CHAPTER

2

Global change and the contextual dynamics shaping education: a view from the sustainability–education nexus

This chapter should be cited as:

This chapter takes an ambitious look into global change and the contextual dynamics that are facing education in the twenty-first century. Starting with a broad look at the sustainability–education nexus from economics and the sustainability sciences, we then consider scientific insights on sociocultural, psychological and behavioural barriers as well as motivators to pro-environmental action and the different intervention pathways that might promote individual and collective sustainable behaviour. But recognizing the dangers of overemphasizing individual behavioural adaptation in light of powerful structural obstacles to change, we go on to problematize some of the epistemic underpinnings of modernity and consider the role of education in both enabling and hindering cultural and ecological transitions. We then turn to the question of how to achieve this sort of deeper educational transformation, proposing a move away from an individualist paradigm towards a more relational approach to one another around the world and to nature. Drawing on insights from the environmental and sustainability education movement and some of the transformative education dynamics emerging from this field, we present the key messages and implications of this chapter, focusing on the need to work with interdisciplinary perspectives towards more sustainable, humanistic and transformative approaches to education.

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2.1   Introduction

Contextual dynamics have played a significant role in the emergence of modern education systems as we know them today. Colonial histories, the industrial revolution and the dominance of fossil-based capital development patterns would not have been

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possible without the scientific and educational processes that characterized the eighteenth, nineteenth and twentieth centuries. Such contextual dynamics have brought us to the current state of educational flux, with a desperate need for reinvention in the face of pressing and complex global changes. These include global health concerns (highlighted by the COVID-19 pandemic), economic pressures, technological developments, continuing or worsening social injustice and inequality and, overshadowing all else, the climate crisis.

Central to the narrative of this chapter is the role of education in addressing such global challenges: is education (as currently constituted) a solution to global inequalities and socio-ecological injustices? Or does it entrench or reproduce now outdated paradigms, further pushing humanity towards catastrophe? The argument of this chapter is that a renewed focus must be placed on reframing the dominant human capital paradigm

of education by placing far greater emphasis on sustainable, humanistic and transformative approaches, building on previous work in this vein by UNESCO **(International Commission on Education for the Twenty-first Century, 1996; UNESCO, 2015b; UNESCO MGIEP, 2017).**

In order to recognize the need for radical transformation of education in the direction of greater sustainability, it is important to grasp the history, politics and science of humanity's detrimental impact on the natural environment. Through engaging critically with the human capital paradigm, **section 2.2** begins by broadly exploring contemporary contextual challenges as articulated by economic, environmental, geographical, population and earth system sciences, referred to collectively as the sustainability sciences. The micro level is the focus of **section 2.3**, which presents scientific insights on sociocultural, psychological and behavioural barriers, as well as motivators to pro-environmental action and the different intervention pathways that can potentially

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promote individual and collective sustainable behaviour.

Moving beyond the discussion of symptoms of unsustainability, towards analysis of its possible root causes, **section 2.4** problematizes some of the epistemic underpinnings of modern science and considers the role of education in enabling (and hindering) cultural and ecological transitions. Offering political-ecological and cultural-historical perspectives, and engaging with recent debate over the role of 'coloniality' in shaping educational institutions and discourse, this section points to the need for a transformation of education systems that cannot be fully captured by the sustainability sciences or addressed simply by the promotion of 'pro-environmental' and 'pro-social' behaviour.

Section 2.5 then turns to the question of how to achieve this sort of deeper educational transformation, in a move away from an individualist paradigm towards a relational approach to others around the world and to nature. Drawing on insights from the environmental and sustainability education movement and from various disciplines, the chapter highlights important themes that remain largely absent from a transformative education perspective, shedding light on the question of what it takes for education to critique its own paradigm. We close the chapter with **section 2.6**, where we discuss key messages and implications, focusing on the need to work with interdisciplinary perspectives in understanding the influence of context on education systems worldwide.

2.2 [Scientific diagnosis of our environmental malaise](#)

The central role of humanity's relationship with the environment in shaping our history has received growing recognition in recent years **(Turner and Sabloff, 2012)**. Substantial scientific work has revealed the risks posed by unsustainable human–environment relations for the well-being not only of humanity but also of other living beings, and for the viability of our shared habitat itself **(see Box 1 for an illustrative example)**. This section provides snapshots of contemporary contextual challenges as articulated mainly by economists and sustainability scientists.

BOX 1: THE COLLAPSE OF EASTER ISLAND: HUMAN–ENVIRONMENT INTERACTIONS ON A CIVILIZATIONAL SCALE

A historical case is the cautionary tale of the collapse of the population on Easter Island. A popular theory is that of ecocide whereby the indigenous people of the island, the Rapanui, destroyed their own natural environment, thus bringing about the disintegration of the social and political structures of their society **(Diamond, 2011)**. Interestingly, new theories are emerging suggesting that, rather than solely self-inflicted, the collapse of the Rapanui society was exacerbated by the arrival of Europeans, whose colonizing drive contributed to the Island's collapse through disease and subjugation of the local population **(DiNapoli et al., 2020)**. This example demonstrates the dynamic and complex interplay between humans and their environment, and is a forewarning of what can happen when such interactions become unbalanced and unsustainable.

2.2 .1

PROBLEMS EMERGING IN HUMAN– ENVIRONMENT RELATIONS

A fundamental dilemma in human–environmental relations is the balance between resource use and human development. In terms of contemporary human development, the Club of Rome published a report in 1972 that predicted the limits to growth on earth by 2072, based on a computer simulation of exponential economic and population growth given a finite supply of resources. Although critics argue the predicted results do not sufficiently consider the

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role of socio-economic factors such as technological progress in ameliorating problems of resource depletion, pollution and food production, it has long been clear that our current economic paradigm based on infinite growth does not square with the finite resources of Planet Earth.

From a sustainability perspective, the continued neocolonization of developing countries drives greater extraction, waste and inequity. Extractive industries, which continue to be central to the political economy of many countries in the Global South, received a massive boost in many regions from Western colonialism. When the West was colonizing Africa, Asia and the Americas, colonizers exploited local resources to meet the demands of the

metropolis in their own countries. This colonization drive has today been transformed into a specific growth-oriented development path named neo-extractivism (with Japan and China among the main players, alongside Western powers), in which extraction becomes the main avenue for development to occur **(Schaffartzik et al., 2016)**. Increases in GDP per capita, however, are frequently not followed by any positive growth of inclusive wealth per capita (Managi and Kumar, 2018). Countries boosting their economy by simply extracting more from local nature typically experience a level of natural capital degradation that outweighs gains in GDP and human capital **(Kurniawan, Sugiawan and Managi, 2021) (see Box 2)**.

BOX 2: THE RELATIONSHIP BETWEEN NATURAL CAPITAL EXTRACTION AND GDP

At the stage of rapid industrial scale expansion that requires more natural capital extraction, usually in developing countries,

increasing GDP per capita often leads to the extraction of more natural capital, while resources to drive GDP

expansion in developed countries are often extracted from offshore – first under colonial regimes, and now under neocolonial extractivist paradigms **(Kurniawan, Sugiawan and Managi, 2021)**. Although an annual reduction in the speed of natural capital degradation has been observed in some developed countries, this reduction has been achieved largely by transferring the burden of resource extraction to developing countries. Furthermore, local employees of neo-extractivist projects often work in oppressive conditions **(Egels-Zandén, 2007)**. This poses issues of massive inter- and intra-country inequality, exacerbating the

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As the above indicates, our most pressing challenge today is to rebalance the delicate reciprocal relations between nature and human well-being **(Díaz et al., 2018)**. According to the Global Assessment of Biodiversity and Ecosystem (IPBES, 2019), nature's contributions to people (NCP) are declining worldwide faster than at any time in human history, with the degradation of ecosystems indicating unsustainable growth patterns in most countries that achieve economic growth through natural capital extraction **(Kurniawan, Sugiawan and Managi, 2021)**. Economists tend to treat nature and NCP essentially as a resource for generating human well-being **(Managi et al., 2019)**. The natural capital component of inclusive wealth takes into account both market and non-market assets that contribute to human well-being including ecosystem services and other renewable/ non-renewable natural capital resources, such as fisheries, forests, agricultural land, fossil fuels and minerals **(UNEP, 2014; Managi and Kumar, 2018)**.

However, the economistic approach to calibrating the value of nature (or 'NCP'),

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while doubtless serving a useful purpose in informing public debate, has been criticized for its anthropocentrism **(Keulartz, 2012)**. The challenge for educators, and for all those (economists included) involved in shaping public discourse, extends beyond refining the technical apparatus for calculating how much humanity can afford to extract from nature. The need for transformative change to achieve sustainability has been broadcast with growing urgency by a range of global reports, notably the report of the Intergovernmental Panel on Climate Change **(IPCC, 2018, 2021)** and the Global Environmental Outlook reports **(UNEP, 2019)**. Addressing climate change requires collaborative efforts and frameworks among related agents at every level, including individuals, communities, companies, and states, as the Paris Accord has stressed. Key to securing and sustaining this collaboration is fostering greater awareness not just of environmental risks, but also of the issues of socio-economic inequality and social justice with

which these are inextricably intertwined. The impact of climate change and natural disasters on societies varies considerably according to economic capacity and geographic location. Low-income countries are more likely to suffer from the negative impacts of climate change and natural disasters, while the negative impacts on middle-income and more developed countries are relatively weaker **(Coulibaly, Islam and Managi, 2020)**, raising issues of climate justice in policy discourse and international practice. Considering the heterogeneous impacts of climate change on different agents is thus essential for effective policy-making and implementation.

Climate change and environmental crisis also have the potential to dramatically corrode social cohesion and damage individual and communal welfare in multiple ways, with ramifications for mental health, social interaction, recreational activity, displacement, cognitive development and quality of life **(Evans, 2019)**. Social conflicts

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related to climate change are already occurring and will likely intensify across all major regions around the world due to future temperature increase **(Hsiang, Burke and Miguel, 2013)**. Meta-analyses of temperature elevation and conflict note that one standard deviation increase in temperature is linked to a 2.1 per cent net increase in the frequency of interpersonal violence and a 11.3 per cent increase in the frequency of inter-group conflict **(Burke, Hsiang and Miguel, 2015)**. For the period 1980–2010, one estimate is that 9 per cent of armed conflicts coincided with climate disasters such as droughts or heatwaves, rising to 23 per cent incidence in ethnically highly fractionalized countries including North and Central Africa as well as Central Asia **(Schleussner et al., 2016)**. Other research has claimed that the experience or fear of environmental degradation, and an associated squeeze on resources, can exacerbate authoritarian attitudes and the derogation of 'others', undermining cohesion and heightening the risk of conflict **(Fritsche et al., 2012)**. Even in relatively prosperous North

America and Europe, rising nationalism and populism in recent years can be associated in part with such fears **(see WG2-ch5** for more on the bidirectional relationship between conflict and education and **WG2-ch8 WG2-ch8** on curriculum and pedagogy for a discussion of how the content of schooling can contribute to fostering, or undermining, the sort of trust and mutual regard upon which effective international collaboration depends).

Both the profound cultural and socio-political changes and scientific and technological innovations needed to address sustainability require transformative education that departs from the dominant model fuelling competition on individual and collective levels. As we highlight in this chapter, in addition to the emphasis on learning interventions aimed at behaviour change **(see section 2)**, the transnational collaboration and sensitivity to our living environment required to achieve this transformation imply ethical and political changes at least as

profound and far-reaching as any scientific or technological advances. This spirit of collaboration depends crucially on consciousness or awareness of our shared humanity – a quality that is corroded and undermined by the stark inequalities that characterize our world. Figures for 2019 show that the top 1 per cent of the adult population possessed 43.4 per cent of global net worth – while 87.6 per cent of adults together possessed only 16.1 per cent of global wealth **(Shorrocks, Davies, and Lluberas, 2020)**. The COVID-19 pandemic is expected to further exacerbate income inequality **(Furceri et al., 2020)**. Continuing natural capital depreciation also threatens to worsen wealth inequality, not least in rich economies where other forms of wealth accumulation are failing to compensate for decreasing natural capital. This remains an issue that is yet to be adequately confronted in economic thinking and policy **(Managi and Kumar, 2018)**. Taking this critique to another level, it has been argued that the assimilation of nature into capitalist discourse as 'natural capital' is based on a

logic of separation of nature and society that has its origins in the post-Enlightenment Western rationality of dominating the world **(Moore, 2016)**. We will further discuss, in **section 3**, the 'invention of (external) nature' as a root cause of unsustainable human–environment relations and explore a decolonial critique of the dualist (Cartesian) ontologies of 'human-nature'/ 'self-other'/ 'subject–object'/ 'cognition–emotion' that have been implicated in a modernity 'project' encompassing modern science and modern education.

2.2 .2

DEMOGRAPHIC CHANGES AND THEIR IMPLICATIONS FOR DEVELOPMENT PARADIGMS

One crucial aspect of the sustainability of humanity's relationship with nature involves

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the size of the human population and the demand this implies for agricultural production, energy generation and extraction of natural resources. Since demography is only one of the contextual factors to be considered for reimagining education for more peaceful and sustainable futures, and is usually not given prominence in the discussion of the education–sustainability nexus, this section highlights demographic trends as important considerations in redesigning education and life long learning systems around the world. According to the United Nations' (UN) projection, the world's population will continue to increase, from 7.7 billion in 2019 to 8.5 billion in 2030, 9.7 billion in 2050, and 10.9 billion in 2100 **(Department of Economic**

Developed countries, especially Japan, Korea and some European countries, will witness rapid ageing over the coming decades.

and Social Affairs, 2020)**. There are two significant dimensions to this trend. The first is the uneven population growth rate between developed and developing countries: the fastest growing populations will be those of developing countries, in part due to higher fertility rates, while many developed countries already have a growth rate that is close to or below zero. Specifically, the largest increases in population between 2020 and 2050 are projected to take place in India, Nigeria, Pakistan, the Democratic Republic of the Congo, Ethiopia, Tanzania, Indonesia and Egypt. The second significant dimension is that the populations of most developed countries, with the exception of the United States (USA), are projected to decrease or to remain almost constant henceforward.

These demographic changes will result in a major shift in age structure. Developed countries, especially Japan, Korea and some European countries, will witness rapid ageing over the coming decades. Conventional economic

analyses tend to emphasize that population ageing presents challenges in terms of labour productivity, capital formation and savings rates **(Bloom, Canning and Fink, 2010; Harper, 2014; Choudhry, Marelli and Signorelli, 2016)**. Meanwhile, many developing countries will experience a potential demographic dividend: economic growth brought on by a change in the structure of a country's population, usually a result of a fall in fertility and mortality rates, which increases the proportion of the working age population compared to the non-working age share of the population. When a large working population has fewer dependents to support, there is a window of opportunity for improving education and promoting more sustainable economic growth. The capacity to claim this dividend, however, will itself depend on education, as it is argued that a true demographic dividend is a human capital dividend **(Lutz et al., 2019)**.

For developing countries where the population continues to

==Also crucial is the development of more sustainable local models of development such as circular, local and regenerative economies that are less dependent on global capitalist and neocolonial extractive models.==

grow and is coupled with lower rates of women's empowerment, it is important to change the extraction-based development mode and to construct a comprehensive framework for provision of public goods, if the potential demographic dividend is to be reaped. Otherwise, continued rapid population growth in developing countries threatens to lead to ever more unsustainable levels of 'natural capital' extraction. A growing population requires additional resources to support its basic needs and economic development, especially in societies where the economy remains largely reliant on extractive industries. This situation calls for an urgent rethink of established development paradigms if we are to adequately address issues relating to ecological sustainability (depletion of natural resources, pollution, climate change), economics (poverty, unemployment, low wages, workplace safety), health (hunger, malnutrition and high maternal and child mortality), governance (lagging investments in health, education and infrastructure),

and social order (rising unrest and crime). Advances in technology and the increasing efficiency of natural resource extraction may contribute to addressing these challenges, but will not be sufficient on their own. Also crucial is the development of more sustainable local models of development such as circular, local and regenerative economies that are less dependent on global capitalist and neocolonial extractive models **(see Morseletto, 2020** for an overview of the concepts of circular, restorative and regenerative economies**)**.

Measures to reduce over-exploitation of natural capital must be accompanied by steps to ensure sufficient investment in enhancing human capacity to maintain the productive base of the economy **(Kurniawan, Sugiawan and Managi, 2021)**, and to re-orient it towards more sustainable development paradigms that are inclusive, and that reduce extreme poverty without exacerbating wealth gaps. Maximizing this potential requires a strong policy environment for increasing the

coverage and quality of education and health systems, stimulating job creation (with emphasis on 'green jobs' and jobs for sustainable development – **see section 2.2.3)** and supporting women's empowerment and more socially just forms of labour force participation (e.g. the concept of 'green and decent jobs') **(UNEP, 2020)**. Enhanced investment in education is thus economically vital, although – as we shall see – there are dangers in seeing education as an economic panacea, or in overemphasizing the economic rationale for educational investment.

