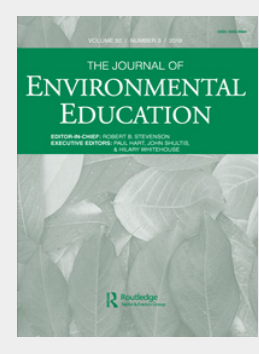


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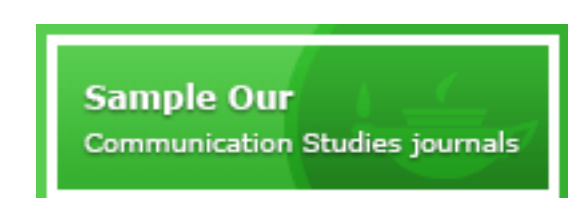
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February 25, 2019

To Whom It May Concern:

Please accept this letter as verification that the following manuscript has been accepted for publication in *The Journal of Environmental Education* 50th Anniversary Special Issue.

Environmental education under siege: climate radicality  
Co-authors: Edgar J. González-Gaudiano & Pablo Á. Meira-Carteá

This Special Issue will be published in the last half of 2019. It is a significant publication and the González-Gaudiano and Meira-Carteá contribution will be part of a strong and diverse set of scholarly works.

Sincerely,

*Paul Hart*

Paul Hart, Executive Editor  
*The Journal of Environmental Education*  
Professor Emeritus  
Adjunct Professor  
Faculty of Education  
University of Regina  
Canada

# **Environmental education under siege: climate radicality**

**Edgar J. González-Gaudiano & Pablo Á. Meira-Cartea**

In small matters we may allow many small misses in order to benefit from the rarer chances of success, we may allow but few where greater things are concerned, and in the really great, irreversible ones, which go to the roots of the whole human enterprise, we really must allow none.

Hans Jonas (1995, 71) (Free translation)

## **Introduction**

The present article gravitates around the radical dilemma in which the evolution of the current human civilization has placed us. This route derives from certain global problems, such as most notably climate change, which have exacerbated the magnitude and complexity of the known socio-environmental problems. Avoiding the most extreme scenarios requires us to promote urgent structural social changes aimed at reorienting the course followed by the dominant development model, by undertaking a deep socio-ecological transition in an extremely short time – during the next 10 or 15 years –, or face an imminent collapse of civilization.

The bases that give rise to this questioning are not recent. Since the late sixties of the last century, and more specifically after the publication of the studies carried out by the Massachusetts Institute of Technology (MIT) and the Club of Rome on the limits of growth in 1972, discussions began on the false premises that support the concepts of prosperity, progress and well-being that we have assumed as universal aspirations of a historical nature. These debates and previous reflections gave rise to a tradition of thought nurtured by authors – whose views not always converged –, such as Thoreau, Tolstoy, Gandhi, Huxley, Weil, Camus, Arendt, Carson, Commoner, Meadows, Schumacher, Mumford, Illich, Marcuse, Gorz, Roegen and Castoriadis, among many others.

Climate change represents the glaring effect of the radical crisis of this style of capitalist development, towards which we should align the whole range of efforts we might undertake in order to try to reduce the most drastic effects of the

changes we are already facing, as well as those we will face with greater force during the next decades. In this process, education plays a role of the highest social priority, in which environmental education should set the course along which to travel, in order to modify the wastage of inherited natural assets and the human potential created.

This desirably central role of environmental education contrasts with the weakness of the educational dimension in global, regional and national policies that attempt to address the climate crisis, more concerned with technological and economic solutions than with the radical social and cultural changes that we will be faced with. In fact, the proposals of the responsible international organizations continue trying to persuade us that with some adjustments in the functionality of the system and with appropriate techno-scientific developments, it is possible to realign or put an end to the pernicious effects observed. The route maps to reach the end of the century with a bearable climate also indicate that the change must be rapid to avoid that the inertia of the climate system leaves us with no options and with very little room for maneuver – only a decade.

