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Building evidence for 'EdTech within Limits': Engaging with the environment in issues of sustainability in EdTech

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About the Jigsaw Learning Brief Series
The Jigsaw Learning Brief Series provides an open-access contribution to building evidence for education. Each brief focuses on a different issue in education and research in low- and middle-income countries, sharing insight and thought leadership to help shape the sector.

Key messages

- Critical questions about the global environmental impacts of EdTech have not yet been given the sustained attention they deserve, resulting in a paucity of evidence on this issue across the sector and a lack of tools tailored to assessing the environmental impact of EdTech programmes.
- Existing tools for environmental assessment, whilst not directly transferable, can nevertheless provide helpful inspiration in the development of a framework for the assessment of environmental impact in EdTech programmes in LMICs; relevant elements of these tools may be adapted and tailored to fit the needs of the sector and incorporated into existing evaluative frameworks in education.
- Transparency, collaboration and data sharing on holistic environmental impacts across the sector, from manufacture to programme implementation, are vital in the pursuit of evidence-informed environmental good practice in the EdTech sector.

Introduction

The recent development of Jigsaw's Environmental Policy has raised critical questions regarding the ways in which we integrate environmental concerns into our work. As a member of EdTech Hub, a global research partnership building evidence on technology in education in low- and middle-income countries (LMICs), one such question relates to research practices and priorities in EdTech, and the extent to which the sector has engaged with environmental concerns in its pursuit of knowledge regarding 'what works' in EdTech. Whilst critical commentators have more recently highlighted the relative neglect of the environment within EdTech research and practice, there has not yet been a dedicated attempt to explore how we might measure the environmental impact of EdTech interventions in the pursuit of more environmentally-conscious practices in EdTech. This learning brief presents an initial examination of this issue and proposes a prospective outline for a framework that could be integrated within EdTech programme impact analyses.

In light of this, the brief engages with two key questions:

1. Why is it important for the EdTech sector working in LMICs to mainstream the environment in its conceptualisations of sustainability?
2. How can we adequately integrate assessments of environmental impact into applied research and evaluation of EdTech, and what tools might we adopt to do this?

The brief first engages with some of the literature on the environmental impacts associated with the digital technology sector in order to frame the topic of discussion, before exploring the potential relevance of two commonly used tools for assessing environmental impact - EIAs (Environmental Impact Assessments) and LCAs (Life Cycle Assessments) - to provide the basis of a framework for assessing the environmental impacts of EdTech in LMICs, and offering a series of recommendations for the sector moving forwards.

As an organisation working on education in LMICs, the following proposition intends to accelerate discussions within the EdTech sector on how the environmental impact of using technology can be appropriately accounted for within programming in LMICs. However, many of the points raised regarding the environmental benefits and shortcomings of orienting towards more tech-based education programming are transferable and applicable to other sectors (for example healthcare), and indeed the education sector beyond LMICs.

Despite the fact that this brief focuses primarily on EdTech programming in LMICs, it is important to highlight that the call to action to urgently confront the environmental impacts of EdTech should be even louder in high income countries (HICs), since it is overwhelmingly countries of the Global North that are responsible for climate breakdown (Hickel, 2020). Otherwise the imposition of strict demands for environmental good practice in relation to highly effective EdTech solutions in LMICs (without equivalent or even more stringent demands placed on EdTech use in HICs) may serve to deepen the global digital divide and further entrench inequality. We therefore strongly encourage stakeholders working on education in HICs, as well as stakeholders in other sectors, to drive this work forward within these contexts.

The EdTech - Environment System: a case for sector-wide engagement

'Sustainability' is a key objective and focus of EdTech interventions across the sector (Hennessey et al., 2021). However, discussions around sustainability of EdTech-supported programmes in low and middle-income contexts have primarily focused on the extent to which activities and impacts on learning outcomes within a programme can be sustained and financed beyond the project life cycle. Indeed, most applied research on EdTech does not consider the environmental sustainability of a given intervention in any explicit way (see for example recent meta-analyses of EdTech in LMICs by Angrist et al. (2020) and Rodriguez-Segura (2021)). Though seldom discussed, when environmental issues have been invoked within EdTech circles, it has primarily been to extoll the potential environmental benefits of increased EdTech use (Selwyn, 2021).