Middle-income countries, such as China, Thailand and Brazil, are also likely to face the problems of ageing before the end of the century. To promote 'healthy' or 'active' ageing in these countries, some of the benefits from their demographic dividends need to be invested in coming decades in the provisions for future seniors, such as social security, pensions and senior health care funds **(Gerland et al., 2014)**. With respect to developed countries where the

population is either declining, or constant and rapidly ageing, it is important to find ways to reduce currently unsustainable levels of consumption, promote well-being and enable healthy active living. A stable population with a very low growth rate has many environmental benefits **(Götmark, Cafaro and O'Sullivan, 2018)**. Halting population growth is essential to mitigating global climate change **(Wynes and Nicholas, 2018)**; avoiding a mass extinction of Earth's species **(McKee, Chambers and Guseman, 2013; Crist, Mora and Engelman, 2017)**; sharing food more equitably across the planet and feeding millions of malnourished people in the developing world **(Hall et al., 2017)**; limiting freshwater withdrawals from natural ecosystems while providing sufficient water for human and wildlife populations **(Rodell et al., 2018)**; and in general staying within the limits of prudent human use of the biosphere **(Watson and Venter, 2019)**. Given the already high consumption level in developed countries, altering current consumption habits is essential, as called for in Sustainable

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Development Goal (SDG) 12 on responsible consumption and production, in particular the target 12.8: 'by 2030 ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature' (UN, 2015, p. 23).

While it is certainly true that societal ageing will have a negative impact on public finances in the medium term, the consequences in the long run are expected to be much milder (Kluge et al., 2014). In fact, population ageing could present opportunities in a number of ways. An older, shrinking population is likely to be more educated (with more investment per child), cleaner (generating less pollution and fewer greenhouse gases) and healthier (with its citizens spending a greater proportion of life in wellness) (Kluge et al., 2014), although these outcomes are far from guaranteed. As discussed in section 2.2.3, the development of education systems plays an important role in addressing the size and structure of the world's population, presenting both challenges and opportunities for future development and carrying important implications for achievement of the SDGs.

2.2 .3

IMPLICATIONS OF DEMOGRAPHIC TRENDS ON LIFELONG LEARNING SYSTEMS

In light of the above demographic trends, what role can or should education play in ensuring the productive deployment of these 'human resources' – or offering the promise of dignified, fulfilling lives to twenty-first-century citizens? While progress has been made in combating high illiteracy rates and achieving universal primary enrolment, concerns regarding the quality and economic relevance of schooling and the innovative capacity of higher education are widely shared (ICoFE). Such concerns stem largely from the perceived implications of technological

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change, such as automation, for the labour market, and hence for education. However, as noted in the previous chapter **(WG2-ch1)**, technological change has also led some to criticize the very basis of our standard assumptions concerning the economic function of education. In *A world without work*, Daniel Susskind **(2020)** argues that as technology will increasingly transform the number and quality of available jobs, making 'employability' the core or overarching purpose of education systems is no longer sustainable. This demonstrates the need to think about the central purpose of education in terms other than maximization of employability, and also to rethink the meaning of work, seeing it as a source of intrinsic fulfilment, as well as (or rather than) economic security **(see WG2-ch6** for more on the relationship between education and technology**)**. Lifelong learning is often touted as an appropriate educational response to technological change or the skills shortages resulting from changing demographics. Related policies are portrayed as enabling workers to

're-tool' or 'up-skill' to meet the changing demands of the labour market, as well as promoting more fulfilling, even liberating, lifestyles. However, in practice, lifelong learning can be experienced as highly oppressive, implying chronic insecurity, and dumping onto workers themselves the responsibility for renewing skills rendered obsolete by technological 'progress' **(e.g. Elfert, 2017)**.

While the human capital approach remains the dominant paradigm for thinking about education, promoting employability will remain a core purpose of education systems. But a rapidly changing economic and technological context also means that the notion of what it means to be 'employed', and the relationship between employment and livelihoods, require a wider rethinking of established social models and welfare provision. Seen through the prism of human capital, the challenge is typically seen primarily as one of adapting education to a changing economic and technological context through enhanced accommodation

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of informal as well as formal learning, more diverse learning pathways, and renewed attention to vocational education and training. However, if we want to move towards a human flourishing paradigm **(WG1-ch1, WG1-ch2)**, this will require a deeper societal transformation, involving a more expansive understanding of the relationship between work, learning and life, encompassing elements such as a reduced working week and more flexibility in workplace arrangements (changes foreshadowed in some societies in response to COVID-19), while maintaining economic security.

Gender also constitutes a crucial dimension of the challenge that education systems must confront. The much trumpeted demographic dividend will be far smaller than anticipated unless significant strides can be made to increase socially just forms of women's empowerment and labour force participation through an increase in employment opportunities and reduction in labour market disadvantages

(Desai, 2010). Developing countries need to enhance investment in girls' education as well as provide greater employment opportunities for women **(Gerland et al., 2014)**. Increasing the availability of early childhood care and education (ECCE) is an effective family policy that can stimulate mothers' work participation **(Brilli et al., 2016; Yamaguchi et al., 2018; Zhang and Managi, 2021)**, thus promoting women's empowerment. Enhancing ECCE also has important implications for child development, as cognitive development and learning in the first five years of a child's life is crucial to ensure a strong foundation for learning. But as with educational debate in general, so with discussion of women's education in particular, there is a danger that a focus on the instrumental value of learning (in terms of enhanced productivity) overshadows its more fundamental intrinsic importance, in terms simply of enhancing the capacity of women to live fulfilling lives.

It is also important for education systems to adequately address

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the needs of the elderly, especially in the light of trends towards population ageing. Again, this is important not just (or even mainly) for the purpose of enhancing economic productivity, but for more intrinsic reasons relating to the ability of elderly people to lead healthy and fulfilling lives. For example, motivational profiles for exercise among older adults highly influence their health condition **(Ferrand, Martinent and Bonnefoy, 2014)**. Older adults who have a high level of self-determined motivation tend to be physically healthier, and educational experience can contribute to elevating such motivation. Research suggests that older adults who take part in learning activities derive both psychological and physiological benefits **(Glendenning, 2000)**. The HE sector is often especially important in providing 'a stimulating learning environment that helps older adults meet their late-life development needs and can lead them toward a meaningful and positive ageing experience' **(Lin, 2011, p. 768)**. Realizing the

potential for 'meaningful and positive' lifelong learning in HE to support healthy and active ageing requires reducing resource gaps between urban and rural areas and creating an age-friendly environment in HE institutions **(Lin and Huang, 2016)**. It also requires challenging conceptions of HE that see its social value primarily in terms of enhancing economic productivity. The boost to well-being that enhanced opportunities for lifelong learning can bestow on the elderly further implies various incidental benefits to society more broadly; reducing chronic illness and health care costs and supporting the elderly in maintaining an active contributory life for as long as possible helps ensure that all individuals are prepared physically, mentally, socially and financially to cope with an extended period of old age **(Harper, 2014)**.

While some societies must address the challenge of rapid ageing, others, primarily in the developing world, confront the demographic trend of a 'youth bulge'. Compared to the

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European Union, for example, countries in western Asia and Africa have predominantly youthful populations **(Lutz et al., 2019a)**, with high levels of youth unemployment, and education systems that are ill-equipped to cope with this demographic trend. While there is much focus on the demographic dividend that youthful populations can bestow (described above), it is human capital driven by education that brings about the dividend, and that in turn helps drive economic growth and sustainable development **(Lutz et al., 2019b)**. In other words, decreasing fertility rates do not automatically result in increased income for a country unless accompanied by high levels of education. While attention has been paid to demands for enhanced lifelong learning in ageing societies **(Slowey, Schuetze and Zubrzycki, 2020)**, research is needed into the provision of more diverse learning pathways in youthful societies. This should be coupled with renewed attention to vocational education and training in ways that are less narrowly constituted and more oriented towards sustainable development and the provision of opportunities for further learning across the life course **(see ILO/Cedefop, 2011** for a synthesis of 21 country studies of skills for green jobs including both ageing and youthful societies**)**.

While the COVID-19 pandemic has been widely interpreted as showing that investment in human capital is essential to enhanced productivity and health outcomes over the life course **(van Dalen and Henkens, 2020)**, contextual factors relating to technology **(WG2-ch6)**, inequality and social justice **(WG2-ch4)** and conflict **(WG2-ch5)** are exposing fundamental flaws in this paradigm. As **section 2.4** describes, more attention must therefore be given to the plurality of ways of knowing and being in reimagining education systems.

As emphasized in the previous chapter **(WG2-ch1)**, given the enormous importance of the 'macro' social, political and economic context in influencing individual attitudes and behaviour, reimagining education or remodelling education
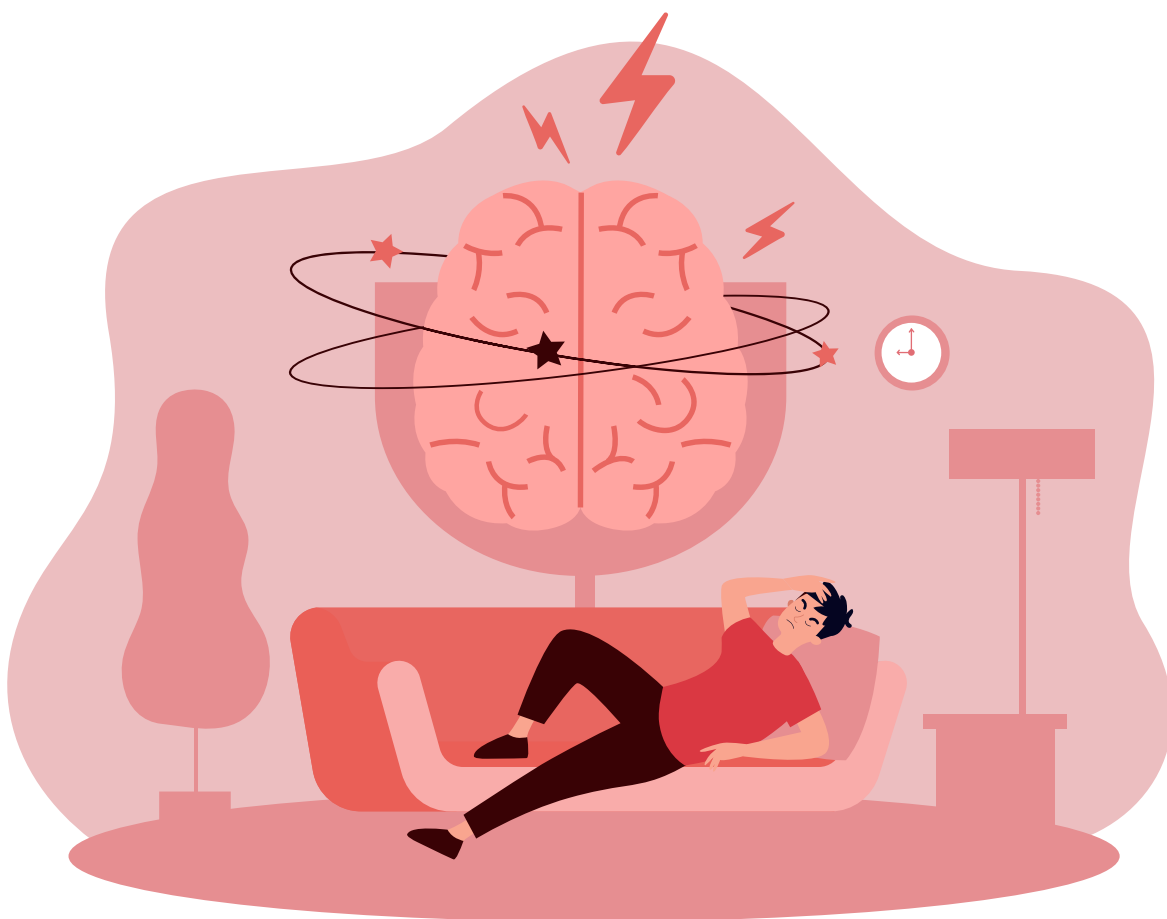
systems will not alone effect the necessary social transformation. Nonetheless, the psychological impact of various environmental crises, and the potential of attitudinal or behavioural change to contribute to mitigating their effects, are issues that demand attention. The following sections therefore discuss research on interventions aimed at promoting behavioural change in response to environmental crisis **(2.3.2 and 2.3.3)**, along with mental health issues linked to environmental problems, in particular climate change **(2.3.1)**.

2.3 Barriers and promoters of pro-environmental behaviour: insights from psychology and behavioural sciences

Recent decades have witnessed growing discussion of learning for sustainable development from a psychological perspective.

Contextual dynamics have played a significant role in the emergence of modern education systems as we know them today. Colonial histories, the industrial revolution and the dominance of fossil-based capital development patterns would not have been possible without the scientific and educational processes that characterized the eighteenth, nineteenth and twentieth centuries. Such contextual dynamics have brought us to the current state of educational flux, with a desperate need for reinvention in the face of pressing and complex global changes. These include global health concerns (highlighted by the COVID-19 pandemic), economic pressures, technological developments, continuing or worsening social injustice and inequality and, overshadowing all else, the climate crisis.

O'Brien **(2018)** postulates three spheres of social transformation that dynamically interact: the personal sphere comprises worldviews, values, norms and beliefs, and interacts with the political sphere of structures and institutions, which bring about the practical sphere of solutions in terms of behaviour and technology.

While the previous section focused on some implications for education arising from macro-level contextual factors, ranging from shifting demographics to geopolitical changes, this section hones in on the personal or individual level, discussing the promotion of pro-environmental behaviour as one kind of educational response to environmental crisis, with a particular focus on climate change. Recent decades have witnessed growing discussion of learning for sustainable development from a psychological perspective **(Gifford, 2011; Hess and Maki, 2019; Ojala, 2019; Luetz, Margus and Prickett, 2020)**.[1] Comprehending the

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[1] WG2-ch1 notes how the COVID-19 pandemic has spurred many governments to intensify a focus on STEM and vocational training in their HE systems.

psychological and behavioural dimensions of the climate crisis, including the behavioural barriers to climate mitigating actions and the psychological impact of climate change, can potentially lead to more effective intervention strategies if combined with other perspectives. Notwithstanding instrumentalist limitations, such analysis can shed useful light on the factors that motivate the translation of environmental knowledge acquired through education to action at the individual and collective levels.

… it is important to highlight the trauma inflicted by climate change and extreme weather conditions, and the potential for education to promote dialogue and empathy that encourage pro-environmental behaviour.

This section highlights a) the psychological impact of climate change **(2.3.1)**; b) barriers to pro-environmental behaviour, that is, how context-dependent and context-independent psychological factors interact **(2.3.2)**; and c) factors motivating pro-environmental engagement, that is, how knowledge, perception and experience of the environmental crisis are seen to affect the brain and behaviour **(2.3.3)**.

2.3 .1

PSYCHOLOGICAL IMPACT OF CLIMATE CHANGE

Beyond disseminating knowledge about the causes of the climate crisis via education, it is important to highlight the trauma inflicted by climate change and extreme weather conditions, and the potential for education to promote dialogue and empathy that encourage pro-environmental behaviour **(Thiermann and Sheate, 2020; see Young, Khalil and Wharton, 2018** for a review on empathy towards animals). However, empathy alone is insufficient, and can actually be psychologically damaging. Findings from social psychology and neuroscience show that empathy needs to be accompanied by agency if it is not to lead to feelings of distress and inadequacy **(Singer and Klimecki, 2014)**. And the challenge of endowing learners with agency once again points beyond individuals or schools to the social, cultural, political and institutional context.

> **Investigation of the effect of air pollution on primary-age children's structural and functional brain measurements found evidence of impairment of functional brain networks (Pujol et al., 2016), indicating physical impacts on human health and well-being.**

Besides the plight of the natural world, the impacts of different dimensions of climate change on human physiology are well documented and include increased risk of stroke, heart disease, lung cancer, respiratory infections, asthma and various infectious diseases **(Pope et al., 2002; WHO, 2016; Jeremy, 2017; Perera, 2017)**. Researchers have also explored the links between environmental crisis and mental health. For example, work on the impact of air pollution on mental well-being have shown that increased air pollution significantly reduces hedonic happiness and raises the rate of depressive symptoms in adults and the elderly **(Lim et al., 2012; Zhang, Zhang and Chen, 2017; Chen, Oliva and Zhang, 2018; Xue et al., 2019)**. Investigation of the effect of air pollution on primary-age children's structural and functional brain measurements found evidence of impairment of functional brain networks (Pujol et al., 2016), indicating physical impacts on human health and well-being. As for the effect of bushfires and wildfires, rendered increasingly prevalent by climate

change, a study of groups most vulnerable to the impacts of Australian bushfires found an increase in psychological distress, post-traumatic stress disorder (PTSD) and depression **(Bryant et al., 2014)**. The World Health Organization predicts deaths to increase by an excess of 250,000 between 2030 and 2050 due to well-understood impacts of climate change **(Watts et al., 2019)**.