However, during the last fifty years, conventional environmental education has remained anchored in a set of environmental issues and problems to whose resolution it has contributed little, by promoting pedagogical strategies of individual change that lacked the necessary socio-political substrate and prospective vision that should stem from the increasingly evident environmental and social complexity. Likewise, we have insisted on greening the educational processes of a school system that, in general terms, has exhausted its heuristic potential and that responds more and more – consciously or unconsciously – to the dictates of the interest groups and factual powers that have created the current panorama.

What can environmental education offer in order to face these terrible conditions? What alternatives are there to promote a reflexive citizenship that can modify the collision course with the limits of the biosphere in which we live? What means and tools can we use as a contribution to at least mitigate the collapse, considering that education cannot do everything? These are the questions that we modestly try to answer with this article.

### **A context of profound changes (for the worse)**

Fifty years ago, when the first issue of JEE appeared, the world presented a completely different picture than today. Although in terms of political polarization we were immersed in a Cold War that fomented the arms race between the blocs, there was also a number of social struggles and political insurrections for freedom and strongly countercultural civil rights: students; women; ethnic, racial and sexual groups, among several others. These initially marginal struggles spread until they impacted the historical foundations of the Western world, which were patriarchal, colonialist, capitalist and Christian, as well as euro- and logocentric.

Within this framework of rupture, movements of a different nature also began due to environmental demands, based on critical questions about the modes of industrial production, demographic growth and development. The relevant reports of the Club of Rome, as well as the pioneering works of Rachel Carson and Barry Commoner, among others, opened a new route of thought and action to analyze the trajectory we followed as a society to satisfy needs and desires, which was precisely the material bases and the quality of life of the development process.

Thus, environmental education was inserted as a main factor in the mainstream of change. In the first issue of JEE (1969, 1), founding editor Clay Schoenfeld stated that “environmental education does indeed represent a significant new scale in the interpretation of man-land relationships”. He characterized this new field as: Comprehensive, broader awareness, global, urban, indigenous concern, ecological, man-centered, universal, [supported in] social studies, in quest for quality, public involvement, open-ended options, adult education, all media, research-based and with *a sense of urgency*. That is to say, it assumes a much deeper approach from the philosophical, pedagogical and socio-political point of view than the reductive version that is usually given of the beginnings of EE in a “naturalistic” or “conservationist” key.

In the same issue of JEE, Professor William Stapp warned about the changes that had taken place during the previous fifty years in the United States, that it had become an eminently urban country, as well as about the growing citizen

concern for the environment and its problems. He also established the concept of environmental education that would give rise to the general constitutive features of this field: “Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated toward their solution” (Stapp, 1969, 3). We emphasize in this definition the element of citizenship and its concomitant cultural and political substrate. This element gradually became less present in subsequent approaches that focused mainly on the individual change of a subject of education presumably homogeneous, without roots and without emancipation. The extreme case of these different approaches, over these fifty years, has been education for sustainable development formulated on the platform of the field of environmental education, as a palimpsest.

The same process of neutralization of the potential components that come into conflict with the economic system, noticed in the most recent profiles of the field of environment-related education is also patent in wider areas of environmental claims. A high-level political operation led to the abolition of the eco-development proposal formulated by Ignacy Sachs, which had begun to be stated in the Founex Seminar (1972) and more specifically in the Cocoyoc Symposium (1974), chaired by Barbara Ward (Naredo, 2004). The participants in this symposium recognized the unjust international economic “order” and the inequitable relationship between the center and an immense periphery that is what allows to sustain the wastage and hyper-consumption of wealthy countries. The Cocoyoc Declaration concludes:

“We have faith in the future of mankind on this planet. We believe that ways of life and social systems can be evolved that are more just, less arrogant in their material demands, more respectful of the whole planetary environment. The road forward does not lie through the despair of doom watching nor through the easy optimism of successive technological fixes. It lies through a careful and dispassionate assessment of the outer limits, through cooperative search for ways to achieve the inner limits of fundamental human rights, through the building of social of social structures to express those rights, and through the patient work of devising

the techniques and styles of development which enhance and preserve our planetary inheritance” (IIED-UNCTAD/UNEP; 1975, 10).

