Digital-Environment System Coalition
https://ict4d.org.uk/desc/ or **http://desc.global**

DESC Conceptual Framework

Context

This document provides a short overview of the basic premises and concepts underlying the Digital-Environment System Coalition (DESC). It serves as an initial guiding framework for the coalition's work in sharing evidence from major areas of existing research, identifying important new areas of research for DESC's Thematic Working Groups, and making policy recommendations at global, national and local scales. The framework is a dynamic document that will evolve as DESC's activities expand. It was first drafted in February 2021, and then revised twice following discussions at the Coalition's meetings in March and August 2021.

DESC's rationale and key principles

DESC is based on the premise that much previous research and practice at the interface between digital technologies and the physical environment has been partial and has failed sufficiently to examine the *holistic* environmental context within which digital technologies are created and used. Previous research and practice have also tended to focus mainly on the positive benefits of digital technologies and have placed insufficient emphasis on their negative harms.

DESC is different from previous initiatives because of the ways in which it integrates four main characteristics with three types of activity:

The characteristics that make DESC different:

1. A **holistic approach** to the inter-relationships between digital technologies and the physical environment;
2. An emphasis on **both the positive benefits and the negative harms** resulting from the use of digital technologies;
3. Its focus on the **entire human-environment interface**, and not just on climate change and carbon; and
4. The combination of attention paid to both **environmental sustainability** and the **sustainability of digital technology business models**.

DESC's three main areas of activity:

1. **Research**: collating and sharing existing knowledge, and undertaking novel research where gaps are identified;
2. **Practice**: engaging with and supporting initiatives that implement positive change; and
3. **Policy**: influencing policy makers and those working in policy environments at local, national and international scales.

DESC's initial conceptual framework

There are many challenges in conceptualising the rich complexity of interactions between the use of digital technologies and the environment. This framework is only an initial step in rethinking their inter-relationships. Each element and flow within it can in turn be broken down into considerably more detail, and members of DESC will focus on specific aspects of the framework to share existing knowledge, build new knowledge, and inform policy making at global, national and local levels.

One of DESC's key purposes of is to develop a holistic approach to global understanding and action relating to the interface between digital technologies and the environment that moves well beyond the current focus primarily on the role of digital technologies in mitigating "climate change" through a reduction in carbon emissions. DESC's framework focuses on four main inter-related ideas or constructs: the physical environment, digital technologies, energy, and the human context, each of which is represented by a rounded rectangle in Figure 1.
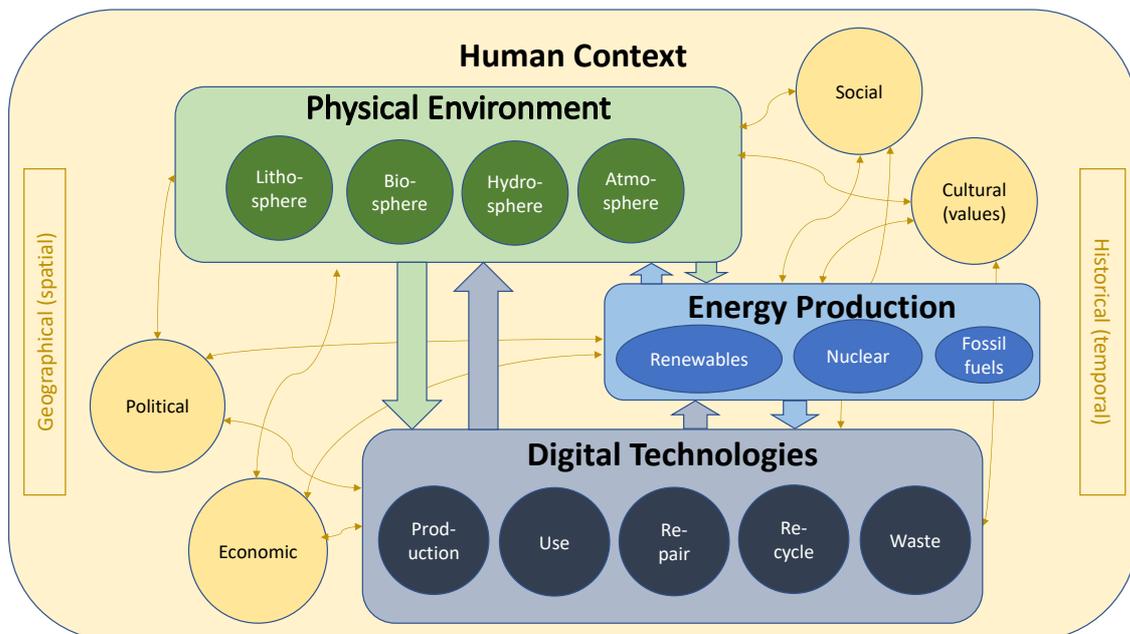

Figure 1: DESC's initial basic framework for considering the interactions between digital technologies and the physical environment (Version 3, August 2021).