Beyond increasing the risk of a multitude of diseases, there is also evidence that climate change negatively impacts neurocognitive function, mental health and subjective well-being. There are three distinct dimensions of this psychological impact **(Doherty and Clayton, 2011**): 1) a direct, acute and traumatic experience, for example, of a sudden or unprecedented natural disaster; 2) indirect, for example, reduced emotional well-being and ecological grief **(Cunsolo and Ellis, 2018)** due to loss of livelihood or feelings of uncertainty; and 3) psychosocial, for example, chronic effects on community and social well-being due to

The indirect effects of long-term climate crisis on individual and collective well-being are also predicted to be especially significant amongst relatively deprived communities and in poorer societies.

drought, flood, heat or climate-related conflict. The American Psychological Association's Task Force on the Interface between Psychology and Climate Change states that the impact of climate change on mental health is likely to disproportionately affect those with low mobility, including the elderly, children and individuals with pre-existing mental health conditions **(Swim et al., 2011)**. Increased incidence of drought has been shown to increase forced migration and conflict, resulting in elevated risk of PTSD, trauma, anxiety and depression **(Wuebbles et al., 2017; see Hayes et al., 2018 for a review)**. The indirect effects of long-term climate crisis on individual and collective well-being are also predicted to be especially significant amongst relatively deprived communities and in poorer societies **(Bourque and Willox, 2014, Table 1)**, with major implications for regional, national and global security and stability **(Anderson, 2010)**.

The implications of climate change for mental health and well-being deserve serious attention **(Murray et al., 2012; Becker and Kleinman, 2013; Vigo, Thornicroft and Atun, 2016)**, particularly in relation to the overwhelmingly negative emotions the climate crisis can evoke amongst youth. Considering the value-saturated nature of climate change, discussions of its impact need to pivot towards more meaning-focused coping mechanisms, whereby people draw on their beliefs, values and existential goals as they interpret and respond to related challenges **(Ojala, 2012)**. Both problem-focused and meaning-focused coping mechanisms in children show positive associations with environmental engagement. Problem-focused coping also shows increased association with negative emotion states, but meaning-focused coping is associated with greater positive affect such as optimism, hope and purpose that acts to buffer the negative affect **(Ojala, 2012)**. As well as raising awareness through dissemination of scientific knowledge, education therefore also has an important role to play in promoting empathy and compassion towards the natural

> ... education therefore also has an important role to play in promoting empathy and compassion towards the natural world and general feelings of hope and optimism that can drive meaningful action, and develop agency for transformative change.

world and general feelings of hope and optimism that can drive meaningful action, and develop agency for transformative change **(Sannino, 2022)**.

2.3 .2

SOCIOCULTURAL AND PSYCHOLOGICAL CONSTRAINTS TO PRO-ENVIRONMENTAL BEHAVIOUR

In addition to raising awareness of the causes of anthropogenic climate change, it is important to understand the behavioural constraints that limit climate mitigating actions, and identify interventions that may help overcome these **(Gifford, Kormos and McIntyre, 2011)**. These constraints range from the contextual, that is, social and cultural, to the psychological, with the latter influenced by both context-dependent and biologically inherent factors.

Scientific knowledge about human impact on the climate is a poor predictor of sustainable behaviour, since a range of entrenched – and unsustainable – cultural and societal values, norms and beliefs underpin our outlook and actions **(Boström et al., 2018)**. Social practice theory views individuals as actors embedded within their social contexts (including news and media), with norms and habits inhibiting internalization of outside knowledge and adaptation of behaviour **(Johnson and Wilson, 2000; Spaargaren, 2011; Newman, Nisbet and Nisbet, 2018)**. Social divisions and ingrained suspicion of out-groups can cause individuals to vary widely in their perception of risks associated with the climate crisis.

Differences in cultural worldviews have also been shown to be associated with climate change risk perceptions, although these differences often cut across stereotypical cultural boundaries **(Xue et al., 2016)**. For example, a study of a large sample of Chinese nationals found four different cultural worldviews, namely,

> **... a powerful school of thought on the environmental crisis holds that altering what we consume is not enough; the fundamental problem is our consumption-driven model of economic growth itself.**

hierarchism, individualism, egalitarianism and fatalism, which were differentially linked to climate change-related risk perception. Those with egalitarian and non-fatalist outlooks associated climate change with greater risk, and showed greater support for policies promoting pro-environmental changes and heightened willingness to adopt mitigating forms of behaviour. On the other hand, those with more individualistic worldviews were less likely to support pro-environmental policies, even when they perceived the risks associated with climate change. Findings from this study indicate a link between cultural or ethical outlook and support for climate change policy through risk perception **(Xue et al.,2016)**.

Habits and attitudes promoting overconsumption present a significant barrier to sustainability. Many commentators have stressed the need to change the current economic foundations to replace a culture of overconsumption, characterized by inequality, waste and excessive market

control, with more sustainable approaches **(Bocken and Short, 2016; Ardley and May, 2020)**. However, there is a significant division between those who merely call for a switch to consumption of less environmentally damaging products and those who also emphasize the importance of reducing overall levels of consumption **(McDonagh and Prothero, 2014)**. In other words, a powerful school of thought on the environmental crisis holds that altering what we consume is not enough; the fundamental problem is our consumption-driven model of economic growth itself **(Klein, 2015)**. Altering this implies a fundamental challenge to ingrained, culturally conditioned beliefs about what constitutes a fulfilling life – moving from a human capital paradigm based on growth, to a human flourishing paradigm emphasizing human potential and relationships. Changing this poses a huge challenge to our education systems, various aspects of which are explored in subsequent chapters.

In addition to sociocultural constraints, research from environmental and behavioural psychology has provided several insights into the factors that constrain the translation of climate and environmental knowledge into pro-environmental action. A key observation relates to the weak association between pro-environmental attitudes and pro-environmental actions or the 'value-action gap' **(Ungar, 1994; Blake, 1999; Kollmuss and Agyeman,**

Research has shown that even when faced with scientific data that predict the imminent intensification of extreme climate events, many individuals perceive the deleterious effects of climate change as distal and thus abstract.

2002) (see Box 3 for examples of theories that explain the 'value-action gap'). Learning plays a fundamental role in bridging this value-action gap, for example, through social learning approaches that take an interactive, participatory and negotiated approach to guiding collective problem-solving and decision-making **(Glasser, 2007).**

Psychological distance and its temporal features are much discussed by researchers in the field of environmental psychology as they seek to understand how the deleterious effects of climate change prompt individuals to perform pro-environmental actions and engage in adaptive resilient behaviour **(Maiella et al., 2020).** Psychological distance is a construct that describes how the 'self' perceives, represents and responds to different features (objects and events) in the external environment. It has four subdomains – spatial, temporal, social and hypothetical – that dynamically interact with each other **(Liberman and Trope, 2008).** The temporal subdomain, for example, refers to how the 'self' abstractly perceives and mentally represents an event in time: an event perceived as proximal (close) is more real and tangible to the self, whereas one perceived as distal (distant) is more abstract.

Research has shown that even when faced with scientific data that predict the imminent intensification of extreme climate events, many individuals perceive the deleterious effects of climate change as distal and thus abstract **(Strombach et al., 2015; Maiella et al., 2020).** This can result in diminution of the perceived 'pay-off' of climate mitigating action and sustainable behaviour. Consequently, psychological distance from the climate crisis is seen by many researchers as a crucial barrier to promoting action necessary to staving off the worst effects of climate change **(Strombach et al., 2015).** However, it has been argued that this pattern does not always hold; some individuals may perceive the climate crisis as a distant event but nonetheless engage in climate mitigating actions and

> **Since young people have the greatest stake in addressing climate change, studying the engagement of youth in climate mitigating action and their levels of trust in climate science can give valuable insights into the prospects of the environmental movement.**

adaptive behaviour, and vice versa **(see Maiella et al., 2020 for further discussion)**. In other words, values and ideals may trump a narrowly utilitarian pleasure–pain calculus (related to psychological stimuli or perceptions of likely impact on the self) in influencing the propensity of individuals to take the climate crisis seriously and act accordingly.

Evidence from behavioural and brain sciences underlines the huge challenge involved in generating strong moral intuitions in response to climate change **(Haidt, 2001;Bazerman and Tenbrunsel, 2011; Markowitz and Shariff, 2012)**. This difficulty is attributed to various sociocultural, cognitive and psychological barriers **(see Markowitz and Shariff, 2012, Table 1)**. However, findings from behavioural sciences also highlight several mechanisms that can engage moral values in individuals, an example being the presentation of messages on the climate in such a way as to engage positive emotions – for example, by tempering messages liable to induce fear or alarm by offering hope through the promise of

constructive action at individual and communal levels **(Stern, 2012; Wang and Leviston, 2018; Brosch, 2021)**. Additionally, positively reinforcing community-level pro-social and pro-environmental norms by leveraging our susceptibility to social influence and approval can be beneficial in engaging moral sentiments **(Markowitz and Shariff, 2012, Table 2)**. Since young people have the greatest stake in addressing climate change, studying the engagement of youth in climate mitigating action and their levels of trust in climate science can give valuable insights into the prospects of the environmental movement **(Corner et al., 2015; Ojala and Bengtsson, 2019; Ojala, 2021)**.

In summary, understanding the psychological and behavioural dimensions of debate over climate change and the environment could aid the design of educational programs that more effectively promote attitudes and beliefs conducive to sustainability.

... the Theory of Planned Behaviour... posits that behavioural change must be preceded by intention to change which, in turn, is determined by the fulfilment of three conditions.

BOX 3: THEORIES ON THE 'VALUE ACTION' GAP IN PRO-ENVIRONMENTAL ATTITUDES AND BEHAVIOUR

One of the theories developed to explain the weak association between pro-environmental attitudes and action is the Theory of Planned Behaviour (TPB) **(Ajzen, 1991; Ajzen and Fishbein, 2005)**. TPB posits that behavioural change must be preceded by intention to change which, in turn, is determined by the fulfilment of three conditions: (1) individuals should display pro-environmental attitudes (values, beliefs); (2) their values and beliefs should be congruent with and supported by the social norms of their community; and (3) they should believe they have enough agency to cause positive change. Failure to fulfill any of these conditions can obstruct mitigating action (behavioural change) and adaptation (individual and community coping) **(Gifford, Kormos and McIntyre, 2011)**. TPB has successfully explained several climate-related behavioural changes **(Boldero, 1995; Laudenslager, Lofgren and Holt, 2004)**, with stronger results obtained through integration of additional factors like habits, norms, past behaviour and self-identity.

A more fully realized model is the General Model of Social Dilemmas **(Gifford, 2006)**, which integrates findings from behavioural sciences with other social and natural sciences, and is informed by geophysical, regulatory, technical and psychological contexts. This model highlights the psychological factors that influence both mitigating and adaptive behaviour at the individual or community levels, including cognitive, affective and motivational components (e.g. denial, cognitive reappraisal and emotion regulation). Some of the psychological barriers

> **... the General Model of Social Dilemmas highlights the psychological factors that influence both mitigating and adaptive behaviour at the individual or community levels, including cognitive, affective and motivational components...**

include the following **(Johnson and Levin, 2009; see Gifford, Kormos and McIntyre, 2011 for an extensive review):**

• Limited cognition: some of the important components of this dimension are spatial and temporal discounting (in other words, historical and geographical ignorance) **(Spence, Poortinga and Pidgeon, 2012);** or the Giddens Paradox **(Giddens, 2009);** reduced valuation of spatially and temporally distant risks. lack of awareness, uncertainty and perceived lack of control.

• Ideologies that include disbelief in global warming and climate change.

• Social comparison and norms.

• Goals and values that are incompatible with mitigating actions.

2.3 .3

MOTIVATORS FOR PRO-ENVIRONMENTAL ENGAGEMENT: INSIGHTS FROM PSYCHOLOGY, BEHAVIOURAL AND MENTAL HEALTH RESEARCH

While the previous section discussed the sociocultural, psychological and behavioural constraints to pro-environmental and climate mitigating actions, this section explores factors conducive to pro-environmental engagement, in particular, positive affect and prosocial behaviour. Behaviour, lifestyle, and culture exert considerable influence on energy use and associated emissions, and there is some evidence that education in areas such as pro-environmental behaviour and sustainable urban planning can have significantly positive effects in terms of enhancing environmental consciousness

==... education in areas such as pro-environmental behaviour and sustainable urban planning can have significantly positive effects in...stimulating a willingness to commit to mitigating climate change.==

and stimulating a willingness to commit to mitigating climate change **(Rajapaksa, Islam and Managi, 2018)**. A prosocial function that has been widely discussed in the climate change literature is the role of empathy in pro-environmental engagement **(Rifkin, 2009; Krznaric, 2015)**. Emotional empathy allows individuals to feel and share the emotions of others and act appropriately, while cognitive empathy is the ability to put oneself in 'other people's shoes' (perspective-taking) to understand their thoughts, intentions and actions **(De Waal, 2008; Singer and Lamm, 2009)**. Research shows how humans can also exhibit empathy for nature –through imaginatively identifying with the experience of the natural world **(see Tam, 2013 for a discussion)**. The social theorist Rifkin **(2009)** and social philosopher Krznaric **(2014)** both discuss the capacity of empathy to transcend the human/non-human dichotomy and foster a sense of connectedness with the biosphere that supports life. Strong attachment to a particular place can also generate place-based empathy (directed at

both human and non-human inhabitants), promoting locally grounded adaptable behaviour and mitigating action **(Singer and Klimecki, 2014; Head et al., 2016)**. Citing O'Brien's work **(2012)**, Brown et al. **(2019, p.16)** posit that the application of 'an empathy-place-identity lens' may contribute to integrating 'the personal, political and practical dimensions of transformation necessary for sustainability'.

Education for behavioural change has been pursued through various initiatives – for example, programs organized by school sustainability leaders, city-wide initiatives focusing on energy consumption, or experiential learning in forest schools **(Newell et al., 2021)**. Schools can also act as powerful spaces where behavioural change can be initiated through nurturing values and attitudes and stimulating practices that support imaginative empathy, creating a foundation for sustainable life choices as adults **(Newell et al., 2021)**. Schools that promote an ethics of care and compassion along with an exploratory

Schools can also act as powerful spaces where behavioural change can be initiated through nurturing values and attitudes and stimulating practices that support imaginative empathy, creating a foundation for sustainable life choices as adults.

pedagogy can foster both human flourishing and sustainability as evidenced in the global eco-schools / green / sustainable schools movement **(Gough, Lee and Tsang, 2021)**. One way of achieving scalable behavioural change is the 'spiral' approach advocated by O'Brien and Sygna **(2013)**. This involves a socio-ecological learning approach that is 'iterative, reciprocal and reflexive' and involves dynamic interactions between 'individuals, societies, institution and infrastructure' **(Newell et al., 2021, p. 24 Box 3)**. The result, its advocates maintain, is scalable behaviour change from a shallow to a deep level. The global green schools movement reports that when communities are involved in programmes, there is impact at individual, school and community level in terms of social and environmental change **(Gough et al., 2021)**.

Formal education is an important component of this spiral scaling for sustainability. However, the fostering of psychological 'coping strategies' at the individual level, as well as exhortation to adapt personal behaviour in the personal sphere of transformation **(O'Brien, 2018)**, is, on its own, a relatively palliative or tokenistic response to the global environmental crisis. The scale of this crisis demands communal responses as well as substantive state action and leadership – in other words, first and foremost, a response from the political sphere. Without this, many people, far from experiencing any empowering sense of agency or optimism in the face of looming catastrophe, will feel hopeless and powerless. There is scope for education to contribute to a virtuous cycle, whereby government action and public attitudes reinforce each other, building momentum for change; there are numerous examples of this happening at the local level, as with municipal moves to shift to electric vehicles for public transport. State education should be a strong support of such transformations.

However, the sheer scale and required speed of the necessary societal transformations are daunting, and mean that waiting

for education to gradually effect mass attitudinal change may be completely inadequate. Promoting changes in individual behaviour may make an important contribution to addressing the crisis, but fundamental solutions must be driven by governmental action (in areas such as carbon taxes, promotion of renewable energy technology and regulation of polluting industries). Implying that responsibility lies primarily at the individual level and depends on behavioural adaptation can serve to distract attention from crucial systemic or structural factors, and end up delaying effective action. Furthermore, insofar as the influence of education acts mainly upon children and youth, it cannot change attitudes and behaviour among the predominantly middle-aged or elderly decision-makers who bear responsibility for our collective fate. Presenting education as the key to salvation can imply a fraudulent attempt to shift responsibility for societal transformation to the very group – young people – who are the ultimate victims of failure by their seniors to act responsibly. The best

... understanding what structural and systemic transformation is needed requires appreciating the historical and epistemic roots of the sustainability -- education challenge.

way in which governments can contribute to stimulating necessary changes in ordinary citizens' attitudes and behaviour is to lead by example. Public education on environmental matters, and the virtuous cycle of attitudinal change and strengthening policy, must begin with state action, not mere exhortation.

While it is undeniably important, behavioural change at the individual level is crucially facilitated or incentivized by structural and systemic reform; it is not simply a matter of awareness or consciousness raising. Elevating living standards, developing a satisfactory level of infrastructure, ensuring public safety and decreasing social inequality in communities have also been shown to motivate pro-environmental behaviour **(Rajapaksa, Islam and Managi, 2018)**. Income inequality has been shown to be intimately associated with human–environment relations. According to the **World Inequality Report 2018 (Alvaredoet al., 2018)**, income inequality has increased in nearly all countries since 1980,

with the most rapid increase in North America, China, India and Russia, more moderate increases in Europe, and persistently high inequality in the Middle East. Unevenness in population growth and economic development within and between countries or regions, combined with the unequal distribution of NCP across space and time and among different segments of society, are complicating human–nature relations. Meanwhile, patterns of global trade involving the spatial decoupling of production from consumption, resulting in unequal access to natural resources and unsustainable supply chains, can also lead to social conflicts and further environmental degradation **(Shinkuma and Nguyen, 2009; Shinkuma and Managi, 2010)**. At the same time, in another example of the iterative relationship between attitudinal change and political action, understanding what structural and systemic transformation is needed requires appreciating the historical and epistemic roots of the sustainability–education challenge – the subject of our next section.