Although some authors (Estenssoro, 2015) tend to argue that ecodevelopment is a precursor of sustainable development, the truth is that these notions have a weak relationship with each other. Both linked productive activities with the protection of the environment, but under different theoretical and political frameworks. Ecodevelopment emphasized ecoregions as the scale on which the use of resources should be made compatible with the conservation of the integrity of ecosystems, with the participation of the local population to favor endogenous and self-managed development with a territorial approach (Sachs, 1982); that is, a development that harmonizes social, environmental and economic objectives (Sachs, 1998). These factors were later included in the conceptualization of sustainable development.

However, sustainable development, although popularized through the Our Common Future report generated by the World Commission on Environment and Development led by Gro Harlem Brundtland, published in 1987, actually stemmed from an idea formulated by the World Bank. On November 12, 1981 in Washington, D.C., the president of said institution, A. W. Clausen, made a presentation entitled “Sustainable development: the global imperative” in The Fairfield Osborn Memorial Lecture in Environmental Science. The three premises around which this presentation gravitates are very eloquent about his intentions:

“first, that if our goal is sustainable development, our perspective must be global; second, that human development must allow for continued economic growth, especially in the Third World, if it is to be sustainable; and third, that sustainable development requires vigorous attention to resource management and the environment” (Clausen, 1981, 2).

Sustainable development was disseminated as a universal spell to respond to criticism against development programs promoted by international organizations since the end of the Second World War, because they were excessively focused on economic growth. This had been assumed as a universal solution to meet the basic needs and aspirations of people. To this end, the environmental dimension (and presumably also social equity) was added to protect the present generations



and guarantee that future generations would not be less able to meet their own needs.

Since its inception, sustainable development has faced a lot of criticism (Bifani, 1999, Grinberg, 1999, Reboratti, 2000), from various positions, since it was seen as an artificial stratagem to relaunch production and consumption within a framework of economic globalization, as well as the unceasing expansion of the power of corporate companies and financial speculation. The best evaluation derives from its results. In the more than 30 years that have elapsed since 1987, the rates of social inequality and environmental degradation have increased substantially and the gap between the so-called developed and underdeveloped countries has not only not been reduced, but rather it has increased both between countries and internally (Morawetz, 1977). For this reason, critical views have emerged that call for degrowth (Latouche, 2006), decoloniality (Quijano, 2011, Santos, 2017) and post-development (Escobar, 2014; Sachs, 1992), as radical reconsiderations of the development concepts of progress and prosperity, turned into spearheads of economic hegemony and therefore politics.

There is an abundance of arguments in favor and against sustainable development, but what we want to make clear here is that there are evident symptoms of a misdevelopment (Amin, 1990; Slim, 1998; Tortosa, 2001) with a view of inducing social welfare with environmental protection. Between these opposing positions, sustained economic growth has become an orthodox fixation and continues to be the (impossible) goal to achieve in the policies promoted by international organizations, despite their proven colonialist and predatory features affecting both people and nature. One recent example can be found in article 8 of the UN 2030 Agenda, on “decent work and economic growth”. It states the need to maintain “economic growth *per capita*” and an increase in GDP of “at least 7% per year in less developed countries” (target 8.1). Recommendations that, if fulfilled, can turn unattainable other objectives of the same agenda, mainly those that refer to the preservation of the biophysical limits of the planet. Furthermore, we also observe the associated optimism in the possibilities of techno-scientific responses that conveniently redefine limits as limitations (CMMAD, 1987), responding to an economic rationality that goes beyond the vital options of people expressed in capacities, rights and freedoms. (Sen, 2009).

In all, the planetary bio-capacity (external limits) has been exceeded and the serious signs of depletion and deterioration of key resources are evident; likewise, socio-economic disparities, in themselves unjust, have increased, exacerbating the precarious balance of social risk. All this causes the emergence of new and more complex problems of a global nature, such as the one addressed hereafter regarding climate change, that will force us to learn to live within the planetary limits, although with each passing day that we procrastinate these limits become narrower.

### **Climate change and environmental education**

Henderson et al. (2017) took stock of the annual meetings of the *American Education Research Association* (AERA) and the *American Educational Studies Association* (AESA) finding that they contain few sessions devoted to climate change. Moreover, a word search in the magazine's corpus produced "only a small handful of mentions from an ever smaller handful of environmental education scholars" (2017, 2). The authors claim that this result is not an anomaly and that the subject is marginalized in the literature produced within the broad field of educational studies as a whole.