However, there is a growing concern amongst critical commentators related to the environmental unsustainability of the unfettered expansion of digital technology use in education. As the Chairholder of the UNESCO Chair in ICT4D Tim Unwin (2020) writes, the digital technology industry "is one of the least sustainable and most environmentally damaging industrial sectors in the modern world". As such, it is argued that the proliferation of educational technology risks exacerbating the ongoing environmental deterioration of the earth (Selwyn, 2021, p.502).

One of the stated aims of EdTech Hub (of which Jigsaw is a part), is to "accelerate, spread, and scale EdTech interventions that maximise the benefits in delivering improved learning outcomes" (Hennessey et al., 2021). However, critical voices are imploring the sector to reassess the assumptions of "limitlessness and abundance" that this fixation on speed, spread and scale require (Selwyn et al., 2019). As a counterbalance to this discourse of acceleration and expansion, it is therefore imperative to also slow down and think deeply about the environmental implications of the proliferation of EdTech and what it means for discussions of impact and sustainability in the education sector.

Environmental considerations across the EdTech product and programme life cycle

Any approach to research on the environmental sustainability of tech-supported education, by necessity, should take a holistic and whole cycle view of EdTech products and programmes, from manufacture to disposal. It is also essential to recognise that the concepts of "environmental impact" and "climate change" are fundamentally different. Focusing on climate change alone can mean that other seriously adverse environmental impacts on the lithosphere, hydrosphere, biosphere and atmosphere are ignored. This section explores the different phases of the product and programme life cycle from this holistic perspective, asserting the importance of capturing data from across these phases in order to fully understand the potential environmental costs of EdTech use in LMICs.

Manufacturing phase

It is critical to understand the environmental impact during the manufacturing phase of EdTech. Between 70-80% of energy expended during the life-time of a digital device occurs during its initial manufacture (Greenpeace, 2017), with resource extraction and manufacturing related emissions accounting for on average 74.1% of the total environmental impact of mobile phones (Suckling and Lee, 2015). When accounting for the manufacturing phase, it is important to include the implications of the extraction of materials that are used to make the products used in EdTech.

Manufacturing often requires non-renewable rare elements (such as for lithium ion batteries) which causes considerable environmental damage upon extraction (Selwyn, 2018). Singh et al., (2019) also showed when assessing mobile phones, that demand for innovation drove the use of 'high tech' materials that contained more toxic components. Beyond devices, the manufacturing of products that are essential to many EdTech programmes also has a significant environmental impact, such as the infrastructure required to provide connectivity, or the energy usage associated with developing online content.

Distribution phase

The distribution of EdTech also contributes notably to the overall environmental impact. Considering the distribution of devices or technological assets employed in an EdTech intervention is crucial, given that supply chains between device manufacture and use in programming are usually global in scale and hence incur significant emissions through shipping and transportation. Capturing the emissions associated with transporting EdTech devices from where they are produced to where they are implemented is therefore an essential element to capture when assessing the impact of EdTech. In order to promote sustainability, EdTech programme designers may want to prioritise sourcing locally produced devices and technologies where possible to reduce emissions associated with the distribution phase. Additionally, distributing EdTech content and connectivity (which is usually designed to be operational and accessible for 24 hours a day) has a significant environmental impact. In particular, the energy consumed by data centres that store online content has a substantial and increasing impact on the environment (Ferreira et al., 2018), although the environmental impact of data centres is not just limited to this aspect (Shah et al., 2011).

Use phase

It is important to understand the impact that using EdTech has on the environment, particularly the impacts of the use of electricity, internet and data storage. It is also critical to specify that within the context of EdTech, the use phase is often artificially shortened, given that a device might only be considered 'useful' if it remains functional relating to its intended use within programming, or online content may only be 'useful' within a particular curriculum or national education strategy. Ageing devices and content may still be usable in other contexts, but if it is unable to perform the requirements of the EdTech programme then it is not 'useful', which shortens the lifespan of EdTech and increases the rate of device turn-over and content development, which in and of itself has important environmental implications. Additionally, EdTech often incurs 'hidden costs' (Mitchell and D'Rozario, 2022) which also include hidden environmental impacts. For example, many devices will need regular maintenance and repair to sustain their intended functionality. However, the replacement of device parts may incur substantial emissions from the manufacturing and distribution of these additional components, which would not be captured in the environmental reporting of device manufacture and use. As a result, it is critical that EdTech programme designers account for any additional technology and hidden impacts that are used throughout a programme, even if they are not included within the initial scoping.