2.4

Tackling a root cause of unsustainability: problematizing epistemic underpinnings of modern scientific and educational enterprises

We have noted how achieving longer-term sustainability requires educational changes appropriate to our demographic and economic predicament **(section 2.2)** and measures to promote behavioural change or psychological resilience at the individual level **(section 2.3)** in ways that do not reduce these efforts to individualized

> **Reimagining education and training for sustainability requires acknowledging the inadequacy of dominant epistemologies such as human capital theory that underpin modern education systems.**

responsibility but see them within the framework of state-led and wider societal responsibility for transformative change. With this as background, for educational innovations that embrace sustainability to take root and acquire legitimacy, heightened awareness of the historical and political dimensions of the environmental crisis is essential. Public opinion needs to be brought to a balanced and critical understanding of the nature and origins of the economic trajectory that has produced many benefits but also massive risks for modern societies **(see section 2.2)**. Reimagining education and training for sustainability requires acknowledging the inadequacy of dominant epistemologies such as human capital theory that underpin modern education systems. This is perhaps especially urgent in those societies – for example, in Europe, North America and East Asia – that have benefited most from the established economic order, and in which per capita emissions of carbon and other pollutants are highest.

However, for both pragmatic and ethical reasons, it is also important that efforts to lead the public away from unsustainable attitudes and practices do not involve demonization of entire civilizational or cultural traditions but instead embrace epistemic plurality and justice.

2.4 .1

COLONIAL REMAKING OF THE WORLD AND COLONIZATION OF KNOWLEDGE

2.4 .1 .1

HISTORICAL COLONIALISMS AND THE REMAKING OF THE WORLD - THROUGH WESTERN AND OTHER FORMS OF HEGEMONY

Contemporary decolonial political theorists and sociologists point not to the benefits of modern Western

Decolonial scholars have argued that 'coloniality' underlies the logic of the foundation and unfolding of Western civilization from the Renaissance period until today.

scientific and industrial paradigms, but critically assess these from the 'darker' side of modernity, offering an important counter-hegemonic view on science, society and education. The concept of 'coloniality', introduced by Peruvian sociologist Aníbal Quijano in the late 1980s and early 1990s, points to the legacy of colonialism that precipitated struggles for liberation in Africa, Asia and Latin America, leading to the early demise of colonial rule after the World Wars **(see**

Box 4 for further information on historical colonialisms and calls for 'decoloniality'**)**. This has continued until as recently as 1994, when apartheid fell in South Africa, although today some societies are still under colonial rule or forms of neocolonial domination. Decolonial scholars have argued that 'coloniality' underlies the logic of the foundation and unfolding of Western civilization from the Renaissance period until today **(Mignolo, 2011)**.

BOX 4: HISTORICAL COLONIALISMS AND CALLS FOR 'DECOLONIALITY'

Historical colonialisms have typically been traced back to early European invasions of colonial territories and the formation of the Americas and the Caribbean, involving massive slave trade out of Africa, and later colonial settlement and control of African and Asian territories amongst others over the past 600 years. The rise of Western colonialism coincided with, and was supported by, the emergence of early (church-led) and modern (state-led) education institutions. Walter Mignolo's **(2011, p. 3)** articulation of the 'colonial matrix of power' posits that 'there is no modernity without coloniality', given the fact that coloniality included in its matrix the subjugation of local populations and massive extractions of resource flows from colonial territories to today's so-called developed nations, building the

> ... calls for 'decoloniality' should challenge neocolonial exploitation in the East and West, or North and South.

wealth base needed to drive the rise of empires and later industrial capitalism.

However, there is also an important body of scholarship that counters this interpretation of the history of colonialism (or 'coloniality') and capitalism. We may acknowledge the ecological damage wrought by capitalism, as well as its dehumanizing ramifications, while questioning a narrative that lays this entirely at the door of a malign 'Western' civilization. Indeed, the origins of capitalism, along with many of our key modern institutions (including those associated with education, such as competitive, bureaucratically administered examinations), are traceable to Asia, or to a shared 'Eurasian' heritage **(Goody, 2006)**. A highly exploitative, unsustainable relationship with nature, while certainly associated with the rise of 'Western modernity', was already evident in China long before the effects of Westernization were felt there **(Elvin, 2004; Glasser, 2018)**. And colonialism, along with

its legitimating ideology of the 'civilizing mission', has been (and continues to be) as ingrained in the geopolitics and culture of Asian societies as anywhere else **(Osterhammel, 2005; Vickers, 2014)**.

Today, exploitative, neocolonial extractivist policies continue to be practiced by established Western and Eastern powers (e.g. in the fishing, land, mining, forestry, oil and resource extraction industries). It is, therefore, important that scholarship and movements that build on what has come to be known as the 'modernity/coloniality' dyad **(Mignolo and Walsh, 2018)** and calls for 'decoloniality' should challenge neocolonial exploitation in the East and West, or North and South. As decolonial scholars themselves clarify, whereas decoloniality challenges the 'colonial matrix of power' and aims at delinking from the economy of growth (i.e., 'capitalism' in the vocabulary of liberalism and Marxism), 'dewesternization', which is pursued by some BRICS

For 'decolonial' theorists, the 'fall out' of capitalism consists not only of the colonial project, but also of massive unsustainability, health and global justice risks.

(Brazil, Russia, India, China and South Africa) countries, merely disputes its control and management **(Mignolo, 2018, p. 146)**. Decolonial discourses can be easily appropriated to support regimes that are oppressive, neocolonial and unsustainable in their ideological outlook and economic practice. Therefore, caution must be taken not to conflate 'colonialism' with 'coloniality' (as a darker side of Western modernity) or confuse 'decolonization' with the concept of 'decoloniality'. Decolonization does not guarantee decoloniality and, indeed, often economic coloniality continues and even intensifies after decolonization.

The influential Argentinian 'decolonial' scholar Mignolo **(2011, p. 3)** argues that the massive shift that occurred around 1500 is that of a transformation 'from a polycentric and noncapitalist world … to a monocentric and capitalist world order from 1500 to 2000'. For 'decolonial' theorists, the 'fall out' of capitalism consists not only of the colonial project, but also of massive unsustainability, health and global justice risks as articulated in **section 2.2**. Today, global capitalism in its neoliberal form operates in a new, relatively boundary-less form, at times ironically under the banner of 'sustainable development' **(Ferguson, 2010)** and other times in the form of 'disaster capitalism' **(Klein, 2007)**.

Arguing that the 'alleged rationality of the profit-maximizing individual became everything' with the birth of instrumental rationality and the rise of capitalism 'in the long sixteenth century', environmental historian Jason Moore suggests that such rationality underpinned subsequent 'scientific discourses, among them classical political economy and later, neoclassical economics' **(Moore, 2016, p. 146)**. Going further, he claims 'that rationality − capitalist rationality − is reckless when it comes to the requirements of the whole system. It is a rationality of the parts and not the whole.' Linking to the discussion above, Moore **(2016, p. 147)** notes that 'capitalism's rationalization of the world is

based on externalization, on tapping resources and on loading the spheres of the planet with solid, fluid, and gas waste'. The concept of 'external nature' itself has been portrayed as a creation of capitalist modernity. The dualist ontologies that see entities such as 'individual', 'nature' and 'the world' as existing on their own (prior to their entanglements and inter-relations) have been portrayed as one particular, culturally specific ontology that has come to be taken for granted as 'universal' over the course of half a millennium of Western hegemony **(Escobar, 2015)**. On the other hand, historians have questioned or qualified such arguments, highlighting the Eastern inspiration for many Enlightenment ideas, and showing that the global hegemony of the West (as distinct from its hegemony over the Americas and parts of Africa) was in fact a relatively ephemeral phenomenon of the nineteenth and twentieth centuries **(Osterhammel, 2018)**.

According to Mignolo **(2011, p. 80)**, one of the most pernicious

> The concept of 'external nature' itself has been portrayed as a creation of capitalist modernity.

consequences of modernity is that

[the] coexistence of diverse ways of producing and transmitting knowledge is eliminated because now all forms of human knowledge are ordered on an epistemological scale from the traditional to the modern, from barbarism to civilization, from the community to the individual, from the orient to the occident … By way of this strategy, scientific thought positions itself as the only valid form of producing knowledge, and Europe acquires an epistemological hegemony over all the other cultures of the world.

De Sousa Santos **(2014)** explains the creation of an 'abyssal line' out of this hegemony, which relegates all ways of knowing that do not conform to the imperially defined hegemonic order to the realm of myth, legend, folklore, local knowledge and so on. Along similar lines, decolonial accounts of climate change trace the origins of climate crisis to historical processes and ideologies rooted in the project of modernity/

2

coloniality, but with escalating effects through contemporary ideologies, practices and political and economic arrangements **(e.g. Stein et al., 2020)**. Such arguments offer important insights into the historical and cultural origins of the present predicament, but have been appropriated by non-Western elites (e.g. in India and China) seeking to valorize ultra-conservative, nativist visions of 'tradition' as a means of legitimating autocratic political regimes locked into unsustainable economic strategies **(Nandy 2003; Hansen, Li and Svarverud, 2018)**. It is therefore vital that the critique of 'coloniality' and its implications for sustainability avoid inadvertently mirroring the reductionist Eurocentrism that its advocates abhor.

==It is therefore vital that the critique of 'coloniality' and its implications for sustainability avoid inadvertently mirroring the reductionist Eurocentrism that its advocates abhor.==

2.4 .1 .2

DECOLONIZING KNOWLEDGE

Mignolo and other decolonial scholars, such as De Sousa Santos **(2014)** and Arturo Escobar **(2016)**, argue for a new shift in the 'geographies of reason' that allows for contextually located epistemic affirmations: 'I am where I think', argues Mignolo **(2011, p. 80)**. This challenges the foundational Cartesian rationality on which, they argue, the entire global education system has been based ('I think, therefore I am'); as social and cultural shifts towards decoloniality seek to democratize and diversify epistemology and ways of knowing and being.

Importantly, Mignolo **(2011, p. 82)** argues that 'decolonising Western epistemology means to strip out the pretense that it is the point of arrival and the guiding light of all kinds of knowledge'. In other words, decolonizing knowledge is not rejecting Western epistemic contributions to the world. On the contrary, decolonizing Western epistemology implies appropriating its contributions in order to then de-chain from any overarching imperial designs. The argument is therefore to create epistemic systems that allow for plurality, dialogue, translations between knowledges and epistemically democratic systems of thought, what De Sousa Santos **(2014)** terms 'ecologies of knowledge'.

> **... social and cultural shifts towards decoloniality seek to democratize and diversify epistemology and ways of knowing and being.**

It is also important to problematize the simplistic dichotomization of 'Western' and 'non-Western' (or 'Northern' and 'Southern') onto-epistemic frames, which can be misleading and divisive **(Sen, 2011; Appiah, 2018; Vickers, 2020)**. Rather than dichotomizing 'East' and 'West', scholars such as Amartya Sen **(2005)** and Jack Goody **(2006)** highlight the shared cultural and philosophical legacy of societies across Eurasia and beyond. Arguments that modern, Western (or 'post-Enlightenment') epistemology is uniquely implicated in fostering an unsustainable, exploitative relationship between humanity and nature – and that therefore non-Western, 'indigenous' wisdom holds the key to our salvation – deserve serious qualification. For example, surveying China's environmental history, Mark Elvin concludes that by 1800 the 'pressure' of the Chinese productive system on the natural environment was 'significantly heavier' than that of France **(2004, p. 470)**. Buddhist and other teachings mandating respect for

nature appear to have had little impact 'in comparison with the massive effects of the pursuit of power and profit' **(p. 471)**.

Whatever its cultural or historical roots, the alienation of humanity from the natural environment, and the global dominance of an instrumentalist, exploitative attitude to nature, present formidable obstacles to the achievement of more sustainable social and economic arrangements – obstacles that education can and should play a crucial role in addressing.

2.4 .2

TOWARDS EPISTEMIC PLURALITY

While **section 2.2** pointed out the need to address changing demographics the world over and its implications for education system development from the provisioning perspective, it is also important to address the implications of the epistemic

There is a need for relational, inter- and transdisciplinary forms of knowledge that counter the dominant epistemologies of education systems today, not limited by the individualization narrative of modernity/coloniality and capitalism.

and other contextual perspectives raised above on education. First of all, given the history of slave trading, forced migration and contemporary patterns of migration in which epistemically disavowed colonial subjects are minority citizens or migrants (as highlighted, for example, by the Black Lives Matter movement), one of the major contextual challenges facing education today relates to the ability to accommodate plurality of culture and epistemology **(see Box 5** for migration and displacement patterns and their implications for educational and social change**)**. This is as true of unacknowledged and marginalized colonial populations in Asia as in Europe or North America **(Roberts, 2020; Vines, 2021)**. Whether in China or the USA, accommodating plurality needs to happen in ways that are not colonially inscribed, patronizing or narrowing, while also re-imagining the nature–society divide that has been sedimented in dominant epistemic traditions in education systems worldwide – most visible through the specialization and construction

of the standard array of disciplines and subjects.

This kind of challenge was initially raised in the feminist movement, but is now also being raised both in the decolonial movement and in the environmental education movement through the emerging understanding that it is not only a particular type of knowledge that counts in responding to environmental crises, but also our agency to act and participate in structuring a more sustainable future in the places where we live. There is a need for relational, inter- and transdisciplinary forms of knowledge that counter the dominant epistemologies of education systems today, not limited by the individualization narrative of modernity/coloniality and capitalism. For example, there is an emerging body of work in the field of comparative education that looks at an empirical link between individualism and environmental outcomes, which suggests the need for shifting cultures away from individualism to achieve sustainability **(Komatsu, Rappleye and Silova, 2019)** or

problematizes axiomatic pedagogic solutions based on 'student-centred learning' in sustainability education **(Komatsu, Rappleye and Silova, 2021)**. The empirical and historical basis for these arguments has been critiqued **(Vickers, 2018)**, and much work still needs to be done to establish the epistemic roots of the current sustainability–education conundrum. But while care must be taken to avoid the simplistic dichotomization of 'individualism' (bad) and 'collectivism' (good) – and the reductionist depiction of entire cultural traditions as 'individualist' or 'collectivist' – such work raises important questions regarding some of our most strongly held assumptions concerning education, opening horizons for imagining education systems – and educational scholarship – that truly embrace epistemic plurality.

... there needs to be recognition of the limited capacity of education on its own to smoothly integrate new migrants into host societies.

BOX 5: MIGRATION AND DISPLACEMENT PATTERNS AND THE NEED FOR EDUCATIONAL AND SOCIAL CHANGE

The 2020 **World Migration Report (IOM, 2020)**, indicates that there are 272 million international migrants globally (or 3.5 per cent of the world's population), which is an increase from 174 million in 1995. Despite much political attention given to the increase in migration in the past few years, especially by conservative governments or nationalist-populist movements, evidence shows that the percentage of international migrants has long been relatively stable at between 2.8 and 3.5 per cent. The **World Migration Report (2020)** notes that 'the vast majority of people in the world continue to live in the country in which they were born', but that 'more people are migrating to other countries, especially those within their region' **(IOM, 2020)**. Work is the primary reason for international migration, with most migrants moving to high-income countries for this reason. It

is important that education policy pays due attention to this sociocultural and socio-economic phenomenon in education, not least so as to better accommodate migrant children in education systems in non-homogenizing or non-assimilative ways.

At the same time, there needs to be recognition of the limited capacity of education on its own to smoothly integrate new migrants into host societies. Migration affects different social groups within the host society in different ways, often disproportionately benefiting those from wealthier, more highly educated backgrounds, while exerting downward pressure on the wages of lower-skilled, more economically disadvantaged groups (who also tend to be less cosmopolitan in experience and outlook) **(Collier, 2013)**. This helps explain why, especially in more socio-economically unequal societies,

fear of mass immigration has granted powerful political leverage to nationalist populists. For transforming our relationships with each other as much as with nature, fostering greater cross-cultural awareness and understanding through education is therefore not enough: there needs to be concrete action to transform the structures and systems that govern our working lives, welfare and access to public goods.

While migration patterns have remained relatively stable in relation to percentage of population, there is increasing concern about the high numbers associated with global displacement. The **2020 World Migration Report (IOM, 2020)** states that 'Global displacement is at a record high, with the number of internally displaced at over 41 million and the number of refugees at nearly 26 million', with the number of refugees being the highest on record, 'although the annual rate of growth has slowed since 2012'. Important for educational responses to contextual dynamics is the insight that, 'at the end of 2018, those under 18 years of age constituted roughly 52 per cent of the global refugee population. From 2003 to 2018, according to available disaggregated data, the proportion of children among stocks of refugees was very high, fluctuating between 41 and 52 per cent' **(IOM, 2020)**. This creates additional need for giving attention to plurality of epistemology, empathy, culture and ways of being in education systems, as migrant and refugee children are included into education systems in ways that do not just subject them to cultural assimilation and the linear epistemic narrative critiqued by decolonial theorists.