It is an explainable silence when one does not want to disrupt the *status quo*, since it is more comfortable to maintain the research traditions of the disciplines unchanged; but this behavior turns us -as educational and social researchers- into passive accomplices of a specific state of affairs.

Henderson et al. (2017) also point out that this issue has been addressed mainly by environmental (and science) educators, although in homeopathic doses. However, they maintain that these are articles with a largely apolitical cognitive approach, as well as a such a limited framework that it obstructs the full understanding of the scope of education on climate change.

Our own searches confirm this grim diagnosis. We have found that the vast majority of educational articles on climate change are geared towards climate science literacy. This is a serious problem, because it reflects the fact that fifty years have not been enough to leave behind the 'original sin' of environmental

education approved at the International Seminar on Environmental Education, held in Belgrade (1975). An approach disseminated throughout the world through the editorial collection of the IEEP (1975-1995), which promoted literacy about the physical environment and its resources as a key to changing attitudes and behaviors.

Do we still have the collective perception that the learning of concepts and processes about the terrestrial atmosphere and its thermodynamic models, the carbon cycle or the thermo-regulating role of the oceans, is enough to influence the lifestyle of people to reduce the emission of greenhouse gases and promote climate adaptation programs that will be essential in the short term?

We recognize that the concept of scientific literacy has evolved and that many authors have ceased to refer only to the cognitive sphere and have incorporated, above all emotional aspects, but also ethical, cultural and political (Hempel, 2014). Even Dupigny-Giroux (2010, 2017) differentiates climate literacy from scientific literacy, noting that the former implies not only having a body of knowledge, but knowing how to use this knowledge to explain and act on the basis of better informed decisions in new situations. This implies – states the author – a deep appreciation of the complexity and interconnection of the climate system in space and time to act accordingly. Even so, there is widespread agreement on the fact that an appropriate education for climate change should not be limited only to climate literacy (Allen & Crowley, 2017, Kahan and others, 2012, Shepherd & Kay, 2012); a position that questions the information deficit theory, since there is no evidence that a greater mastery of the science of climate change may lead to changes in behavior and individual action (or even influence attitudes), and even less to a mobilization in collective action (Allen & Crowley, 2017).

It is clear that education for climate change is not merely about climate literacy. Just as environmental education does not consist only of ecological education and conservation. If we have not understood this in fifty years, something is wrong in our field. Because of the burden it represents and the serious bias it produces, it might be advisable to propose that ecological literacy be eradicated from environmental education and reintegrated into science education, where it belonged before the Belgrade Seminar.

Education for climate change would have to start by radically questioning the foundations of the economic system and its concomitant socio-cultural substrate that has led us to this critical moment. Palliative measures won't do, nor will analgesics work. Sustainable development has only been a placebo in order to continue with 'business as usual' for as long as possible, despite the enormous environmental costs and despite condemning billions of human beings to suffering. We do not recognize the benefits that this supposedly green economy may be producing compared to the new extractive processes of oil and gas from oil sands (fracking) and in deep waters, only to maintain the price of a barrel of oil low, irrespective of the high levels of water, soil and air pollution, as well as the severe destruction of the environment that accompanies these techniques.

Nor do we recognize said benefits as compared to open pit mining in developing countries, through processes that companies are prohibited from applying in the countries of their parent companies. Neither in the construction of hydroelectric dams or the installation of huge complexes of wind turbines to produce clean energy. All this at the cost of deceiving people and putting pressure on local authorities in poor countries to lease their land for fifty years at a bargain price and with long-term tax exemptions. All to satisfy an energy model in crisis and respond to an international market that requires increasing volumes of energy, raw materials and cheap labor, although basic human rights are violated (See: Svampa & Viale, 2014). This phenomenon has been well defined by Harvey (2003) as accumulation by dispossession.

Assuming that, in the beginning, sustainable development had some possibilities to induce changes in lifestyles, these possibilities have already been metabolized by the *status quo* and have been returned to us recharged and ready to consume.

