2022). They provide opportunities for governments, institutions, communities, and organizations to track progress on all 169 targets, and to use the global and thematic indicators under those targets

to benchmark progress over time (UN General Assembly, 2017). Unfortunately, at the current mid-point of the SDG timeframe (2015–2030), it is not possible to know whether progress of any kind has been realized on climate change education-related indicators due to the lack of appropriate and sufficiently robust indicators (Benavot and Williams, 2023).

In this paper we lay out the background of how climate change education is addressed in the SDGs and initial attempts at monitoring CCE by UNESCO. We then discuss collaborative attempts to tackle the gaps in available data and how the Monitoring and Evaluating Climate Communication and Education (MECCE) Project is learning from past attempts and working to develop a suite of indicators of CCE. We conclude with some reflections on what such non-state actor collaborations can contribute to the monitoring of SDG 4 for the remainder of Agenda 2030.

## 2. Background: towards the global monitoring of climate change education

The critical contribution of CCE to a climate-based transformation has been internationally recognized since at least 1992, when it was enshrined in the United Nations Framework Convention on Climate Change (UNFCCC). This focus on CCE was intensified and expanded by

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the 2015 Paris Agreement (United Nations General Assembly, 2015).<sup>1</sup> Simultaneous to the Paris agreement, the UN also included CCE as part of Agenda 2030, launched in 2015, with it being included in three locations in the SDGs, particularly as part of the Education for Sustainable Development (ESD) focused target, target 4.7.<sup>2</sup> The inclusion of CCE here is especially important as target 4.7 is recognized as one of the most aspirational and ambitious of the education related targets, focusing as it does on the (transformative) purpose of education to create a more just and sustainable world (Benavot and Williams, 2023; Brockwell et al., 2022). SDG target 4.7 is defined as seeking to: "ensure all learners acquire knowledge and skills needed to promote sustainable development, including among others through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development" (United Nations, n.d). SDG target 13.3 addresses climate change education specifically, in an ambition "that countries improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning" (United Nations, n.d). In addition, SDG 12.8 on sustainable consumption aims to "ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature" (United Nations, n.d). Given the close similarities across all three targets, UNESCO proposed in 2019 that the global indicators of the three targets be integrated into a single mechanism for measurement and UNESCO, as the entity responsible for monitoring of global progress on these indicators, has subsequently moved forward with this approach (UNESCO Institute for Statistics, 2019).

Overall, the approach to measuring the SDGs has been to rely whenever possible on "voluntary and country led instrument[s] (p.2)" to produce the data needed for indicators (UN General Assembly, 2017). The joint 4.7/13.3/12.8 global indicator is no exception. Rather than develop a new approach, it was decided to use an existing and country-driven reporting mechanism—the non-binding 1974 Recommendation Concerning Education.<sup>3</sup> The 1974 Recommendation empowers UNESCO to issue a survey to member countries every 4 years. In the 7th and most recent iteration in 2020, UNESCO included questions asking member states about progress on implementing targets 4.7/13.3/12.8, with the intention of using this data for the global indicator of said targets. The survey asks for self-reported information on actions, which yields non-validated data that is in most cases gathered by one (or a few) person(s), usually in ministries of education. The completion of this survey by member states is completely voluntary and participation in this latest version was under 40 %.

This voluntary survey of self-reported data unsurprisingly yielded less than robust results. Benavot and Williams (2023) assessed 71 responses to the 2020 survey (4 more were submitted later) and found that "although it was a rather efficient solution to a complex monitoring challenge, it did little to improve the quality of reported information and country coverage (i.e. number of countries with data)" and that current reporting strategies "raise more questions than provide answers" (p. 5, 9). There are several key weaknesses which undermine the value of this data for measuring targets 4.7/13.3/12.8 (Benavot and Williams, 2023, pp. 9–11). The information collected is all self-reported with little or no independent verification. While detailed and extensive, the survey

questions themselves mostly yield only yes/no responses, which provide insufficient information; while the 13 open-ended questions enable too much variation in responses to make comparability between countries possible. Even beyond these and other issues, the low response rate makes this data source inadequate for use as a global indicator of target 4.7.