Statistics also show that it is mainly unresolved or renewed conflict dynamics in key countries that are producing the

==While migration patterns have remained relatively stable in relation to percentage of population, there is increasing concern about the high numbers associated with global displacement.==

In recent years, decolonial approaches to global citizenship education have called for closer linkages to be forged between global citizenship and environmental and sustainability education.

above situation, such as climate migration and food insecurity and their implications for instability and forced migration and displacement. The top ten countries of origin of refugees and globally displaced people are the Syrian Arab Republic, Afghanistan, South Sudan, Myanmar, Somalia, Sudan, the Democratic Republic of the Congo, the Central African Republic, Eritrea and Burundi, which account for roughly 16.6 million, or 82 per cent of the total refugee population, a pattern that has persisted for over seven years **(IOM, 2020) (also see WG2-ch5** of this volume for more on the nexus between education and conflict). This raises the need to couple peace with sustainability discourses, a focus that has been taken up by UNESCO across its Education for Sustainable Development (ESD) and Global Citizenship Education Programmes, albeit unevenly as will be noted below **(see section 2.5)**. In recent years, decolonial approaches to global citizenship education have called for closer linkages to be forged between global citizenship and environmental and sustainability education **(see Andreotti, 2016; Stein, 2019; Pashby et al., 2020; Stein et al., 2020)**.
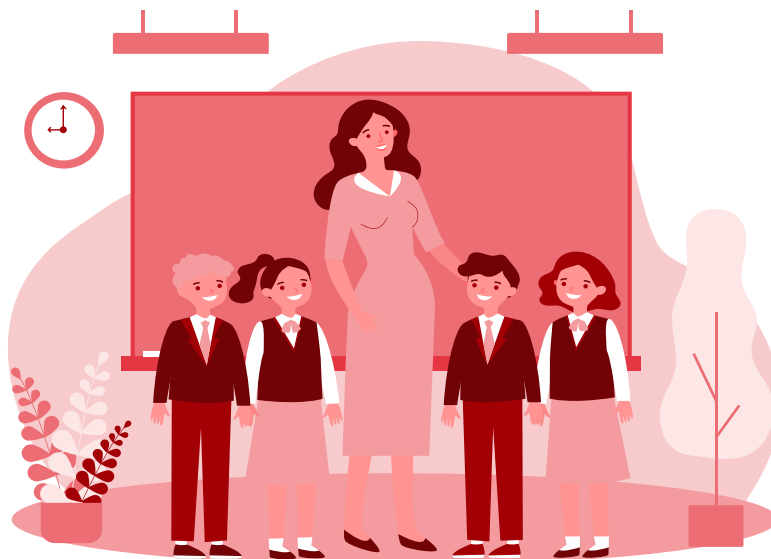
2.5 [Learning to be and learning to live together in the Anthropocene](#)

Decolonial scholarship and associated movements, combined with contemporary and emerging patterns of migration and displacement, suggest that there is a continued need for deeper transformation away from an instrumentalist paradigm (whether it be liberal-capitalist or autocratic and developmentalist), towards a human flourishing approach **(WG1-ch2)** that emphasizes our relationships with others around the world and with nature **(WG1-ch4)**. This requires balancing an individualized behaviour change narrative with a wider social change narrative emphasizing the intrinsic value of particular liberties or 'capabilities' **(Sen,**

> UNESCO defines ESD broadly as education that 'empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity.'

2005). In order to achieve a greater focus on education as a 'global common good' **(UNESCO, 2015b)** and education for human flourishing, we need, in the words of Colombian anthropologist Arturo Escobar **(2015, p. 13)**, 'to step out of existing institutional and epistemic boundaries' in order to 'envision the worlds and practices capable of bringing about the significant transformations seen as needed'.

2.5 .1

ORIGINS AND DEVELOPMENT OF EDUCATION FOR SUSTAINABLE DEVELOPMENT

There have been wide-ranging and long-standing efforts to reorient education towards peace and sustainability. These two interrelated strands of value-based and action-oriented education have each promoted pedagogies that aim to examine and counteract the root causes of social injustice and environmental crisis. This section broadly refers to them jointly as education for sustainable development (ESD) and focuses on global efforts that have historical roots in a series of UN meetings on international environmental issues **(see Box 6)**.

UNESCO defines ESD broadly as education that 'empowers learners to take informed decisions and responsible actions for environmental integrity, economic viability and a just society, for present and future generations, while respecting cultural diversity' **(UNESCO, 2014a, p. 12)**. UNESCO explicitly acknowledges that ESD is 'intended to encompass all activities that are in line with the [ESD] principles irrespective of whether they themselves use the term ESD or – depending on their history, cultural context or specific priority areas – environmental education, sustainability education, global education, development education, or others' **(UNESCO, 2013, Annex 1, 2)**.

Space does not permit in-depth

Space does not permit in-depth discussion of the histories, purposes, scopes and stakeholders of educational movements associated with the UN processes related to peace, human rights and associated areas, such as Education for International Understanding, Human Rights Education, Peace Education, Development Education, and most recently, Global Citizenship Education.

discussion of the histories, purposes, scopes and stakeholders of educational movements associated with the UN processes related to peace, human rights and associated areas, such as Education for International Understanding, Human Rights Education, Peace Education, Development Education, and most recently, Global Citizenship Education. However, it is important to note that UNESCO reporting for the global indicator of SDG 4.7[2] depends solely on the mechanism of the 'UNESCO 1974 Recommendation Concerning Education for International Understanding, Co-operation and Peace and Education Relating to Human Rights and Fundamental Freedoms' (hereafter 1974 Recommendation). Adopted in 1974 by the 18th UNESCO General Conference, governments have the obligation to report their progress towards implementing the 1974 Recommendation every four years.

BOX 6: THE HISTORY OF EDUCATION FOR SUSTAINABLE DEVELOPMENT AND MAJOR UN MILESTONES ON INTERNATIONAL ENVIRONMENTAL ISSUES IN THE PAST 50 YEARS (1972–PRESENT)

The 1972 UN Conference on the Human Environment in Stockholm called for environmental education to be used as a means to address environmental problems in its Recommendation 96. In 1975, this recommendation was addressed at the International Environmental Workshop

[2] The global indicator for SDG 4.7 is the indicator 4.7.1: extent to which (i) global citizenship education and (ii) education for sustainable development are mainstreamed in (a) national education policies; (b) curricula; (c) teacher education; and (d) student assessment. The same indicator is used to report on SDG 12.8: by 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature. Similarly, SDG 13.3: improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

in Belgrade, Yugoslavia, organized by UNESCO and the UN Environment Programme, which adopted a global framework for environmental education known as the Belgrade Charter. Internationally, the official launch of environmental education is attributed to the world's first intergovernmental conference on Environmental Education in Tbilisi, Georgia (then the USSR) in 1977, with the Tbilisi Declaration **(UNESCO, 1978)** providing guiding principles for environmental education (EE).

Chapter 36 of Agenda 21 **(UN Conference on Environment and Development, 1992)** is widely considered a foundational ESD text, recommending that 'environment and development education should deal with the dynamics of both the physical/biological and socio-economic environment and human (which may include spiritual) development, should be integrated in all disciplines,

and should employ formal and non-formal methods'. The importance of climate change education (CCE) was identified in the same year at the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and was reaffirmed as a priority in the 2015 Paris Agreement.

In 2002, the UN General Assembly adopted a resolution to declare a UN Decade of Education for Sustainable Development (DESD) from 2005 to 2014, acting on a proposal made at the World Summit on Sustainable Development (WSSD) and included in the Johannesburg Plan of Implementation. In the second half of the DESD, the lead agency of the DESD, UNESCO, identified climate change as one of the three action themes for addressing global sustainable development challenges through ESD, along with biodiversity and disaster risk reduction **(UNESCO, 2015a)**. In 2012 Rio+20 launched a

process of formulating what later became the Sustainable Development Goals (SDGs). In 2015 ESD has become part of the SDG Target 4.7 focusing on 'knowledge and skills needed to promote sustainable development', and CCE part of SDG 13 on climate action **(indicator 13.3: 'improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning').** In 2018, an IPCC Special Report warned that we have only 12 years to avert catastrophic climate change and highlighted the demand for increased CCE to 'accelerate the wide scale behaviour changes consistent with adapting to and limiting global warming' **(IPCC, 2018, p. 22).**

It is worth noting that ESD is far from an uncontested term. There is a certain confusion, ideological differentiation and diversity of opinion around the multiple and overlapping educational movements such as EE, ESD and education for sustainability (EfS) **(Grosseck, Țîru and Bran, 2019).** The main terms, EE and ESD, can either be seen as overlapping concepts, or two distinct philosophies, with some scholars highlighting the difference in subject matter and focus between the two **(Briggs, Trautmann and Fournier, 2018).** For example, a challenge at the heart of debates around educational terms is the concept of 'sustainable development' in ESD, which has been linked to expert-based knowledge and top-down approaches to educational reform **(Huckle and Wals, 2015).** In Latin America, for example, some scholars perceive ESD as an imposition of Western neoliberal policies and practices on local cultures, thus reinforcing and reproducing environmental and social problems **(Briggs, Trautmann and Fournier, 2018).** Here, though, we follow Kopnina **(2012)** in taking the view that, considering the urgency of our environmental

crisis, we should place less emphasis on terminological distinctions (EE/ESD/EfS), and instead focus on radically turning away from neoliberal and anthropocentric education towards education that advances well-being for all and for our planet.

and sustainability education movement over the last 50 years and presents challenges and future directions for research and practice. It is based on a review of recent systematic review literature **(from 2016 onward)** on EE, ESD, CCE and EfSD.[3]

2.5 **.2**

LESSONS FROM THE ENVIRONMENT AND SUSTAINABILITY EDUCATION MOVEMENT

This section summarizes some of the findings from the environment

2.5 **.2** **.1**

ENVIRONMENTAL EDUCATION AND ENVIRONMENTAL AND SUSTAINABILITY EDUCATION

EE is a substantive and growing educational movement with a 50+ year history and a considerable body of scholarship **(cf. footnote 4)**, that 'develops and enhances

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[3]A systematic review was carried out into EE, ESD, ESE and CCE, in the database Google Scholar. Keywords used were 'environmental education' OR 'education for sustainable development' OR 'climate change education' OR 'Environment and Sustainability Education' AND 'systematic review' OR 'literature review' OR 'review of research' OR 'meta-analysis', from the year 2016 onwards. Twelve review articles were identified (n=12), and through snowballing methods, four more non-review papers were identified to offer wider geographical scope (n=4). Our intention was not to review all of the EE / ESD / ESE / CCE literature as a Google Scholar search rendered over 500, 000 results: 'Environmental Education' rendered 454, 000 papers, ESD 75, 000 results, Climate Change Education 10, 600 results, and 390 results. This shows the scope of scholarly work in this area. For this reason, we drew only on systematic reviews conducted from 2016 onwards, and the perspectives may also be limited as a result and should therefore be viewed as indicative only.

environmental attitudes, values, and knowledge, as well as builds skills that prepare individuals and communities to collaboratively undertake positive environmental action' **(Ardoin, Bowers and Gaillard, 2020, p. 1)**. Furthermore, it facilitates connections between actionable research findings and on-the-ground practices, attempting to bridge the theory–action gap. To understand this relationship, Ardoin et al. **(2020)** carried out a systematic review into conservation outcomes, where they identified themes in the literature to improve environmental outcomes by: 1) focusing on localized issues in conservation; 2) building multistakeholder collaborations between scientists, resource managers and local actors; 3) integrating action elements into educational programmes; and 4) being intentional, creative and thorough in measuring and reporting programme outcomes. The common thread through the four themes is the importance of 'synergistic spaces' where research findings and knowledge converge in local communities and

ecosystems **(Maas, Toomey and Loyola, 2019)**. A particularly pertinent field using these themes is citizen science, which brings in members of the general public to design and implement research projects with viable and useful data **(McKinley et al., 2017)**. Importantly, a limitation also highlighted in this systematic review is the English language criterion and peer-reviewed literature, whereby the authors noted that there is a wealth of research in other languages and in the grey literature, though these dimensions are more difficult to systematically review.

Exploring this limitation, Briggs et al. **(2018)** present a systematic review of EE in publications focused on Latin America and the Caribbean (LATAM). In contrast to EE in North America, which developed in the 1970s in formal education connecting youth to environmental issues, EE in LATAM developed in the 1980s, with influences in emancipatory, rural and popular causes **(González-Gaudiano, 2007)**. Though some EE research has been conducted in Brazil and

Mexico, LATAM is poorly documented **(González-Gaudiano and Lorenzetti, 2013)**. The authors of the systematic review identify large gaps in EE knowledge in LATAM, particularly EE as it applies across cultural contexts, due in part to the exclusion of regionally important journals from accessible research databases. The authors

suggest further emphasis needs to be placed on supporting and promoting more region-focused research, as well as building partnerships between practitioners and scholars.

Whereas EE – which is a complex and richly textured research field – **(Stevenson et al., 2013)**, is seen to be oriented towards learning facts about the environment, developing attitudes in and for the environment, and can also be associated with environmental actions and action competences,[4] some authors see environment and sustainability education (ESE) to be placing more focus on abilities to embrace and develop a more intersectional type of 'democratic action competence' **(Sund, Gericke and Bladh, 2020)**. In a systematic review of ESE, Maina-Okori, Koushik and Wilson **(2018)** explore the role of intersectionality to deconstruct and disrupt oppression in ESE, for example, ecofeminism, queer pedagogy, and indigenous and decolonizing

perspectives. The authors call for increased attention in ESE to include black feminist and indigenous approaches, alongside renewed attention to social justice and indigenous systems of knowledge, with a territorial understanding and focus on education.

2.5 **.2** **.2**

CLIMATE CHANGE EDUCATION

In light of the climate change emergency, there has been a recent growth in the number of CCE publications, adopting a variety of educational strategies. In a systematic review, Monroe et al. **(2019)** present strategies for both formal and non-formal settings. The authors note the difficulties arising from different conceptions of CCE, both with respect to presenting 'the facts' and to addressing climate action and politics. The authors highlight the need to discuss public engagement

...call for increased attention in ESE to include black feminist and indigenous approaches, alongside renewed attention to social justice and indigenous systems of knowledge, with a territorial understanding and focus on education.

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[4]Note that this is by necessity a simplification of a complex, oftentimes politically charged and transformatively oriented field of educational research and practice (cf. Stevenson et al., 2013).

... highlight the need to discuss public engagement simultaneously at different levels (Wibeck, 2014), as well as to address beliefs and attitudes to climate change through place-based education (WG3-ch7)

simultaneously at different levels **(Wibeck, 2014)**, as well as to address beliefs and attitudes to climate change through place-based education **(WG3-ch7)**, whereby students directly experience climate change disruptions that can affect their perception of, and opinions on, climate change **(Brownlee, Powell and Hallo, 2013)**. In another systematic review of CCE, focusing on children and young people, Rousell and Cutter-Mackenzie-Knowles **(2020)** note that more participatory, interdisciplinary, creative and affect-driven approaches to CCE are needed. Specifically, they stress a need for CCE to engage with broader social movements addressing climate change, and, citing Brownlee, Powel and Hallo **(2013)**, to move beyond cognitive and scientific knowledge-based approaches so as to engage with affective dimensions, especially research that 'gives young people both a hand and a voice in redressing the complex implications of climate change in their own communities and environments' **(Rousell and Cutter-Mackenzie-Knowles, 2020, p. 203)**.

Reviews have also noted a trend for increasing research into climate change education policy **(e.g. Bangay and Blum, 2010)**, as well as a need for greater research attention to critical policy theory and methodology and issues of intersectionality **(Aikens, McKenzie and Vaughter, 2016)**. In line with the limitations in EE research, the authors identify the under-representation of published policy research across Africa, South and Central America, Eastern Europe, and North and West Asia, as well as the exclusion of local-scale policy research due to factors including the dominance of Western academic publishing networks and marginalization of languages other than English **(Aikens, McKenzie and Vaughter, 2016)**. All this suggests that there is a need for a greater attention to local contexts and closer attention to the messier aspects of policy enactments **(Braun et al., 2011)**.

2.5 **.2** **.3**

EDUCATION FOR SUSTAINABLE DEVELOPMENT

Research interest in ESD has, like EE and CCE, increased considerably over the years, with increasing collaboration of authors worldwide **(Grosseck, Tîru and Bran, 2019)**. In a systematic review of ESD in early childhood education (ECE), Bascopé et al. **(2019)** note the importance of: 1) action-oriented and participatory research that promotes local change agents; 2) the requirement of ECE to be a community-based process, with education understood as a localized social process; and 3) being value-oriented, since our civilizational crisis requires a radical transformation in how we relate to one another and to non-human life. The authors suggest appropriate pedagogical approaches such as arts-based methods, outdoor education and project- and problem-based learning.