Will anyone think that all these are not issues belonging to the official subject matter of environmental education? Will anyone think that if we incorporate this "context" we would be denounced once again as trainers of little green fascists? To paraphrase John Smyth (1998), after fifty years, will we be at the beginning of the end of an environmental education cloistered in the green environment that has not reached its purposes of social change and that has operated under a kind of prediction made by Cassandra: anticipate in the future only what we want to see even if nobody really believes it? o Are we at the end of the beginning of the

holistic and critical vision that leads people towards a better, less threatened life and a safer world in the face of climate change and the other dangers that derive from our current way of life?

The answer to these questions is more important with each passing day.

### **What does educating for climate change mean?**

More than a decade ago, Stern (2006) published a seminal report commissioned by the government of the United Kingdom. One of his conclusions was that climate change was the biggest market failure ever seen in the world. The author examines a wide range of data on the economic costs of climate change, but admits that we still have time to avoid the worst repercussions of this phenomenon if drastic and urgent measures are adopted. Very little has happened since then, although we continue to hear that there is still time.

Although every year there is a conference of the signatory parties (CoP) of the United Nations Framework Convention of Climate Change (UNFCCC), these are negotiations that do not usually reach the type of decisions required, despite the high media expectations that arise some of them. In 2015, the CoP21 was held in Paris, from which an announced agreement emerged as a great success, since all countries made a commitment to set goals for reducing greenhouse gas emissions considering the principle of “common but differentiated responsibilities.”<sup>1</sup> All this in order to reach what was the most celebrated agreement: “to maintain the increase in the global average temperature well below 2°C with respect to the pre-industrial levels, and to continue efforts to limit this increase in temperature to 1.5°C” ( UNFCCC, 2015). However, the reductions are voluntary, and the agreement does not establish percentages or deadlines to achieve them. An agreement without specific and urgent commitments, nor sanctions, nor clear purposes of decarbonization, even considering the

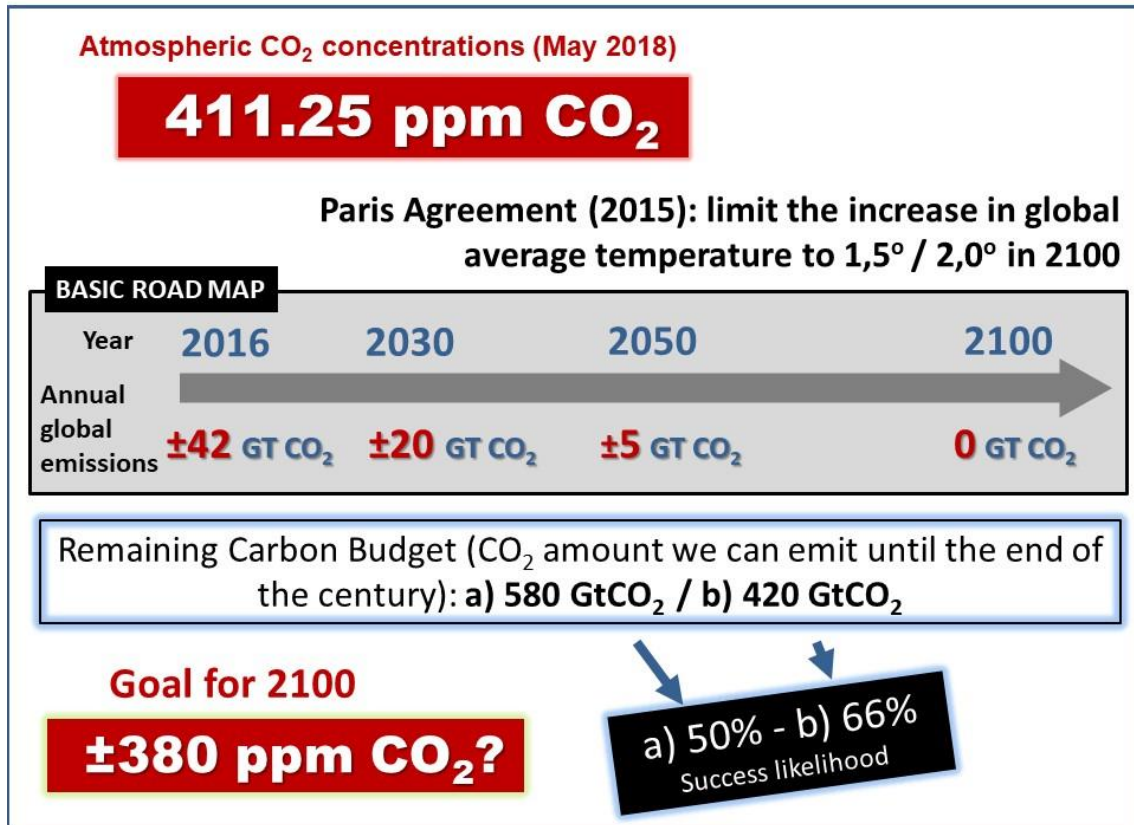
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<sup>1</sup> The agreement, however, includes only emissions derived from the burning of fossil fuels, leaving out emissions from important sources such as industrial agriculture (responsible for 24% of global emissions) and air and maritime transport (responsible for 10%), although the latter, due to the high altitude they are produced at, have a much greater destructive effect, estimated at 2.7 times more (RFI-Radiative Forcing Index). For these types of emissions, not even voluntary contributions are required.