Disposal phase

The disposal of EdTech and considerations of waste, reuse and recycling are important to engage with to fully understand the environmental implications of EdTech. Globally, USD 62.5bn of electronic waste (e-waste) is thrown away each year, with dumping sites often located nearest the most marginalised (Okafor, 2020). In 2019, less than 13% of global e-waste was recycled (Andeobu et al., 2021). Throwing away and not formally recycling e-waste has significant negative implications for the environment, particularly due to the toxicity of non-properly disposed e-waste (Singh et al., 2020), and so proper disposal needs to be encouraged. However, this is a more significant challenge in LMICs where less e-waste is recycled (Global E-Waste Statistics Partnership, 2019) due to a lack of infrastructure to support formal recycling and waste management (Jambeck et al., 2018). Additionally, government legislation and the location of recycling facilities have been shown to affect the eventual environmental impact of mobile phones and other technology products (Suckling and Lee, 2015). As a result, in many implementing contexts EdTech programmers will have to grapple with external infrastructural constraints, which may limit their ability to reduce negative environmental impacts associated with EdTech. Because of these external challenges to sustainable disposal, where possible EdTech designers, manufacturers and programmers should actively prioritise 'circular' rather than linear products, whereby the EdTech product or its component materials have a clear route to re-enter the economy at the end of their use (Ellen MacArthur Foundation, 2022). This would reduce the necessity for the infrastructure to facilitate sustainable forms of recycling and disposal, which is currently significantly lacking, to exist. Beyond physical e-waste, the EdTech sector also needs to engage with how it can more sustainably dispose of, recycle or reuse online content, particularly given that continuing to store online content indefinitely has a significant environmental impact.

Additionally, the high turnover of devices (and associated emissions of production of new replacement devices) is often exacerbated by the fact devices that are not properly disposed of (Suckling and Lee, 2015) as fewer second-hand products are available on the market, making purchasing new products essential. The recycling (and often simply the dumping) of devices that are deemed to have outlived their usefulness leads to heightened levels of pollution, contamination and toxic waste in some of the poorest regions of the world. In this sense, the continued imperative to upgrade and keep EdTech 'up-to-date' is one of its most destructive qualities (Selwyn, 2018).

What next?

While the relationship between EdTech and the environment is complex, what is certain is that in an age of accelerating climate change, it is imperative to capture and learn from the environmental implications - whether good or bad - of using EdTech solutions in LMICs and beyond. The environmental harms of using EdTech must be mitigated so that the benefits can be fully achieved. As a sector, we cannot and should not research or discuss 'sustainability' without the explicit integration of environmental considerations within these discussions. As demonstrated above, there are many ways in which the proliferation of digital technologies in education could have adverse environmental impacts across the product and programme life cycle. Despite this, there has thus far been little focus or research within the EdTech sector that is dedicated to exploring the environmental impacts of accelerating, spreading and scaling EdTech interventions in LMICs.

In his call to action, Selwyn asserts:

"The 2020s will be the decade where we finally face up to the imperative to establish sustainability and ecological responsibility as central elements of educational provision and practice. One key aspect of this will be properly facing up to the ways in which digital technologies have been excessively consumed and discarded over the past 20 years in the name of education 'innovation'. Regardless of how daunting such changes might seem, the education community needs to quickly curtail the environmental and ethical impacts of its digital technology consumption if there is to be a viable future for EdTech." (Selwyn, 2021, p.502)

The remainder of this brief heeds this call by presenting an outline for a framework that could, with further discussion and refining, be utilised to capture evidence of the environmental implications of EdTech programming in LMICs. The intention is that this can contribute to shifting sector thinking towards prioritising this aspect of EdTech and building an evidence base that can more rigorously inform environmentally conscious decision-making within the sector.

Building better evidence on the EdTech-Environment System

There are numerous existing tools in use for the assessment of the environmental impacts of projects, products, services and organisations. The first section in this discussion explores some of these existing tools, and considers their application within the context of EdTech in LMICs.

Adapting existing tools for environmental assessment

Environmental impact assessments (EIAs) have become established as a central tool of environmental management over the last half-century, in line with growing concern over the extent and scale of human-made environmental change (Morgan, 2012). EIAs are a crucial part of the design and approval process for many projects in HICs, designed to ensure the social and environmental implications of new projects are understood prior to the decision-making process (Digital EIA, 2020). EIAs are heavily guided by legislation and have been used most commonly in the EU. EIA frameworks typically follow a strict process for understanding the environmental implications of individual projects and programmes. The 9 main stages that are central to the EIA process in the EU are detailed below.