In large part, UNESCO was constrained to rely on an approach that was not likely to succeed because of a lack of other options. Despite dedicating a decade to ESD (2005–2015) which ended just as the SDGs started, there were no global datasets that were developed during that decade to track country progress of implementation (Brockwell et al., 2022, p. 3). This means that SDG 4.7 from the beginning had neither baseline data nor any established mechanisms for monitoring or measurement, despite an extensive record of UN policy programs on ESD or related approaches to environment and education.

### 3. Collaborating towards monitoring data and indicators

Indicators are proxy measures, which while imperfect are useful as an accountability tool to help governments, as well as institutions and organizations, to benchmark, target set, and monitor progress towards shared goals (Hák et al., 2016; Lehtonen et al., 2016). The scholarly literature outlines a range of considerations in the creation of indicators. These include that a robust indicator framework should go beyond input-focused indicators (i.e., those on 'inputs' to education, such as curricular content), to also encompass those focused on outcomes (e.g., student learning), outputs (e.g., students graduated), and processes (e.g., degree programs implemented) (Scheerens et al., 2011; Tilbury, 2007). Data for such indicators are ideally not self-reported, but rather provided by third party entities with processes in place to verify and validate the data (e.g., review by experts or triangulating with independent sources) and to ensure quality measures (Benavot and Williams, 2023). It is important that the data be accessible, longitudinal (i.e., regular data collection versus a one-off data source), and with good geographical coverage (Martin, 2011; OECD, 2008). The literature also emphasizes the role that partnerships can play in data availability, including the role of collaborations with non-state actors in providing indicator data that can then be used in national, regional and inter-governmental policy making and monitoring (Amacker et al., 2017).

In addition, in the case of CCE, the literature indicates the importance of going beyond cognitive understandings of climate change to also address psycho-social considerations (e.g., grief, denial) and climate action opportunities in learning methods and outcomes (Hargis and McKenzie, 2020). Therefore, when considering a framework of CCE-related indicators, one should aim to have several that help assess the extent to which more holistic and effective approaches to CCE are being engaged. This typically means moving beyond easily quantifiable data, and instead engaging in the more nuanced analysis required to assess these non-cognitive aspects of CCE (Cuevas, 2016).

To address these considerations and help progress towards indicators that are stronger proxy measures for climate change education, a global partnership was created in 2020. The Monitoring and Evaluating Climate Communication and Education (MECCE) Project is a Canadian-funded research collaboration with over 100 partners and collaborators ([www.mecce.ca](http://www.mecce.ca)). Its Advisory Committee is comprised of representatives from the Intergovernmental Panel on Climate Change (IPCC), UNESCO, UNFCCC, and the UNESCO Global Education Monitoring (GEM) Report. Other partners include a range of academic institutions, non-governmental organizations, intergovernmental agencies, and individuals working on various aspects of CCE in academic, civil society, or governmental roles. Regional Hubs also provide an opportunity for national representatives to provide input, as do other occasions such as convenings at UNFCCC and UNESCO events. The MECCE Project is focused on increasing the quality and quantity of climate change communication and education in policy and practice through the generation and provision of relevant global data. One of the project's main

<sup>1</sup> Climate change education was further developed and integrated into the UNFCCC as a key part of the Glasgow Work Program in 2021.

<sup>2</sup> The focus on CCE by the UN was furthered when in 2023 UNESCO launched a Greening Education Partnership, which seeks to build "climate change education for social transformation" (<https://www.unesco.org/en/education-sustainable-development/greening-future>).

<sup>3</sup> 1974 Recommendation concerning Education for International Understanding, Co-operation and Peace and Education relating to Human Rights and Fundamental Freedoms

activities is to collaboratively develop a suite of robust global indicators, with accompanying datasets, to support international benchmarking and policy dialogue on CCE, including in relation to the SDGs.