aggregate amount of all the reductions offered, does not seem to tend towards the goal of keeping below 2° (with reference to pre-industrial values). There will be cycles of transparent review of these voluntary commitments every five years to see if they were met or not, but the next appointment is no earlier than 2023. Disappointing.

For its part, the Intergovernmental Panel on Climate Change (IPCC), a large body of recognized experts invited by the UN to integrate working groups that gather scientific evidence on the problem, has published five evaluation reports since 1988 to date. The sixth will be published in 2022, and the partial reports of the three working groups in 2021. Although the conclusions and recommendations are also negotiated and tend to be moderate, the IPCC has made urgent calls to undertake far-reaching actions that have not been addressed in the official meetings. In 2018, the IPCC published an interim report that warns once again of the seriousness of the phenomenon and the need for urgent action following a critical roadmap. If with the current 1°C increase of the global temperature we are experiencing devastating climatic events in many regions of the world, all further increases of even a tenth of degree will represent increasing risks.

**Figure 1. Synthesis of the roadmap prepared by the IPCC (2018) to increase the probability of limiting the temperature increase to 2.1° by 2100.**



Source: Authors' own elaboration with data from the IPCC (2018).

As summarized in Figure 1, the path drawn by the IPCC to limit the increase in the average global temperature to 1.5°, as agreed in the Paris Agreement, cannot be more demanding. Furthermore, it implies urgent and decisive action in order to reach a 50% reduction in the current annual emissions of CO<sub>2</sub> by 2030 – that is, within 12 years –, and, by 2050, a 90% reduction. The vast majority of current societies are not aware of the scope and depth of the changes necessary to be able to comply with this road map.

However, the recent report of the IPCC (2018) does not address the underlying issues by not questioning the economic *status quo* and global inequity in relation to the main sources of emissions. It does not specify, for example, who should make the largest reductions on the proposed route. In addition, it is mistaken in its recommendation of instruments that should be activated, since among the measures it recommends the use of high-risk technologies, such as geoengineering, which not only are not a solution, but could worsen the

precarious climate balance<sup>2</sup>. Once again, the focus of the solutions moves towards techno-scientific measures, underestimating the processes of socio-cultural and economic change that must be undertaken to decarbonize the current civilization, as well as the demands that the necessary socio-ecological transition be carried out in conditions of equity and justice for all humanity.

Faced with this hopeless panorama, why is it vital to promote a good education for climate change?