The 9 stages necessary for EIAs in EU, as sourced from (Ecochain, 2020):

1. Screening - Is an Environmental Impact Assessment required? Screening is done through a formal screening procedure. If a project is too small, an EIA might not be necessary.
2. Scoping - Which impacts are likely to be important? This is similar to the Goal & Scope definition in many other environmental analyses.
3. Examination of Alternatives - What are alternatives for the project? Can, for example, materials be sourced differently? Also a 'no action' option is often considered. This is a scenario as if the project would not continue.
4. Impact Analysis - What are the effects of the proposed project? This is where the actual environmental impact gets evaluated. An EIA is typically limited to the environmental impact of one specific project on the local geographical area within a given time span (see below)
5. Mitigation and Impact Management - Which measures could be taken to reduce the impact?
6. Evaluation of Significance - Do the benefits of the project outweigh the negative environmental impacts?
7. Environmental Impact Statement (EIS) - This is the report that sums up the assessment. Important: It must contain a non-technical summary that is targeted towards political decision makers.
8. Review of EIS - Assessment of quality by an independent party.
9. Decision Making and Follow-up - Political decision making of the project.

However, there are three reasons why EIA frameworks do not neatly translate into a practical tool for evaluating the environmental implications of EdTech. First, EIAs are eurocentric and based on EU regulatory requirements (Ecochain, 2020) whereas EdTech interventions in LMICs are undertaken across much more legislatively diverse contexts. Using EIAs that are related to national environmental regulations which would shift the requirements and scope of each EIA for EdTech on a contextual basis and make it more resource intensive for EdTech programmers to engage with. Second, EIAs are typically extensive in scope, and are time and cost intensive (Digital EIA, 2020). Necessitating such a significant level of effort means it is unlikely that an EdTech programme would want, or be able to, fund an EIA using this framework. Third, impact analyses within EIAs only account for emissions and effects that occur at the location of the project itself, which can neglect a significant amount of the actual environmental impact associated with a project (Ecochain, 2020). This limitation is particularly pertinent to EdTech programming in LMICs that usually relies on global supply chains for its technology provision. Additionally, EIAs have been criticised for not appropriately categorising all of the environmental impacts associated with a project.

It is also important to note that EIAs have also been critiqued more broadly for being susceptible to politicisation, and with some commentators arguing that EIAs have been co-opted to serve specific economic interests and legitimise a neoliberal economic agenda (Bond et al., 2020). These shortcomings and warnings are important to keep in mind. However, several of the stages outlined above can still be used as inspiration in the development of a framework for the assessment of the environmental impacts of EdTech programmes.

Indeed, the first two stages of EIAs outlined above, namely screening and scoping, are important steps that EdTech interventions should consider following with regard to considering environmental impacts. Within an EIA context, the 'screening' phase refers to assessing whether the project has a significant enough impact on the environment to require an assessment (Gov UK, 2020). While it is important for all education programmes to consider the environmental impact of using technology (no matter how small), an initial screening process could be used to determine the appropriate level of effort necessary to evaluate the environmental impact of each EdTech intervention. The scoping stage examines what information should be included within an impact analysis, in particular determining the content and extent of environmental information to be included (European Commission, 2001). Within an EdTech context, it may also be helpful to conduct an initial scoping review to determine which impacts are likely to be most significant in the context of a given intervention, and account for these at the outset to ensure they are captured in subsequent analyses of the impact of a given EdTech innovation.

The third and sixth stages in the EIA framework, the consideration of alternatives and evaluation of significance, are also highly relevant to EdTech and could therefore be drawn into a framework for the environmental assessment of EdTech innovations. Since engaging with both of these aspects already occurs in some form within existing evaluative frameworks for EdTech in LMICs, it is perhaps most helpful to explore the possibility of integrating environmental considerations into these existing frameworks for evaluating its significance and considering alternatives within education programming in LMICs.

Life Cycle Assessment as an alternative to EIA impact analyses

If the impact analyses within EIAs are not appropriate for adaptation into an EdTech context, are there alternative tools to assess environmental impact that may be better suited? One tool, the Life Cycle Assessment (LCA), could provide an alternative option to the impact analysis that forms part of a typical EIA. An LCA is defined as the systematic analysis of the potential environmental impacts of a product or service during their entire life cycle (Sphera, 2020). While LCAs have significant overlap with EIAs, the focus on individual 'products', rather than a programme as a whole, demonstrates significant alignment with EdTech programming whereby technology devices or products (and understanding their environmental impact) often constitute a small part of a wider education programme.