Towards this aim, the partnership has developed an indicator lifecycle approach that enables consideration of a range of factors in indicator development (see Fig. 1). The lifecycle approach includes operationalizing different considerations for CCE. It considers aspects such as holistic CCE; and diversity across a range of sectors, forms of participation, and indicator types. It relies on explicit criteria to identify quality CCE indicators such as geographical coverage, temporal scope, data accessibility, and reliable data sources. Guidelines and criteria for this framework were developed based both on a literature review and extensive input from the project team, including its indicator development ‘expert group’ and ‘working group.’ A thorough search of existing and possible future data sources was carried out (with more than 150 existing data sources identified that could be drawn on), with some of these being suggested or made accessible through partner relationships. A small subset of these data sources was selected to support indicator development, with the working and expert groups providing ongoing critiques and inputs during the development process.

For the 27th Conference of Parties (COP) in 2022, the MECCE project released nine global climate communication and education indicators, with five more released for COP28 in 2023, and others in development. An example of a global indicator is that of: *Integration of Climate Change in National Curriculum Policy*. This indicator is both particularly relevant for SDG 4.7 and demonstrates the potential of non-self-reported data for measuring the SDGs. It measures the extent to which climate change, environment and sustainability are included in national curriculum frameworks (NCFs).<sup>4,5</sup> The MECCE project compiled an extensive pool of official curriculum documents, with the initial set collected as part of a UNESCO study. These were analyzed for specific environmental, sustainability, and climate keywords in a total of 25 different languages to assess the extent and type of integration of climate change into countries’ NCFs.

The use of NCFs as a data source enables broad global coverage, with information on all SDG regions. However, since it has been collected by the MECCE Project team and requires resources to maintain on an ongoing basis, it is less ideal as an accessible data source with good temporal coverage. It is ‘input’ indicator data, which is typically the easiest data type to collect, and so there is scope for other indicators that address outcomes, outputs, and processes and covering different sectors (e.g. non-formal) and participants (e.g., students, teachers). These indicator data do offer the opportunity to not only examine extent of inclusion, but also type of inclusion of climate change content - and thus, the extent to which curriculum policy documents address not only cognitive understandings of climate change, but also psychosocial and action components known to be critical in supporting climate action.

The analysis of NCF indicator data shows that climate keywords were found to be far less common than those related to environment or sustainability, with only 44 % of countries having any climate change content in their NCFs at all. In most cases, the integration of climate terminology into NCFs was not very substantive, though a handful of countries had much more significant integration. Additionally, the analysis shows that documents published more recently are more likely to have climate keywords. The data are publicly available to governments and other stakeholders through the Project’s [interactive data platform](#), which also includes opportunities to examine the indicator data in relation to a range of country characteristics, such as income

levels, greenhouse gas emission levels, and climate vulnerability. See, for example, Fig. 2, which overviews the NCF data for 161 countries. Other MECCE Project components, such as country profiles (80 undertaken to date in collaboration with the UNESCO GEM Report) and case studies (20 funded to date), are also available on the project’s interactive data platform. These components provide contextualized information on how quality climate change communication and education is being undertaken across a range of countries, including how approaches appropriately vary with geographic and cultural differences.

The use of NCF data to create a global indicator enables a representation of whether and how climate change is included in countries’ (or subnational states) explicitly stated aims for their curriculum. Nearly all countries in the world have NCFs, so the indicator provides extensive international coverage that exceeds many existing SDG indicators. Another indicator is currently under development based on grade and subject level curricula, which provides more specific information on how climate change is integrated in the teaching and learning of science and social science subjects in 85 countries. A limitation is that both curriculum frameworks and subject curricula are educational ‘inputs’ (versus outcomes) that outline intended aims and content for an education system, rather than what is actually implemented in schools and classrooms. In addition, for some countries, content may be included just to meet requirements by funding agencies such as the Global Education Partnership versus being local priorities (Fontdevila, 2023; Zapp, 2019).