A core aspect of ESD is to educate individuals and societies to live more harmoniously with nature and face up to the immense challenges confronting humanity. As a means to address structural obstacles to sustainability, there is an important transformative aspect to EE, CCE and ESD, requiring deep reflection and shifts in beliefs and value-systems towards more socio-ecologically just futures. This requires learning methods that allow for the development of competencies that go beyond cognitive and 'knowing' aspects, to include socio-emotional and 'being' competences **(Gómez-Olmedo, Valor and Carrero, 2020)**. A systematic review of mindfulness in ESD highlights that mindfulness practices can help nurture socio-emotional competencies **(WG1-ch3; WG2-ch5; WG3-ch4)**, and that in addition to adapting mindfulness to the specific outcome desired, it is necessary to fit interventions to specific contextual socio-environmental challenges **(Gómez-Olmedo, Valor andCarrero, 2020)**. A review paper also focusing on mind-in-society, but on the social

... appropriate pedagogical approaches such as arts-based methods, outdoor education and project- and problem-based learning.

2

CHAPTER

Lessons from research, consultations, piloting of materials, demonstration projects and capacity-building workshops will need to be transferred into ESD policy and practice on a wide scale.

formation of mind through socio-cultural learning, which captures insights across a number of cases and contexts in Africa, argues for collective forms of expansive learning in sociocultural contexts for transgressing normalized unsustainable practices **(Lotz-Sisitka et al., 2017a)**. The paper argues for the sociocultural co-construction of meaning and transformative praxis through expansive learning in the cultural historical activity theory tradition, which has a long history of indicating how collective learning and transformed human activity emerges from multi-actor formations in response to challenges and contradictions in society **(cf. Engeström, 2015)**.

HE has also been connected to ESD and there is an independent subfield called higher education for sustainable development (HESD). An early focus **(2005, 2009)** on environment protection, environmental science education and environmental engineering education **(Jim and Shen, 2016)** has evolved into a more diverse focus on learning, pedagogy and

community outreach between 2009 and 2014 **(e.g. Wals, 2014)**. Jim and Shen **(2016)** also note that there was a mismatch between the UNESCO aims for the UNDESD and ESD research, with a particular dearth of research from sociocultural perspectives, such as research on gender equality and human rights.

Given the global scale of the response needed to address sustainability challenges, the final UNDESD report **(UNESCO, 2014b)** highlights the importance of scaling up action through ESD policy and action. However, there is an appreciation of the complexities of ESD, centred around the need for education to be contextualized **(UNESCO, 2014b, p. 180)**. What works in scaling up ESD across a local school district in Colombia, for example, may be quite different from what will be needed to scale up systems across Finland. Lessons from research, consultations, piloting of materials, demonstration projects and capacity-building workshops will need to be transferred into ESD policy and practice on a wide

> **... dominant forms of modernity and coloniality underpin the unsustainability of the established model of 'development' and associated forms of education.**

scale, but there will be cases where initiatives work best because they are very local in context and only manageable as small interventions.

2.5 **.3**

TOWARDS TRANSFORMATIVE EDUCATION FOR SUSTAINABLE DEVELOPMENT

Current views on sustainability development focus on working towards major societal transformations (**Bostrom et al., 2018**), through holistic and transformational learning and intergenerational sustainability, to preserve common intergenerational resource pools (**Aoki et al., 2020**). Although the broader aim of ESD is 'positive societal transformation' (**UNESCO, 2014a, p. 12**), a full transformation of education systems has yet to take place. As discussed in **section 2.4**, dominant forms of modernity

and coloniality underpin the unsustainability of the established model of 'development' and associated forms of education. Efforts to transform education for sustainability can therefore be meaningfully linked to decolonial efforts to de-centre modern systems of knowledge that have led to the denigration and disavowal of other systems of knowing and being and the devastation of nature. Increasing understanding of sustainability challenges (scientific literacy) and engaging psycho-social and action dimensions are necessary for personal and political change. At the same time, addressing the crisis discussed in **section 2.2** requires going beyond awareness raising and behavioural change interventions to rethinking how we have been constituted as individuals, and how our social norms and cultural practices are formed. We must consider how to escape the trap of twentieth century individualization in and through education, and instead realize a socially framed paradigm that recognizes the individual-in-society and environment (i.e.

Understanding of the role of positive emotion in promoting human flourishing and sustainable development has prompted calls for integrating social and emotional learning into ESD.

collective action, social learning and social change approaches in education) that also foreground social justice, the common good and include the more-than-human **(Lotz-Sisitka, 2017)**.

There is an emerging effort by environmental scientists, neuroscientists, psychologists and educators to come together and combine neuroscientific and psychological insights with the analysis of the broader societal framework for sustainable development, in an effort to create a holistic perspective for ESD programmes **(Ojala, 2019; Aoki et al., 2020; Luetz, Margus and Prickett, 2020)**. Understanding of the role of positive emotion in promoting human flourishing and sustainable development has prompted calls for integrating social and emotional learning (SEL) into ESD **(UNESCO MGIEP, 2020)(WG3-ch4)**. Such calls envisage the addition of an emotional dimension to the ESD framework including: 1) developing capacities for emotional articulation and regulation **(O'Brien and Sygna, 2013; Ojala, 2013)**; and 2) integrating social, affective

and cognitive dimensions of ESD at the individual level with an understanding of the importance of inclusiveness, social relationships, institutions and politics **(Boström et al., 2018)**. Understanding the neural basis of persistent behaviour change and prosocial motivation both from the perspective of 'individual cognition' and of a 'social learning paradigm' **(Luetz, Margus and Prickett, 2020, Figure 2)** is increasingly seen as important to informing the ESD frameworks of the future. There is also a strong body of research emerging in the cultural psychological arena that does not reduce the mind to brain, but recognizes the cultural historical and social origins and dynamics of human learning **(Engeström, 2015; Stetsenko, 2018)**. This research couples transformative, transgressive learning with an expansive process of co-creating transformed human activity. This emerges from our capabilities to use language, work with tools and artefacts that are culturally co-created, and think and exercise volitional will (i.e. capability to choose with reason), in relation

to others and conflicting stimuli in society. This research as it is emerging in the context of sustainability and social justice, focus particularly on collective social learning and transformative agency formation, with proven non-instrumental outcomes at the level of transformed human activity **(e.g. Engeström and Sannino, 2021; Sannino, 2022; Lotz-Sisitka et al., 2017a)**. There are also attempts to integrate the teaching of STEM (science, technology, engineering and maths) with culturally relevant place-based exploratory approaches in indigenous communities **(Roehrig et al., 2012; Kern et al., 2015; Lotz-Sisitka et al., 2017b)**. Such approaches respect the connections that indigenous communities have with the natural environment yet allow indigenous learners to value scientific inquiries about the world, offering a wider scope of knowledges (i.e. an ecology of knowledges) for meaning-making **(for further discussion, see WG3-ch4)**.

Education – including formal schooling, training, public awareness and public participation – is considered fundamental to overcoming denial and anxiety, increasing climate literacy and supporting the climate action we need. However, enacting a model of sustainable development is not simply about furthering 'pro-environmental behaviour' and informing ESD with evidence from neural and behavioural sciences. ESD, properly understood, is not just a learning intervention but ultimately a vision of the kinds of societies that are both served by, and enable, a more holistic vision of education. An excessive or unbalanced focus on behavioural change through education can potentially distract from the urgent need for transformative social change. From an educational system development perspective, there is a fundamental need to shift away from learning-to-understand towards learning-how-to-act-and-transform **(Schnitzler, 2019)**. Kagawa and Selby **(2010)** go a step further by stating the need for a lived paradigm shift in addressing climate change, whereby education can only address global dysfunction if it addresses its root

> Education – including formal schooling, training, public awareness and public participation – is considered fundamental to overcoming denial and anxiety, increasing climate literacy and supporting the climate action we need.

causes **(Lotz-Sisitka et al., 2015)**. This requires interdisciplinary and multidisciplinary frames and multi-actor engagement at local and global levels, a social and holistic learning process and appreciation that climate justice is fundamental for ethical and responsive CCE **(Reid, 2019)**. It also, crucially, requires that attempts to transform pedagogy, curricula and educational institutions in ways conducive to sustainable lifestyles are matched by appropriate steps to transform the contexts in which education systems operate. As we emphasize in the work of this working group, without far-reaching reforms to political institutions, labour markets and welfare systems to dampen the competitive dynamic, promote security and enhance human dignity and agency, educational initiatives alone are likely to be inadequate. Importantly, educational initiatives should not be reductionist in their scope and conception; if anything education should be conceptualized as

individual involvement in social engagement and co-learning to transform human agency and collective cultures and activity.

Contextual influences articulated by the sustainability sciences on education are broad, ranging from shifting demographics and geopolitical changes. Importantly, there is a need to learn from historical mistakes in education and training systems worldwide (e.g. to avoid linear thinking in the colonial image), so as not to reproduce outdated approaches to capacity building and education and training system development. Due to a strong and enduring emphasis on education for human capital development and economic growth, mainstream discourse and public policy on education have a long distance to travel toward a 'common good' paradigm **(on Asian policies and curricula, see UNESCO MGIEP, 2017)**.

2.6 <u>Key messages and implications</u>

Running through this chapter (and subsequent chapters) is the argument that reconfiguring education to meet the challenges of sustainability involves far more than a process of 'scientifically'-informed technical adjustment. In planetary and human terms, our dominant educational paradigm is profoundly toxic, and meeting the challenge of educational 'detoxification' requires first understanding, or reimagining, the fundamental aims, purposes

and potential power of education as a transformative force. While scientific insight and technological innovation may contribute to rendering certain educational practices more sustainable, a more radical and thorough project of transformative cultural critique and ethical reflection is therefore urgently needed. While EE, CCE, ESE and ESD are essential, in this respect, for raising awareness of our predicament, this emerging body of transformative educational research and praxis, is insufficient by itself to bring about the transformation in our relationships with each other and with nature that is vital to staving off the worst effects of environmental crisis. The following are our five key findings and recommendations:

- *Education has the potential to transform behaviour and practices,* and to facilitate social, economic and institutional changes necessary to ameliorator counter climate-related threats. Its capacity to do so, however, depends largely on how rapidly and effectively we can also address macro-contextual factors

such as political oppression, chronic economic insecurity and inequality, as well as the underlying epistemic assumptions that inform our beliefs about education and its role in our social order.

- *The important positive contribution that education can make in raising awareness, fostering empathy* (for each other and for nature) and promoting active, engaged citizenship may be diminished if opportunities to exercise agency are frustrated, and if governments and corporations continue to treat humans instrumentally as 'resources' for perpetual expansion and unsustainable consumerism.

- *Fostering critical awareness of histories of colonialism, violence, ecological exploitation, and intolerance,* and their role in the construction of our present unsustainable political, social and economic order, is important for underpinning efforts to promote a more sustainable, inclusive and humane approach, that also takes the more than human fully

into account in the context of overall planetary well-being and sustainability.

- ***While emphasizing the need for critical awareness of the pernicious legacies of colonialism*** and associated patterns of thought, we must beware of appearing to subscribe to crude 'anti-Westernism'. Rather than simplistically dividing humanity into 'oppressed' and 'oppressing' groups, or promoting civilizational stereotypes, education should reinforce awareness of our common humanity and shared responsibility to address a global crisis for which we are all jointly, if unequally, to blame.

- ***While enhancing awareness (through education), alongside psychological and behavioural and social change interventions,*** is necessary to motivate pro-environmental action, research suggests that it is not sufficient to achieve meaningful or lasting change in our societies or our relationship with nature. The operation of powerful vested interests that wish to deflect demands for concerted action by state and corporate actors must be taken into account – and this implies a crucial role for political action, alongside education.

Importantly too, educational initiaitves should not be reductionist in their scope and conception; if anything education should be conceptualized as individual involvement in social engagement and co-learning to transform human agency and collective cultures and activity.

REFERENCES

Aikens, K., McKenzie, M. and Vaughter, P. (2016) 'Environmental and sustainability education policy research: a systematic review of methodological and thematic trends', Environmental Education Research, 22(3), pp. 333–359.

Ajzen, I. (1991) 'The theory of planned behavior', Organizational Behavior and Human Decision Processes, 50(2), pp. 179–211.

Ajzen, I. and Fishbein, M. (2005) 'The influence of attitudes on behavior', in Albarracín, D., Johnson, B.T. and Zanna, M.P. (eds.) The handbook of attitudes. Mahwah, NJ: Lawrence Erlbaum, pp. 173–221.

Alvaredo, F., Chancel, L., Piketty, T., Saez, E. and Zucman, G. (2018) World inequality report 2018. Cambridge, MA: Belknap Press of Harvard University Press.

Anderson, A. (2010) Combating climate change through quality education. Available at: https://www.preventionweb.net/files/15415_15415brookingspolicyclimatecha.pdf

Andreotti, V. (2016) 'The educational challenges of imagining the world differently', Canadian Journal of Development Studies, 37(1), pp. 101–112.

Aoki, R., Ito, A., Izuma, K. and Saijo, T. (2020) How can neuroscience contribute to the science of intergenerational sustainability? Available at: http://www.souken.kochi-tech.ac.jp/seido/wp/SDES-2020-11.pdf (Accessed: 30 June 2021).

Appiah, K.A. (2018) The lies that bind: rethinking identity. London: Profile Books.

Ardley, B. and May, C. (2020) 'Ethical marketer and sustainability: facing the challenges of overconsumption and the market', Strategic Change, 29(6), pp. 617–624.

Ardoin, N.M., Bowers, A.W. and Gaillard, E. (2020) 'Environmental education outcomes for conservation: a systematic review', Biological Conservation, 241. https://doi.org/10.1016/j.biocon.2019.108224.

Bangay, C. and Blum, N. (2010) 'Education responses to climate change and quality: two parts of the same agenda?', International Journal of Educational Development, 30(4), pp. 359–368.

Bascopé, M., Perasso, P. and Reiss, K. (2019) 'Systematic review of education for sustainable development at an early stage: cornerstones and pedagogical approaches for teacher professional development', Sustainability: Science Practice and Policy, 11(3). https://doi.org/10.3390/su11030719.

Bazerman, M.H. and Tenbrunsel, A.E. (2011) Blind spots: why we fail to do what's right and what to do about it. Woodstock, Oxfordshire: Princeton University Press.

Becker, A.E. and Kleinman, A. (2013) 'Mental health and the global agenda', The New England Journal of Medicine, 369, pp. 1380–1381.

Blake, J. (1999) 'Overcoming the "value-action gap" in environmental policy: tensions between national policy and local experience', Local Environment, 4(3), pp. 257–278.

Bloom, D.E., Canning, D. and Fink, G. (2010) 'Implications of population ageing for economic growth', Oxford Review of Economic Policy, 26(4), pp. 583–612.

Bocken, N.M.P. and Short, S.W. (2016) 'Towards a sufficiency-driven business model: experiences and opportunities', Environmental Innovation and Societal Transitions, 18, pp. 41–61.

Boldero, J. (1995) 'The prediction of household recycling of newspapers: the role of attitudes, intentions, and situational factors', Journal of Applied Social Psychology, 25(5), pp. 440–462.

Borrelle, S.B., Ringma, J., Law, K.L., Monnahan, C.C., Lebreton, L., ... and Rochman, C.M.(2020) 'Predicted growth in plastic waste exceeds efforts to mitigate plastic pollution', Science, 369(6510), pp. 1515–1518.

Boström, M., Andersson, E., Berg, M., Gustafsson, K., Gustavsson, E., ... and Öhman, J. (2018) 'Conditions for transformative learning for sustainable development: a theoretical review

and approach', Sustainability: Science Practice and Policy, 10(12).https://doi.org/10.3390/su10124479.

Bourque, F. and Willox, A.C. (2014) 'Climate change: the next challenge for public mental health?', International Review of Psychiatry, 26(4), pp. 415–422.

Braun, A., Ball, S.J., Maguire, M. and Hoskins, K. (2011) 'Taking context seriously: towards explaining policy enactments in the secondary school', Discourse: Studies in the Cultural Politics of Education, 32(4), pp. 585–596.

Briggs, L., Trautmann, N.M. and Fournier, C. (2018) 'Environmental education in Latin American and the Caribbean: the challenges and limitations of conducting a systematic review of evaluation and research', Environmental Education Research, 24(12), pp. 1631–1654.

Brilli, Y., Del Boca, D. and Pronzato, C. D. (2016) 'Does child care availability play a role in maternal employment and children's development? Evidence from Italy', Review of Economics of the Household, 14(1), pp. 27-51.

Brosch, T. (2021) 'Affect and emotions as drivers of climate change perception and action: a review', Current Opinion in Behavioral Sciences, 42, pp. 15–21.

Brown, K., Adger, W.N., Devine-Wright, P., Anderies, J., Barr, S., ... and Quinn, T. (2019) 'Empathy, place and identity interactions for sustainability', Global Environmental Change: Human and Policy Dimensions, 56, pp. 11–17.

Brownlee, M.T.J., Powell, R.B. and Hallo, J.C. (2013) 'A review of the foundational processes that influence beliefs in climate change: opportunities for environmental education research', Environmental Education Research, 19(1), pp. 1–20.