The interactions between these constructs are represented by the arrows in Figure 1, and the circles represent the main elements of initial interest to DESC within each of them.

Physical environment (green)

The physical environment is central to all of DESC's work, and is conceptualised in terms of four main elements (represented by circles): (i) the lithosphere, (ii) the biosphere, (iii) the hydrosphere, and (iii) the atmosphere and outer space. DESC's work focuses on the ways through which the uses of digital technologies intersect with numerous aspects of each of these four elements of the physical environment, recognising that it is particularly mediated through demands for and thus production of energy (blue rounded rectangle).

Digital technologies (grey)

Digital technologies (including both hardware and software, as well as increasingly converged technologies) are initially considered in terms of their production and transport, use, repair, recycling, and waste or end of life. In practice, much of DESC's work will address the environmental ramifications of specific technologies, but instead of trying to list all of these here, this framework focuses on generic aspects to be considered for all such technologies.

Energy production (blue)
Electrical energy is essential for the functioning of digital technologies, and its production and consumption are therefore an especially important means through which digital technologies influence the physical environment. As an initial starting point, DESC considers three types of energy, subdivided into the following main types: renewables (hydro, wind, solar, tidal, geothermal, hydrogen); fossil fuels (hydrocarbons, primarily coal, oil and gas), and nuclear (including both fission and fusion).

The human context (pale yellow)

The human context within which these physical interactions occur is conceived within the fourfold structure of economic, social, political, and cultural elements (again represented by circles). DESC recognises that this framing itself largely represents European intellectual traditions, and an important part of the work within the cultural/values dimension will be to explore alternative ways of understanding the relationships between people, digital technologies and the physical environment, particularly from the perspective of those marginalised by existing power structures. Legal and psychological issues are considered in terms of their economic, political, social and cultural dimensions, but they also form important aspects of enquiry within their own right. All these interactions occur within the dimensions of space (geographical) and time (historical) which are represented by rectangles in Figure 1.

A focus on both the positive and negative of digital technology production and use

Each of the basic elements of this model can be considered both as a black box or subdivided into numerous further sub-elements. Throughout, DESC is committed to exploring both the positive benefits and the negative harms on the physical environment of all aspects of the production and use of digital technologies.

Use of the framework

The framework (Figure 1) is designed with three main purposes in mind:

- o To provide a structure within which to collate and share existing research knowledge;
- o To identify and fill research gaps that have as yet been insufficiently considered; and
- o To develop policy recommendations based on the research evidence.

With respect to the first of these, DESC Members will use the framework to share evidence and current understandings of the relationships between the various elements in a comprehensive bibliographical database,[1] as well as through short summaries of existing knowledge.[2] For example, one group of members might focus on the economics of the inter-relationships between the use of digital tech and the atmosphere, another might explore varying cultural values relating to recycling digital tech, and another might address the impact on the lithosphere of the use of digital tech in renewable energy production.

Second, this framework has been crafted deliberately to identify gaps in existing research and practice, so that Members of the coalition can then address them by forming Thematic Working Groups to seek research funding, undertake novel research activities, and develop policy recommendations based thereon.

An underlying normative ethic

Much contemporary academic enquiry and policy making is essentially based on a *positive* view of science (what is), rather than a *normative* one (what should be). DESC in part seeks to redress this balance by highlighting the importance of normative recommendations by scientists (and others) for policy making. It suggests that scientists, in the broadest sense of the term, have a responsibility not just to explain or describe what is, but need to go beyond this to recommend what should be. DESC therefore has in place a robust governance framework and a clear set of ethical guidelines that underlie all of its activities. It is particularly important to emphasise two aspects of these in the context of this conceptual framework.

First, DESC's commitment to diversity in the widest sense means that the coalition includes people and organisations from many different backgrounds and with contrasting perspectives. This is essential for the construction of the truly holistic approach that DESC is developing to understand and change the existing interactions between digital technologies and the environment. However, it also means that Members must pay particular attention to being sensitive to the opinions and practices of others. Reaching consensus may not always be easy, but the coalition is seeking to do so through openness and transparency in all of its activities.

Second, DESC recognises that the voices and experiences of the most marginalised must play an important role in shaping any normative vision of how digital technologies should be created and used with respect to the physical environment.

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[1] See, for example, EuroDig wiki for an existing listing of related materials.
[2] See, for example, *Deep-sea mining and digital technologies* (DESC) and *Indigenous Peoples, Digital Technologies and the Environment* (DESC)

DESC is not about imposing a particular "development" perspective or intervention on people, but is rather concerned with creating a fairer and more equitable relationship between people and the physical environment through the use of digital technologies. DESC therefore seeks to move beyond much of the existing rhetoric and practice concerned with international "development", and particularly so-called "sustainable development". Instead, it aspires to craft collaboratively a holistic approach that can be adopted at global, national and local levels, and that takes into consideration the importance of local context.

An emergent framework

This document is intended to be an emergent conceptual framework, with new versions being developed, alongside more detailed models of particular elements within this overall framework throughout the duration of DESC's activities.

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