Developing a range of indicators helps overcome the limitations of using any one indicator, so that the complexity of CCE—and with a range of sectors (formal education and beyond), age levels, and participant types—can be better assessed. Other CCE indicators under development by the MECCE Project, for example, include new data on student learning and teacher capabilities from several ongoing international assessments, the extent to which libraries and library associations support CCE in schools and offer non-formal learning opportunities, the development and implementation of a learning assessment on climate change for higher education students, assessment of the extent of university operations and policy support climate action, and the level of participation in online training opportunities focused on climate change. These and related indicators are or will be developed based on collaborative partnerships that enable access to data and/or further collaboration towards global data in a range of areas. For example, MECCE has partnered with the [International Federation of Library Associations](#) (IFLA) to co-design a survey which IFLA is distributing to its global network of individual libraries and library associations.

#### 4. Conclusion

As proxy measures, well-conceived indicators not only help to track progress but also serve to identify leading examples of CCE and constitute a site of learning for member countries and non-state actors. The UN clearly recognizes the importance of robust indicators to reflect and foster SDG progress, having invested substantial time and energy in the development of 231 global indicators. Given the difficulties of tracking progress for SDG targets 4.7/13.3/12.8 and capturing different aspects of CCE specifically, non-state actor partnerships can provide resources and support networks to enable the development of globally informed indicators and data sets for both governmental and non-governmental stakeholders. The MECCE Project exemplifies such a partnership, helping to establish a strategic framework for indicator development in a key area of the 2030 Agenda for Sustainable Development. It offers publicly available indicators for use in the global monitoring of climate focused SDG targets. Furthermore, it offers a model for the second half of the SDG era, of how data broad partnerships can enable the mobilization of expertise, resources, and stakeholders. This can contribute to the development of more robust indicator frameworks, data, and indicators that can help support monitoring, particularly in cases where there remain data gaps and lack of country capacity to develop national-level

<sup>4</sup> National curriculum frameworks (NCFs) are documents that outline overarching national curricular priorities and learning outcomes that cross multiple grade and subject levels.

<sup>5</sup> For 25 countries the Project and partners were unable to obtain an NCF but were able to get an Education Sector Plan (ESPs) so in these cases the ESPs were utilized for the analysis.

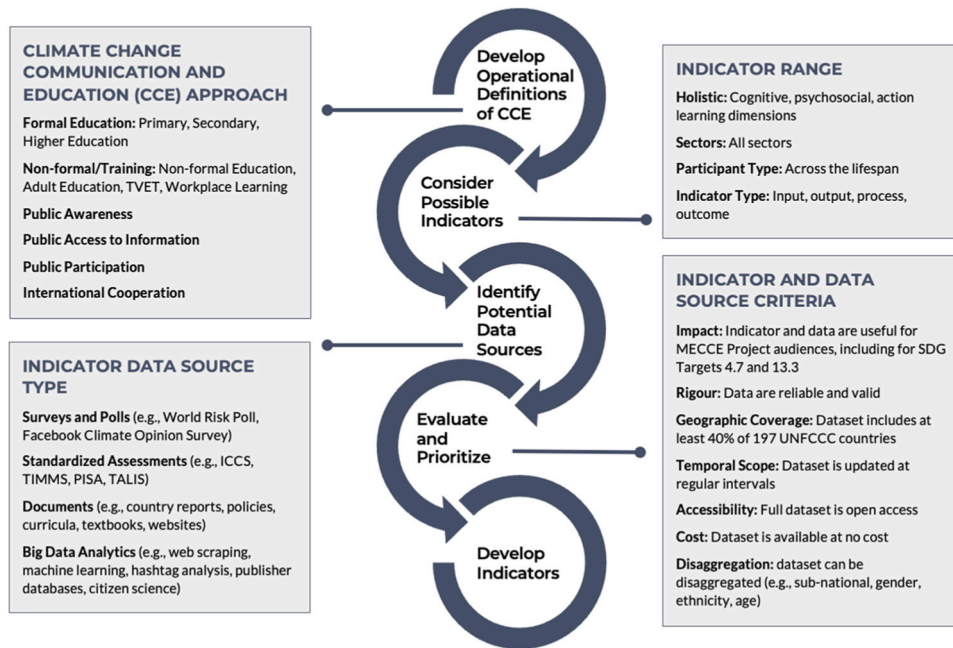


Fig. 1. Lifecycle approach to indicator development on climate communication and education (MECCE Project, n.d.).