Bryant, R.A., Waters, E., Gibbs, L., Gallagher, H.C., Pattison, P., ... and Forbes, D. (2014) 'Psychological outcomes following the Victorian Black Saturday bushfires', The Australian and New Zealand Journal of Psychiatry, 48(7), pp. 634–643.

Burke, M., Hsiang, S.M. and Miguel, E. (2015) 'Climate and conflict', Annual Review of Economics, 7(1), pp. 577–617.

Chen, S., Oliva, P. and Zhang, P. (2018) Air pollution and mental health: evidence from China. National Bureau of Economic Research (Working Paper Series). doi: 10.3386/w24686.

Choudhry, M.T., Marelli, E. and Signorelli, M. (2016) 'Age dependency and labour productivity divergence', Applied Economics, 48(50), pp. 4823–4845.

Collier, P. (2013) Exodus: immigration and multiculturalism in the 21st century. London: Penguin.

Corner, A., Roberts, O., Chiari, S., Völler, S., Mayrhuber, E.S., ... and Monson, K. (2015) 'How do young people engage with climate change? The role of knowledge, values, message framing, and trusted communicators', Wiley Interdisciplinary Reviews: Climate Change, 6(5), pp. 523–534.

Coulibaly, T., Islam, M. and Managi, S. (2020) 'The impacts of climate change and natural disasters on agriculture in African countries', Economics of Disasters and Climate Change, 4(2), pp. 347–364.

Crist, E., Mora, C. and Engelman, R. (2017) 'The interaction of human population, food production, and biodiversity protection', Science, 356(6335), pp. 260-264.

Cunsolo, A. and Ellis, N.R. (2018) 'Ecological grief as a mental health response to climate change-related loss', Nature Climate Change, 8(4), pp. 275–281.

de Sousa Santos, B. (2014)Epistemologies of the south: justice against epistemicide. London: Paradigm Publishers.

De Waal, F.B.M. (2008) 'Putting the altruism back into altruism: the evolution of empathy', Annual Review of Psychology. Available at: https://www.annualreviews.org/doi/abs/10.1146/annurev.psych.59.103006.093625 (Accessed: 21 March 2021).

Department of Economic and Social Affairs (2020) World population prospects

REFERENCES

2019 – volume II: demographic profiles. New York: United Nations.

Desai, M.A. (2010) 'Hope in hard times: women's empowerment and human development', UNDP-HDRO Occasional Papers (2010/14).

Diamond, J. (2011) Collapse: how societies choose to fail or succeed. New York: Penguin.

Díaz, S., Pascual, U., Stenseke, M., Martín-López, B., Watson, R.T., ... and Shirayama, Y. (2018) 'Assessing nature's contributions to people', Science, 359(6373), pp. 270–272.

DiNapoli, R.J., Rieth, T.M., Lipo, C.P. and Hunt, T.L. (2020) 'A model-based approach to the tempo of "collapse": the case of Rapa Nui (Easter Island)', Journal of Archaeological Science, 116. https://doi.org/10.1016/j.jas.2020.105094.

Doherty, T.J. and Clayton, S. (2011) 'The psychological impacts of global climate change', The American Psychologist, 66(4), pp. 265–276.

Egels-Zandén, N. (2007) 'Suppliers' compliance with MNCs' codes of conduct: behind the scenes at Chinese toy suppliers', Journal of Business Ethics, 75(1), pp. 45-62.

Elfert, M. (2017) UNESCO's utopia of lifelong learning: an intellectual history. London: Routledge.

Elvin, M. (2004). The retreat of the elephants: an environmental history of China. New Haven: Yale University Press.

Engeström, Y. (2015). Learning by expanding. Cambridge: Cambridge University Press.

Engeström, Y. and Sannino, A. (2021). From mediated actions to heterogenous coalitions: four generations of activity-theoretical studies of work and learning. Mind, Culture, and Activity, 28(1), pp. 4-23.

Escobar, A. (2015) 'Degrowth, postdevelopment, and transitions: a preliminary conversation', Sustainability Science, 10(3) pp. 451–462.

Escobar, A. (2016) Thinking-feeling with the earth: territorial struggles and the ontological dimension of the epistemologies of the south'. Revista de Antropología Iberoamericana. Available at: http://www.redalyc.org/html/623/62345164002/ (Accessed: 20 March 2021).

Evans, G.W. (2019) 'Projected behavioral impacts of global climate change', Annual Review of Psychology, 70(1), pp. 449–474.

Ferguson, J. (2010) 'The uses of neoliberalism', Antipode, 41, pp. 166–184.

Ferrand, C., Martinent, G. and Bonnefoy, M. (2014) 'Exploring motivation for exercise and its relationship with health-related quality of life in adults aged 70 years and older', Ageing & Society, 34(3), pp. 411–427.

Fritsche, I., Cohrs, J.C., Kessler, T. and Bauer, J. (2012) 'Global warming is breeding social conflict: the subtle impact of climate change threat on authoritarian tendencies', Journal of Environmental Psychology, 32(1), pp. 1–10.

Furceri, D., Loungani, P., Ostry, J.D. and Pizzuto, P. (2020) 'Will Covid-19 affect inequality? Evidence from past pandemics', Covid Economics. Available at: https://cepr.org.uk/sites/default/files/news/CovidEconomics12.pdf#page=143 (Accessed: 30 June 2021).

Gerland, P., Raftery, A. E., Ševčíková, H., Li, N., Gu, D., ... and Wilmoth, J. (2014) 'World population stabilization unlikely this century', Science, 346(6206), pp. 234-237.

Giddens, A. (2009) The politics of climate change. Cambridge: Polity.

Gifford, R. (2006) 'A general model of social dilemmas', International Journal of Ecological Economics and Statistics, 4 (S06). Available at: https://www.academia.edu/download/43806827/A_General_Model_of_Social_Dilemmas20160316-24286-1dqie3f.pdf (Accessed: 30 November 2020).

Gifford, R. (2011) 'The dragons of inaction: psychological barriers that limit climate change mitigation and adaptation', The American Psychologist, 66(4), pp. 290–302.

Gifford, R., Kormos, C. and McIntyre, A. (2011) 'Behavioral dimensions of climate change: drivers, responses, barriers, and interventions'. Climate Change, 2(6), pp. 801–827.

Glasser, H. (2007) 'Minding the gap: the role of social learning in linking our stated desire for a more sustainable world to our everyday actions and policies', in Wals, A.E.J. (eds.) Social learning: toward a more sustainable world. Wageningen: Wageningen Academic Publishers, pp. 35–61.

Glendenning, F. (2001) 'Education for older adults', International Journal of Lifelong Education, 20(1-2), pp. 63-70.

Gómez-Olmedo, A.M., Valor, C. and Carrero, I. (2020) 'Mindfulness in education for sustainable development to nurture socioemotional competencies: a systematic review and meta-analysis', Environmental Education Research, 11, pp. 1–29.

González-Gaudiano, E. (2007) 'Schooling and environment in Latin America in the third millennium', Environmental Education Research, 13(2), pp. 155–169.

Gonzalez-Gaudiano, E. and Lorenzetti, L. (2013) 'Trends, junctures, and disjunctures in Latin American environmental education research', in Stevenson, B., Brody, M., and Dillon, J. and Wals, A.E.J. (eds.) International handbook of environmental education research. New York and London: Routledge, pp. 171–177.

Goody, J. (2006) The theft of history. Cambridge: Cambridge University Press.

Götmark, F., Cafaro, P., & O'Sullivan, J. (2018) 'Aging human populations: good for us, good for the earth', Trends in ecology & evolution, 33(11), pp. 851-862.

Gough, A., Lee, J.C.K., and Tsang, E.P.K. (eds.) (2020) Green schools globally: Stories of impact on education for sustainable development, Springer Nature Switzerland. doi: 10.1007/978-3-030-46820-0.

Grosseck, G., Țîru, L.G. and Bran, R.A. (2019) 'Education for sustainable development: evolution and perspectives: a bibliometric review of research, 1992–2018', Sustainability: Science Practice and Policy, 11(21). https://doi.org/10.3390/su11216136.

Haidt, J. (2001) 'The emotional dog and its rational tail: a social intuitionist approach to moral judgment', Psychological Review, 108(4), pp. 814–834.

Hall, S. and Ince, A. (2017) 'Introduction: sharing economies in times of crisis', in Ince, A. and Hall, S. (eds.) Sharing economies in times of crisis: practices, politics and possibilities. London: Routledge.

Hansen, M.H., Li, H.T. and Svarverud, R. (2018) 'Ecological civilization: interpreting the Chinese past, projecting the global future', Global Environmental Change, 53, pp. 195–203.

Harper, S. (2014) 'Economic and social implications of aging societies', Science, 346(6209), pp. 587–591.

Hayes, K., Blashki, G., Wiseman, J., Burke, S. and Reifels, L. (2018) 'Climate change and mental health: risks, impacts and priority actions', International Journal of Mental Health Systems, 12. https://doi.org/10.1186/s13033-018-0210-6.

Head, L., Gibson, C., Gill, N., Carr, C. and Waitt, G. (2016) 'A meta-ethnography to synthesise household cultural research for climate change response', Local Environment, 21(12), pp. 1467–1481.

Hess, D.J. and Maki, A. (2019) 'Climate change belief, sustainability education, and political values: assessing the need for higher-education curriculum reform', Journal of Cleaner Production, 228, pp. 1157–1166.

Hsiang, S.M., Burke, M. and Miguel, E. (2013) 'Quantifying the influence of climate on human conflict', Science, 341(6151). doi: 10.1126/science.1235367.

REFERENCES

Huckle, J. and Wals, A.E.J. (2015) 'The UN decade of education for sustainable development: business as usual in the end', Environmental Education Research, 21(3), pp. 491–505.

ICoFE (2021). Reimagining our futures: a new social contract for education. Report from the International Commission on the Futures of Education. Paris: UNESCO.

ILO/Cedefop (2011) Skills for green jobs: a global view. Geneva: International Labour Organization.

International Commission on Education for the Twenty-first Century (1996) Learning: the treasure within. Report to UNESCO of the International Commission on Education for the Twenty-first Century. Paris: UNESCO.

IOM (2020) World migration report 2020. Paris: UNESCO.

IPBES (2019) 'Summary for policymakers', in Díaz, S., Settele, J., Brondízio, E.S., Ngo, H.T., Guèze, M., ... and Zayas, C.N. (eds.) Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Bonn: IPBES secretariat. https://doi.org/10.5281/zenodo.3553579.

IPCC (2018) Global warming of 1.5 C: an IPCC special report. Geneva: Intergovernmental Panel on Climate Change.

IPCC (2021) Climate change 2021: the physical science basis. Geneva: Intergovernmental Panel on Climate Change.

Jeremy, W. (2017) 'Air pollution and brain health: an emerging issue', The Lancet, 390, pp. 1345–1422.

Jim, W.Y.-C. and Shen, J.-P. (2016) 'Higher education for sustainable development: a systematic review', International Journal of Sustainability in Higher Education, 17(5), pp. 633–651.

Johnson, D. and Levin, S. (2009) 'The tragedy of cognition: psychological biases and environmental inaction', Current Science, 97(11), pp. 1593–1603.

Johnson, H. and Wilson, G. (2000) 'Institutional sustainability: "community" and waste management in Zimbabwe', Futures, 32(3–4), pp. 301–316.

Kagawa, F. and Selby, D. (2010) Education and climate change: living and learning in interesting times. London: Routledge.

Kern, A. L., Roehrig, G. H., Bhattacharya, D., Wang, J. Y., Finley, F. ... and Nam, Y. (2015) 'Drawing on place and culture for climate change education in native communities', in Mueller, M.P. and Tippins, D.J. (eds.) Ecojustice, citizen science and youth activism: situated tensions for science education. Cham: Springer International Publishing, pp. 121–138.

Keulartz, J. (2012) 'The emergence of enlightened anthropocentrism in ecological restoration', Nature and Culture. Available at: https://www.berghahnjournals.com/view/journals/nature-and-culture/7/1/nc070104.xml (Accessed: 30 June 2021).

Klein, N. (2007) The shock doctrine: the rise of disaster capitalism. London: Macmillan.

Klein, N. (2015) This changes everything: capitalism vs. the climate. New York: Simon and Schuster.

Kluge, F. A., Goldstein, J.R. and T.C. (2019) 'Transfers in an aging European Union', The Journal of the Economics of Ageing, 13, pp. 45-54.

Kollmuss, A. and Agyeman, J. (2002) 'Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?', Environmental Education Research, 8(3), pp. 239–260.

Komatsu, H., Rappleye, J. and Silova, I. (2019) 'Culture and the independent self: obstacles to environmental sustainability?', Anthropocene, 26. https://doi.org/10.1016/j.ancene.2019.100198.

Komatsu, H., Rappleye, J. and Silova, I. (2021) 'Student-centered learning and sustainability: solution or problem?', Comparative Education Review, 65(1), pp. 6–33.

Kopnina, H. (2012) 'Education for sustainable development (ESD): the turn away from "environment" in environmental education?', Environmental Education Research, 18(5), pp. 699–717.

Krznaric, R. (2015) Empathy: why it matters, and how to get it. New York: TarcherPerigee.

Kurniawan, R., Sugiawan, Y. and Managi, S. (2021) 'Economic growth – environment nexus: an analysis based on natural capital component of inclusive wealth', Ecological Indicators, 120. https://doi.org/10.1016/j.ecolind.2020.106982.

Laudenslager, M.S., Lofgren, S.T. and Holt, D.T. (2004) 'Understanding Air Force members' intentions to participate in pro-environmental behaviors: an application of the theory of planned behavior', Perceptual and Motor Skills, 98(3 Pt 2), pp. 1162–1170.

Liberman, N. and Trope, Y. (2008) 'The psychology of transcending the here and now', Science, 322(5905), pp. 1201–1205.

Lim, Y.-H., Kim, H., Kim, J.H., Bae, S., Park, H.Y. and Hong, Y.-C. (2012) 'Air pollution and symptoms of depression in elderly adults', Environmental Health Perspectives, 120(7), pp. 1023–1028.

Lin, Y.-Y. (2011) 'Older adults' motivation to learn in higher education', paper presented at the Adult Education Research Conference (AERC), Toronto, Canada, June 2011. Available at: https://eric.ed.gov/?id=ED539152 (Accessed: 30 November 2020).

Lotz-Sisitka, H.B. (2017) 'Education and the common good', in Jickling, B. and Sterling, S. (eds.). Post-sustainability and environmental education: re-making education: beyond sustainability. Plymouth: Palgrave Mc Millan.

Lotz-Sisitka, H., Wals, A.E.J., Kronlid, D. and McGarry, D. (2015) 'Transformative, transgressive social learning: rethinking higher education pedagogy in times of systemic global dysfunction', Current Opinion in Environmental Sustainability, 16, pp. 73–80.

Lotz-Sisitka, H., Mukute, M., Chikunda, C., Baloi, A. and Pesanayi, T. (2017a) 'Transgressing the norm: transformative agency in community-based learning for sustainability in southern African contexts', International Review of Education, 63(6), pp. 897-914.

Lotz-Sisitka, H.B., Shumba, O., Lupele, J. and Wilmot, D. (eds.). (2017b) Schooling and sustainable development in Africa. Heidelberg: Springer. ISBN 978-3-319-45989-9.

Luetz, J.M., Margus, R. and Prickett, B. (2020) 'Human behavior change for sustainable development: perspectives informed by psychology and neuroscience', Quality Education. Available at: https://link.springer.com/content/pdf/10.1007/978-3-319-95870-5_12.pdf (Accessed: 2 March 2021).

Lutz, W., Amran, G., Belanger, A., Conte, A., Gailey, N., ... and Stonawski, M. (2019a) Demographic scenarios for the EU: migration, population and education. Luxembourg: Publications Office of the European Union.

Lutz, W., Cuaresma, J.C., Kebede, E., Prskawetz, A., Sanderson, W.C. and Stiessnig, E. (2019b) 'Education rather than age structure brings demographic dividend', Proceedings of the National Academy of Sciences of the United States of America, 116(26), pp. 12798–12803.

Maas, B., Toomey, A. and Loyola, R. (2019) 'Exploring and expanding the spaces between research and implementation in conservation science', Biological Conservation, 240. doi: 10.1016/j.biocon.2019.108290.

Maiella, R., La Malva, P., Marchetti, D., Pomarico, E., Di Crosta, A., ... and Verrocchio, M.C. (2020) 'The psychological distance and climate change: a systematic review on the mitigation and adaptation behaviors', Frontiers in Psychology, 11. https://doi.org/10.3389/fpsyg.2020.568899.

Maina-Okori, N.M., Koushik, J.R. and Wilson, A. (2018) 'Reimagining intersectionality in environmental and sustainability education: a critical literature review', The Journal of Environmental Education, 49(4), pp. 286–296.

Managi, S. and Kumar, P. (2018) Inclusive wealth report 2018: measuring progress toward sustainability. New York: Routledge.

REFERENCES

Managi, S., Islam, M., Saito, O., Stenseke, M., Dziba, L., ... and Hashimoto, S. (2019) 'Valuation of nature and nature's contributions to people', Sustainability Science, 14(6), pp. 1463–1465.