The phenomenon of climate change is made up by characteristics that make it a consubstantially complex object from a scientific point of view, for which the scientific and technological knowledge available is usually not enough. However, this complexity is also expressed in a multifaceted way in the economic, political, sociocultural and ethical dimensions. As climate change is a phenomenon resulting from a development model based on a congenital voracity for fossil fuels, it is impossible to conceive structural policies and programs to fight it without delving into the pillars that support the current economic model and its corresponding socio-cultural horizon. Achieving the systemic changes required to reduce emissions to the projected levels so that the global temperature does not exceed the 1.5°C threshold will involve radical transformations in the civilization model in use since the 18th century with the Industrial Revolution and in its energy matrix. All this in order to light the way to a new eco-social space with a foundation constituted by universal rights and a security ceiling set by the ecological limits of the planet (Assadourian & Prugh., 2013). This is the colossal challenge to which we must direct the pedagogical efforts to overcome the cultural, cognitive and psychosocial obstacles that condition the social representation of the problem.

**First**, there are the obstacles that stem from the difficult understanding of the scientific nature of the problem because of the human and natural causes that intervene herein. Bypassing (for reasons of space) the ‘denialist’ arguments that

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<sup>2</sup> The same week in which this new report was released, 23 international organizations, 6 “alternative Nobel prizes” and 87 national organizations from five continents published a manifesto calling for an end to experimenting with climate geo-engineering due to the devastating impacts this could have on ecosystems and in many communities of the world, especially indigenous ones. These measures only divert attention from real solutions. (<http://www.geoengineeringmonitor.org/2018/10/hands-off-mother-earth-manifesto-against-geoengineering/>)



companies have financed to delay as much as possible the adoption of policies in line with the magnitude of the problem (Oreskes and Conway, 2010), the available scientific evidence concludes that climate 'forcing' was mainly caused by human activity. We usually blame it, *inter alia*, on corporations and certain countries. We wash our hands of it, because it is difficult to accept that the often invisible contributions of our lifestyle (diet, transportation, housing, leisure, etc.) have significant impacts, in view of the fact that they are produced billions of times and have cumulative effects. A large number of people have a distorted view of the current energy model and are unable to assess our role in it: we do not know where the energy we consume comes from when we switch on a household appliance or how it is generated, we largely ignore how we consume energy and how much of it, and we do not identify the consequences that our individual energy behavior has on the environment, the climate and the people, those alive now and those that have not yet been born. Faced with climate change, we tend to perceive ourselves more as victims than as responsible or co-responsible.

Likewise, it is not easy for us to understand that a phenomenon that has been slowly produced by delayed and cumulative processes over several centuries has accelerated so much in recent decades that it now requires urgent and radical actions that imply substantive changes in our way of life. This is especially true in advanced countries, where we still do not perceive great changes that increase our sense of vulnerability to the consequences already underway of the alteration of the climate; nor are we clear about what we could do to support the peoples and ecosystems that are suffering these consequences before we will and with more severity, beyond feeling sorry for ourselves as spectators and participating with donations in some campaigns.

To these difficulties we may add our tendency to overestimate extreme weather events, given that the media coverage of their effects tends to shock us emotionally, but we disregard the subtle but relevant changes that occur around us (for example: the increment in average temperatures by decimal points, alterations of coastlines or changes in phenological rhythms).

Even more complicated issues to understand are the irreversibility, inertia and ubiquity of climate change, as well as the differences in regional effects that may be contrary to global warnings. For all these reasons, climate change can seem

an abstract and timeless problem, as well as a counter-intuitive phenomenon whose causes are not easy to discern and whose consequences are projected in distant spaces and at temporary scales remote from the immediate horizon of current life (Uzzell, 2000; Spence and others, 2012).

Being a phenomenon of recent appearance in our lives, the information disclosed about climate change and taking into account that there is no unanimous scientific agreement about it – which responds to the levels of epistemic uncertainty characteristic of all scientific knowledge – contributes to our confusion, hinders our awareness of the seriousness of the problem, and inhibits the urge to act. The emphasis on indeterminacy, knowledge gaps or variance margins in prediction models discourages preventive measures by fueling doubts about the problem, its causes and possible consequences, weakening the relevance it deserves as a real threat. It is paradoxical that the high levels of belief in climate change in countries such as Spain – 9 out of 10 people think it is a real phenomenon – are accompanied by the perception that the scientific community still has doubts about it – 5 out of 10 people perceive discrepancies in the scientific community on this issue (Meira et al., 2013).