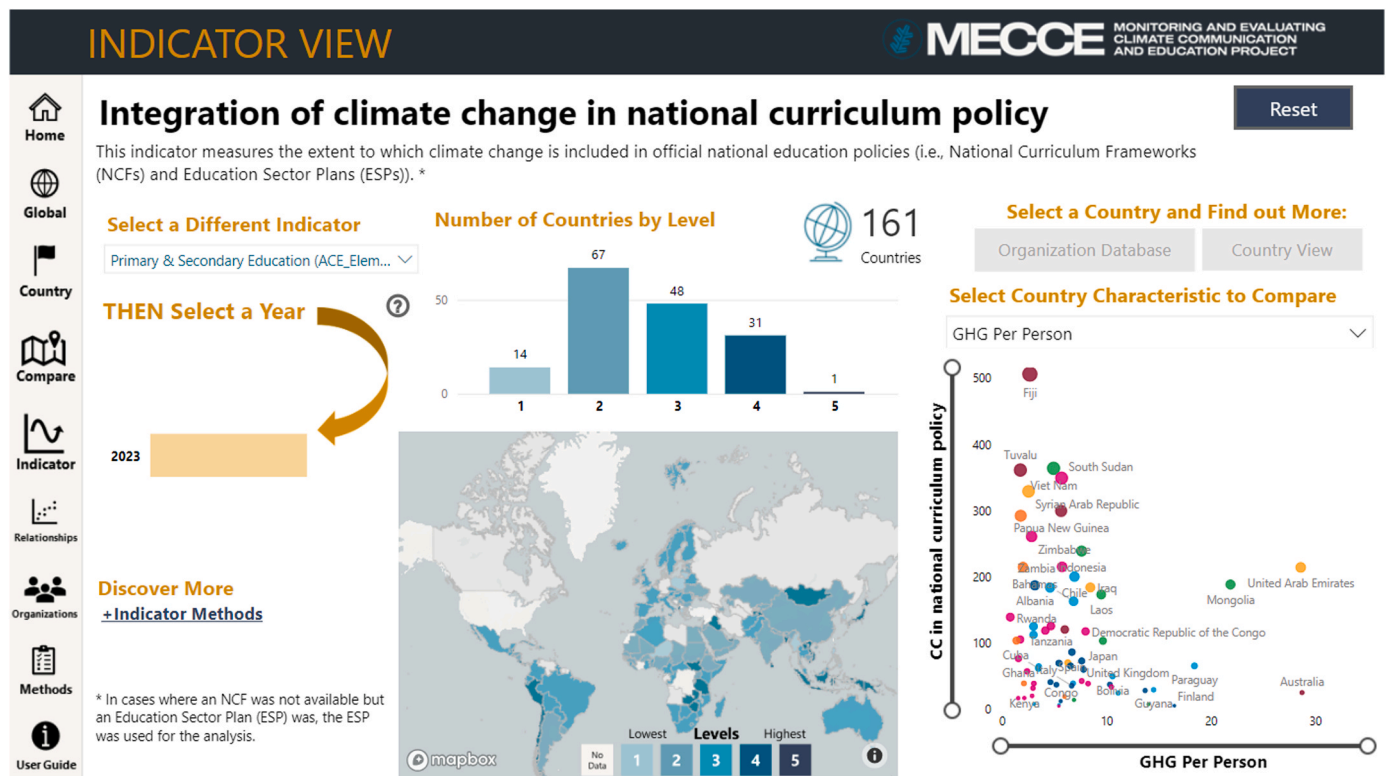


Fig. 2. Overview of the National Curriculum Framework indicator data (MECCE Project, <https://mecce.ca/data-platform/indicators/>).

data.

**CRedit authorship contribution statement**

**McKenzie Marcia:** Writing – review & editing, Writing – original draft, Conceptualization. **Benavot Aaron:** Writing – review & editing. **Redman Aaron:** Writing – review & editing, Writing – original draft.

**Declaration of Competing Interest**

The authors have no declarations of interest. All work is the authors' own.



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