Markowitz, E.M. and Shariff, A.F. (2012) 'Climate change and moral judgement', Nature Climate Change, 2(4), pp. 243–247.

McDonagh, P. and Prothero, A. (2014) 'Sustainability marketing research: past, present and future', Journal of Marketing Management, 30(11-12), pp. 1186-1219.

McKinley, D.C., Miller-Rushing, A.J., Ballard, H.L., Bonney, R., Brown, H., ... and Soukup, M.A.(2017) 'Citizen science can improve conservation science, natural resource management, and environmental protection', Biological Conservation, 208, pp. 15–28.

Mignolo, W. (2011) The darker side of Western modernity: global futures, decolonial options. Durham, NC: Duke University Press.

Mignolo, W. (2018) 'The conceptual triad: modernity/coloniality/decoloniality', in Mignolo, W.D. and Walsh, C.E. (eds.) On decoloniality: concepts, analytics, praxis. Durham, NC: Duke University Press, pp. 135–152.

Mignolo, W. and Walsh, C.E. (Eds.) (2018) On decoloniality: concepts, analytics, praxis. Durham, NCa: Duke University Press.

Monroe, M.C., Plate, R.R., Oxarart, A., Bowers, A. and Chaves, W.A. (2019) 'Identifying effective climate change education strategies: a systematic review of the research', Environmental Education Research, 25(6), pp. 791–812.

Moore, J. (ed.) (2016) Anthropocene orcapitalocene? Nature, history, and the crisis of capitalism. Oakland, CA: PM Press.

Morseletto, P. (2020) 'Restorative and regenerative: exploring the concepts in the circular economy', Journal of Industrial Ecology, 24(4), pp. 763–773.

Murray, C.J.L., Vos, T., Lozano, R., Naghavi, M., Flaxman, A.D., ... and Memish, Z.A. (2012) 'Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010', The Lancet, 380(9859), pp. 2197–2223.

Nandy, M. (2003) Prophets facing backward: postmodern critiques of science and Hindu nationalism in India. New Brunswick, NJ: Rutgers University Press.

Newell, P., Daley, F. and Twena, M. (2021) Changing our ways? Behavior change and the climate crisis. Report on the Cambridge Sustainability Commission on Scaling Behaviour Change. Cambridge Commission on Scaling Behaviour Change: University of Sussex.

Newman, T.P., Nisbet, E.C. and Nisbet, M.C. (2018) 'Climate change, cultural cognition, and media effects: worldviews drive news selectivity, biased processing, and polarized attitudes', Public Understanding of Science, 27(8), pp. 985–1002.

O'Brien, K. (2012) 'Global environmental change II: from adaptation to deliberate transformation', Progress in Human Geography. Available at: http://phg.sagepub.com/content/36/5/667.short (Accessed: 30 June 2021) .

O'Brien, K. (2018) 'Is the 1.5°C target possible? Exploring the three spheres of transformation', Current Opinion in Environmental Sustainability, pp. 153–160. doi: 10.1016/j.cosust.2018.04.010.

O'Brien, K. and Sygna, L. (2013) 'Responding to climate change: the three spheres of transformation', Proceedings of Transformation in a Changing Climate, University of Oslo, 19–21 June, pp. 19–21.

Ojala, M. (2012) 'How do children cope with global climate change? Coping strategies, engagement, and well-being', Journal of Environmental Psychology, 32(3), pp. 225–233.

Ojala, M. (2013) 'Emotional awareness: on the importance of including emotional aspects in education for sustainable development (ESD)', Journal of Education for Sustainable Development, 7(2), pp. 167–182.

Ojala, M. (2019) 'Integrating a sustainability perspective into psychology education: a review of the literature and some suggestions'. Available at: https://www.diva-portal.org/smash/record.jsf?pid=diva2:1351285 (Accessed: 27 July 2021).

Ojala, M. (2020) 'Att inkludera hållbarhets och bildningsperspektiv i socialpsykologin: om vikten av att ta hänsyn till emotionella aspekter', in Boström, M., Lundahl, C. and Öhman, J. (eds.) Humanistiskaochsamhällsveten skapligaperspektivpåbildningochhållb arutveckling. Örebro: Örebro Universitet, pp. 34–43.

Ojala, M. (2021) 'To trust or not to trust? Young people's trust in climate change science and implications for climate change engagement', Children's Geographies, 19(3), pp. 284–290.

Ojala, M. and Bengtsson, H. (2019) 'Young people's coping strategies concerning climate change: relations to perceived communication with parents and friends and proenvironmental behavior', Environment and Behavior, 51(8), pp. 907–935.

Osterhammel, J. (2005) Colonialism: a theoretical overview. Princeton: Markus Wiener.

Osterhammel, J. (2018) Unfabling the East: the enlightenment's encounter with Asia. Princeton, NJ: Princeton University Press.

Pashby, K., da Costa, M., Stein, S. and Andreotti, V. (2020) 'A meta-review of typologies of global citizenship education', Comparative Education Review, 56(2), pp. 144–164.

Perera, F.P. (2017) 'Multiple threats to child health from fossil fuel combustion: impacts of air pollution and climate change', Environmental Health Perspectives, 125(2), pp. 141–148.

Pope III, C.A., Burnett, R.T., Thun, M.J., Calle, E.E., Krewski, D., ... and Thurston, G.D. (2002) 'Lung cancer, cardiopulmonary mortality, and long-term exposure to fine particulate air pollution', JAMA: The Journal of the American Medical Association, 287(9), pp. 1132–1141.

Pujol, J., Martínez-Vilavella, G., Macià, D., Fenoll, R., Alvarez-Pederol, ... and Sunyer, J. (2016) 'Traffic pollution exposure is associated with altered brain connectivity in school children', NeuroImage, 129, pp. 175–184.

Rajapaksa, D., Islam, M. and Managi, S. (2018) 'Pro-environmental behavior: the role of public perception in infrastructure and the social factors for sustainable development', Sustainability: Science Practice and Policy, 10(4). https://doi.org/10.3390/su10040937.

Reid, A. (2019) 'Climate change education and research: possibilities and potentials versus problems and perils?', Environmental Education Research, 25(6), pp. 767–790.

Rifkin, J. (2009) The empathic civilization: the race to global consciousness in a world in crisis. New York: Penguin.

Roberts, S. (2020) The war on the Uyghurs: China's campaign against Xinjiang's Muslims. Manchester: Manchester University Press.

Rodell M., Famiglietti J., Wiese D., Reager J., Beaudoing H., ... and Lo M. (2018) 'Emerging trends in global freshwater availability', Nature, 557(7707), pp. 651-659.

Roehrig, G., Campbell, K., Dalbotten, D. and Varma, K. (2012) 'CYCLES: aculturally-relevant approach to climate change education in native communities', Journal of Curriculum and Instruction, 6(1), pp. 73–89.

Rousell, D. and Cutter-Mackenzie-Knowles, A. (2020) 'A systematic review of climate change education: giving children and young people a "voice" and a "hand" in redressing climate change', Children's Geographies, 18(2), pp. 191–208.

Sannino, A. (2022). Transformative agency as warping: How collectives accomplish change amidst uncertainty. Pedagogy, Culture & Society, 30(1), pp. 9-33.

REFERENCES

Santos, B. (2014) 'Másalládel pensamiento abismal: de las líneas globales a una ecología de saberes', in Santos, B. and Meneses, M.P. (eds.) Epistemologías del sur (perspectivas). Madrid: AKAL, pp. 21–66.

Schaffartzik, A., Mayer, A., Eisenmenger, N. and Krausmann, F. (2016) 'Global patterns of metal extractivism, 1950–2010: providing the bones for the industrial society's skeleton', Ecological Economics: The Journal of the International Society for Ecological Economics, 122, pp. 101–110.

Schleussner, C.-F., Donges, J.F., Donner, R.V. and Schellnhuber, H.J. (2016) 'Armed-conflict risks enhanced by climate-related disasters in ethnically fractionalized countries', Proceedings of the National Academy of Sciences of the United States of America, 113(33), pp. 9216–9221.

Schnitzler, T. (2019) 'The bridge between education for sustainable development and transformative learning: towards new collaborative learning spaces', Journal of Education for Sustainable Development, 13(2), pp. 242–253.

Sen, A. (2005) 'Human rights and capabilities', Journal of Human Development, 6(2), pp. 151–166.

Sen, A. (2011) Development as freedom. New York: Knopf Doubleday Publishing Group.

Shinkuma, T. and Managi, S. (2010) 'On the effectiveness of a license scheme for e-waste recycling: the challenge of

China and India', Environmental Impact Assessment Review, 30(4), pp. 262–267.

Shinkuma, T. and Nguyen, T.M.H. (2009) 'The flow of e-waste material in the Asian region and a reconsideration of international trade policies on e-waste', Environmental Impact Assessment Review, 29(1), pp. 25–31.

Shorrocks, A., Davies, J. and Lluberas, R. (2020) Global wealth report 2020. Zurich: Credit Suisse Research Institute.

Singer, T. and Klimecki, O.M. (2014) 'Empathy and compassion', Current Biology, 24(18), pp. R875–R878.

Singer, T. and Lamm, C. (2009) 'The social neuroscience of empathy', Annals of the New York Academy of Sciences, 1156(1), pp. 81–96.

Slowey, M., Schuetze, H.G. and Zubrzycki, T. (2020) Inequality, innovation and reform in higher education: challenges of migration and ageing populations. Cham: Springer Nature.

Spaargaren, G. (2011) 'Theories of practices: agency, technology, and culture: exploring the relevance of practice theories for the governance of sustainable consumption practices in the new world-order', Global Environmental Change: Human and Policy Dimensions, 21(3), pp. 813–822.

Spence, A., Poortinga, W. andPidgeon, N. (2012) 'The psychological distance of climate change', Risk Analysis: An Official Publication of the Society for Risk Analysis, 32(6), pp. 957–972.

Stein, S. (2019) 'The ethical and ecological limits of sustainability: a decolonial approach to climate change in higher education', Australian Journal of Environmental Education, 35(3), pp. 198–212.

Stein, S., Andreotti, V., Suša, R., Ahenakew, C. and Čajková, T. (2020) 'From "education for sustainable development" to "education for the end of the world as we know it"', Educational Philosophy and Theory. doi:10.1080/001 31857.2020.1835646.

Stetsenko, A. (2018) 'Natureculture in a transformative worldview: moving beyond the "interactionist consensus", in The challenges of cultural psychology. London: Routledge, pp. 37--56.

Stern, P.C. (2012) 'Fear and hope in climate messages', Nature Climate Change, 2(8), pp. 572–573.

Stevenson, R., Brody, M.S., Dillon, J., and Wals, A.E. (2013) International handbook of research on environmental education. New York: Routledge.

Strombach, T., Weber, B., Hangebrauk, Z., Kenning, P., Karipidis, ... and Kalenscher, T. (2015) 'Social discounting involves modulation of neural value

signals by temporoparietal junction', Proceedings of the National Academy of Sciences of the United States of America, 112(5), pp. 1619–1624.

Sund, P., Gericke, N. and Bladh, G. (2020) 'Educational content in cross-curricular ESE teaching and a model to discern teacher's teaching traditions', Journal of Education for Sustainable Development, 14(1), pp. 78–97.

Susskind, D. (2020) A world without work. London: Allen Lane.

Swim, J.K., Stern, P.C., Doherty, T.J., Clayton, S., Reser, J.P., Weber, E.U., Gifford, R. and Howard, G.S.(2011) 'Psychology's contributions to understanding and addressing global climate change', The American Psychologist, 66(4), pp. 241–250.

Tam, K.-P. (2013) 'Dispositional empathy with nature', Journal of Environmental Psychology, 35, pp. 92–104.

Thiermann, U.B. and Sheate, W.R. (2020) 'Motivating individuals for social transition: the 2-pathway model and experiential strategies for pro-environmental behaviour', Ecological Economics: The Journal of the International Society for Ecological Economics, 174. doi: 10.1016/j.ecolecon.2020.106668.

Turner, B.L. and Sabloff, J.A. (2012) 'Classic Period collapse of the Central Maya Lowlands: insights about

human–environment relationships for sustainability', Proceedings of the National Academy of Sciences of the United States of America, 109(35), pp. 13908–13904.

UN (2015) Transforming our world: the 2030 agenda for sustainable development. New York: United Nations.

UNEP (2014) Inclusive wealth report 2014: measuring progress toward sustainability. Cambridge: Cambridge University Press.

UNEP (2019) Global environment outlook 6: healthy planet, healthy people. Cambridge: Cambridge University Press.

UNEP (2020) Green jobs. Fact sheet. Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/32281/GJ.pdf?sequence=1&isAllowed=y (Accessed: 20 December 2021).

UNESCO (1978) Intergovernmental conference on environmental education: final report. Paris: UNESCO.

UNESCO (2013) Proposal for a global action programme on education for sustainable development as follow-up to the UN Decade of Education for Sustainable Development (DESD) after 2014 (37c/57). Paris: UNESCO.

UNESCO (2014a) Roadmap for implementing the global action programme on education for sustainable development. Paris: UNESCO.

UNESCO (2014b) Shaping the future we want: UN Decade of Education for Sustainable Development: final report. Paris: UNESCO. Available at: https://play.google.com/store/books/details?id=ImZuBgAAQBAJ (Accessed: 30 June 2021).

UNESCO (2015a) Not just hot air: putting climate change education into practice. Paris: UNESCO.

UNESCO (2015b) Rethinking education: towards a global common good? Paris: UNESCO.

UNESCO MGIEP (2017) Rethinking schooling for the 21st century. New Delhi: UNESCO MGIEP.

Ungar, S. (1994) 'Apples and oranges: probing the attitude–behaviour relationship for the environment', Canadian Review of Sociology and Anthropology, 31, pp. 288–288.

Vickers, E. (2014) 'A civilising mission with Chinese characteristics: education, colonialism and Chinese state formation in comparative perspective', in Vickers, E. and Kumar, K. (eds.) Constructing modern Asian citizenship. London and New York: Routledge, pp. 50–79.

Vickers, E. (2018) 'Education and climate change: is blaming "Western modernity" the answer?', Norrag. Available at: www.norrag.org (Accessed: 16 November 2021).

REFERENCES

Vickers, E. (2020) 'Critiquing coloniality, "epistemic violence" and Western hegemony in comparative education - the dangers of ahistoricism and positionality', Computers & Education, 56(2), pp. 165–189.

Vigo, D., Thornicroft, G. and Atun, R. (2016) 'Estimating the true global burden of mental illness', The Lancet: Psychiatry, 3(2), pp. 171–178.

Vines, S. (2021) Defying the dragon: Hong Kong and the world's largest dictatorship. London: Hurst.

Wals, A.E.J. (2014) 'Sustainability in higher education in the context of the UN DESD: a review of learning and institutionalization processes', Journal of Cleaner Production, 62, pp. 8–15.

Wang, S. and Leviston, Z. (2018) 'Emotions predict policy support: why it matters how people feel about climate change', Global Environmental Change: Human and Policy Dimensions, 50, pp. 25–40.

Watson, J.E.M. and Venter, O. (2019) 'Mapping the continuum of humanity's footprint on land', One Earth, 1(2), pp. 175-180.

Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., ... and Chambers, J. (2019) 'The 2019 report of The Lancet Countdown on health and climate change: ensuring that the health of a child born today is not defined by a changing climate', The Lancet, 394(10211), pp. 1836–1878.

WHO (2016) 'Ambient air pollution: a global assessment of exposure and burden of disease'. Available at: https://apps.who.int/iris/handle/10665/250141 (Accessed: 30 June 2020).

Wibeck, V. (2014) 'Enhancing learning, communication and public engagement about climate change: some lessons from recent literature', Environmental Education Research, 20(3), pp. 387–411.

Wuebbles, D.J., Fahey, D., Takle, E., Hibbard, K., Arnold, J., ... and Walsh, J. (2017)'Climate science special report: fourth national climate assessment (NCA4), Volume I'. Available at: https://lib.dr.iastate.edu/agron_reports/8/ (Accessed: 27 July 2021).

Xue, T., Zhu, T., Zheng, Y. and Zhang, Q. (2019) 'Declines in mental health associated with air pollution and temperature variability in China', Nature Communications, 10(1).doi: 10.1038/s41467-019-10196-y.

Xue, W., Hine, D.W., Marks, A.D.G., Phillips, W.J. and Zhao, S. (2016) 'Cultural worldviews and climate change: a view from China', Asian Journal of Social Psychology, 19(2), pp. 134–144.

Yamaguchi, S., Asai, Y. and Kambayashi, R. (2018) 'Effects of subsidized childcare on mothers' labor supply under a rationing mechanism', Labour Economics, 55, pp. 1-17.

Young, A., Khalil, K.A. and Wharton, J. (2018) 'Empathy for animals: a review of the existing literature', Curator: A Quarterly Publication of the American Museum of Natural History, 61(2), pp. 327–343.

Zhang, C. and Managi, S. (2021) 'Childcare availability and maternal employment: new evidence from Japan', Economic Analysis and Policy, 69, pp. 83–105.

Zhang, X., Zhang, X. and Chen, X. (2017) 'Happiness in the air: how does a dirty sky affect mental health and subjective well-being?', Journal of Environmental Economics and Management, 85, pp. 81–94.