LCAs evaluate the potential impacts throughout the different phases of a product's lifecycle (production, distribution, use and end-of-life), including the upstream (e.g. suppliers) and downstream (e.g. waste management) processes associated with each phase (Sphera, 2020). In addition, the much broader scope of an LCA - which aims to understand the impact of a specific product across different locations, rather than being confined to a single location like EIAs (Tukker, 2000) - is much more useful for capturing the the environmental impacts of EdTech and technology products which are global in their scale. LCAs could therefore be used as a basis for evaluating EdTech interventions, particularly for the individual technological components that form part of an intervention. However, like EIAs, LCAs can also be lengthy and expensive, which has led to the development of more simplified models (SLCAs) across different industries (see for example Douziech et al., 2021, Hur et al., 2005). In the development of LCA models for the EdTech sector, the efficiency of simplified models must be balanced against the need for a holistic, 'product systems' approach which takes into consideration the environmental impact of not just the EdTech device itself, but also other core digital systems required for the function and ongoing delivery of the EdTech innovation such as connectivity and content.

Evaluating significance and exploring alternatives

Once the environmental impacts of EdTech have been properly documented and accounted for within each programme through an SLCA or equivalent, it is subsequently important to evaluate the significance of these impacts *in relation to* the learning outcomes and delivery of an intervention. Value for Money (VfM) strategies and frameworks may represent an appropriate existing framework in the EdTech toolbox to engage with this issue.

Traditionally, VfM strategies set out a programme's approach to achieving the maximum impact for the resources available (Lamp Development, 2019a) and VfM frameworks provide an approach to measure, monitor and report information on value for money across the programme cycle (Lamp Development 2019b). Within the education sector, VfM analyses typically focus on the impact of programmes on learning against the 4 Es (economy, efficiency, effectiveness, and equity) (DFID, 2011), to provide a supporting qualitative assessment on the extent to which the results of an intervention (in terms of learning) justify the costs (when related to each of the 4 E categories). Some frameworks have already started to incorporate a 5th E of environment (Chuang et al., 2021).

Moving forward, systematic inclusion of the environment as a 5th 'E' in Value for Money strategies and frameworks would ensure that EdTech programmes are considering the environment both at the programme design phase, and throughout implementation via the ongoing assessment of the significance of the environmental impacts of an intervention relative to the learning that is being delivered. It will do this through engaging in discussion over whether the harmful environmental impacts of an intervention represent an appropriate impact relative to the success of intervention delivery. Using VfM strategies and frameworks as a basis for evaluating environmental impacts is helpful for two further reasons. Firstly, VfM and cost-based analyses are already an essential component of EdTech programming, and so adding an additional 'E' of environment is a sensible approach to reduce LoE, work within existing mechanisms and improve prospects for buy-in. Secondly, sustainability is an important cross-cutting issue across VfM frameworks and their evaluation categories, and considering the environmental impacts of EdTech is essential to fully document and evaluate the sustainability of an intervention (it is hard to reach convincing conclusions regarding sustainability without considering the environment!).

In relation to the examination of alternatives, within the sector more broadly there is a recognised need for research that compares the effectiveness of EdTech interventions (in terms of impact on learning and cost-effectiveness) with potential non-tech or alternative technology options. Where possible, the environmental impact of EdTech components and their possible alternatives should be included and weighed against the projected costs and impact on learning. While this is a significant endeavour, and requires a substantial amount of time to establish a comparable evidence base and appropriate framework (such as LAYS for cost-effectiveness (Filmer et al. 2018)), eventually it will provide decision-makers with the evidence necessary to compare the cost-per-child of interventions to both their effectiveness *and* environmental impact, which will ultimately allow environmentally conscious decisions to be made when pursuing cost-effective EdTech programmes. As a sector, agreeing upon a comparative system of measurement for environmental impact in EdTech is therefore particularly important. As a standardised and comparable system of measurement, an approach based on SLCAs may prove particularly useful in this regard.

That is not to say that environmentally-friendly programmes should always be prioritised at the expense of impact on learning (the appropriate weighting of the importance of the environmental impact of programmes relative to their impact on learning is an additional, complex discussion), but that evidence of the environmental implications of possible interventions should be part of the discussions that inform which EdTech programmes are ultimately selected, particularly with regard to choosing programmes that are the most sustainable and are therefore more likely to lead to long-term sustained improvements in learning outcomes. Incorporating the environmental impact of EdTech within Value for Money assessments, alongside rigorous cost-effectiveness data, will ultimately be most useful to decision makers in helping to address this question.

What an EdTech environmental assessment framework might look like

A comprehensive and holistic engagement with environmental considerations within an EdTech programme, integrating aspects of EIAs and LCAs within pre-existing evaluative frameworks in education, would cover the following stages:

At the programme design and preparation phase:

1. A screening to consider whether a full assessment of environmental impact is necessary for a given programme
2. An initial scoping process to determine which impacts are likely to be the most important and require inclusion in the analysis of environmental impact
3. A Simplified Life Cycle Assessment (SLCA) or equivalent, covering the manufacture, distribution, use and disposal of the EdTech product system and its impact on the environment at each stage, using standardised, comparative measures to the extent possible
4. An examination of alternatives, including non-tech options
5. An environmentally-sensitive VfM strategy which includes an assessment of the extent to which any environmental costs are outweighed by the potential impact of the programme on learning (and other) outcomes

At the implementation and evaluation stages:

An environmentally-sensitive VfM framework that integrates environmental considerations into ongoing monitoring and reporting on Value for Money across the project cycle, and collects data on the actual (rather than projected) impact of the project in terms of both learning outcomes and environmental impact.

Limitations and challenges

The above discussion presents an initial exploration into elements of some existing environmental assessment tools that could be harnessed and integrated into current frameworks for EdTech research. However, there are a number of other tools that have not been engaged with in this discussion that may also add value to a framework for assessing the environmental impact of EdTech. These tools should be comprehensively explored moving forwards in order to assist the development of methods for the collection and analysis of data on the environmental impacts of EdTech solutions.

It is also important to recognise that a significant challenge with evaluating the environmental impact of EdTech in LMICs is the lack of publicly accessible data. While the above framework provides a useful outline for how EdTech could be appropriately assessed, it is reliant on data from EdTech manufacturers (particularly relating to information for products relating to their manufacturing, distribution and use phases, e.g. battery electricity usage, expected product life expectancy, equivalent emissions to manufacture a product).

Without a shift towards transparency and public reporting of environmental data from EdTech manufacturers (which needs to also be encouraged by donors), this or any alternative environmental assessment framework will be difficult to implement in practice. It is important that data is readily available to programmers and researchers in order to ensure that assessing the environmental impacts of individual EdTech interventions is not an onerous and costly task that requires significant additional data collection, but instead represents a relatively low and appropriate level of effort that can be implemented widely across LMIC contexts, which is necessary in order to add significant value to decision-making.

Recommendations

Alongside efforts to build evidence on the effectiveness and cost-effectiveness of EdTech interventions relative to non-tech-based alternatives, it is necessary to develop ways of measuring the potential environmental impacts of EdTech programmes and integrate these findings into discussions of which educational solution is most appropriate and 'sustainable' in a given context. As the above discussion demonstrates, taking inspiration from existing tools for the assessment of environmental impact, and adapting and integrating elements of these into the design, monitoring and evaluation of EdTech programmes, offers a way to build the evidence base on the EdTech-environment system. However, this requires buy-in from across the EdTech and digital technologies sector, a culture of transparency and collaboration, and a collective commitment to evidence-building and data sharing on the environmental impacts of EdTech. This evidence, in turn, should factor into any discussion of 'what works' in EdTech, and feed into decision-making regarding the financing of EdTech programmes.

In conclusion, this brief recommends that:

1. **Researchers and policy-makers should commit time and resources to adapt/develop affordable and practically applicable tools for the assessment of environmental impact in EdTech,** and establish guidance and good practice standards for stakeholders at all stages of the product cycle in the pursuit of environmentally sustainable EdTech.
2. **Researchers and EdTech programmes should integrate these tools into the design, monitoring and evaluation of EdTech programmes** in order to build the evidence base on the environmental impacts of EdTech solutions.
3. **Tech manufacturers should systematically and transparently report the emissions and environmental impacts associated with the manufacturing phase of the product cycle** so that policy-makers and practitioners can easily harness this data for the assessment of EdTech interventions.
4. **Inter-organisational collaboration and dialogue on the EdTech-environment system should be fostered** through, for example, engagement with DESC - a research coalition on the digital-environment system.
5. **Decision-makers in education should use this evidence to make better, more environmentally sustainable decisions about what technology to use,** weighing both financial *and* environmental costs against projected learning benefits.