**Second**, the obstacles that stem from the sociopolitical context and its ethical expressions are related, as we have stated, to the fact that climate change results from an economic system that is in a crisis brought on by its own success as a way of organizing material production, creating a relatively safe environment, and generating meanings and lifestyles shared by a significant portion of humanity. Therefore, the solutions, whichever they may be, have to generate a great international consensus, since they must be globally assumed and applied to be effective, which has not happened until now. Climate change confronts humanity for the first time with the possibility of a global collapse that, therefore, requires a global response.

Similarly, the complexity that surrounds this threat is also expressed in the ethical field. The ethical and political responsibility in the causes of climate change is unequally distributed, globally and within each country. Most of the greenhouse gas emissions, both historical and current, have been and continue to be generated by the most developed countries and by the elites of the developing countries. Although we are only a little more than one fifth of the world population,

we accumulate the highest per capita rates of hydrocarbon consumption and emissions. Such a paradox, that the presumably better educated population of history should cause the greatest damage to the planet and the rest of humanity!

In the scenario of a delocalized market, a large part of the emissions in the developing world are produced to satisfy the needs and desires of first world inhabitants. In addition, poor countries are the most vulnerable to climate change. Much of their production relies on extractive activities that move large volumes of unprocessed materials and on the primary sector. Furthermore, these countries have fewer resources to prevent impacts, mitigate emissions and adapt to change by strengthening their social resilience; they are the ones that are most at risk from indirect effects derived from the degradation of ecosystems, from economic turbulence, from new threats to health or from the deterioration and depletion of vital resources such as land and water. By exacerbating inequities, climate change poses difficult moral dilemmas in the context of a persistent economic crisis and an increasingly rarefied international geopolitical scenario.

The urgency to take personal action often seems incongruent with public policies and with the over-optimism of the messages projected through advertising, marketing and other ways of modeling the consumerist lifestyle. This contradiction also weakens our perception of the threat and discourages the adoption of alternative behaviors, sometimes difficult to put into practice in the absence of adequate facilities (i.e., the use of public transport, the consumption of energy from alternative sources, economic precariousness, etc.). We tend to perceive the slowness in the implementation of policies to respond to climate change as an indicator that the threat is not imminent, that it is not as urgent as it seems, and that there is still an ample margin of time to act (Meira, 2008).

The limited and selective memory of the past, as well as the linear vision of history that situates modern civilization at the zenith of human evolution, fuel a cult of progress rooted in the myth that the future will always, necessarily, be better than the present. This myth is based on the belief that our species has been able to overcome other critical moments in the past, despite the fact that human history is full of cases of civilizations which have collapsed or suffered notable declines and setbacks (Diamond, 2005, Berman, 2007). Many of them due to deep ecological alterations, although they had achieved extremely sophisticated

advances in their specific time and space. This myth is also reinforced by the confidence that science and technology, as instruments within the reach of advanced societies, will eventually find solutions that do not require substantial changes in the established model.

**Third**, the following types of obstacles in the path of a full understanding of the problem are related to the cognitive and psychosocial processes that mediate scientific information, reinterpret it and integrate it into the population's environmental culture. It is necessary to take them into account for at least two reasons:

- a) so that we do not insist on the before-mentioned political and pedagogical ingenuity of thinking that it is enough to transfer scientific information about climate change to society – conventional scientific literacy – so that this problem can be understood and assumed without further ado; and
- b) to help guide programs and educational, communication and participation initiatives aimed at raising awareness and mobilizing the population against the climatic threat and thus obtaining a greater collective efficacy.

Below, we synthetically present some of the most widespread beliefs, conceptions and prejudices according to our own research experience (González Gaudiano, 2007; González and Maldonado, 2013; Meira, 2008; Meira and others, 2013) and the experience systematized by other authors (Bord and others, 1998; Moser and Dilling, 2004; Weber, 2010):

- a) Our difficulty in perceiving the implications of climate change can contribute to the idea that a moderate increase in temperature is trivial, given that it manifests in increments of “only” tenths of a degree per decade. In addition, temperate climates tend to value such increases as positive within the contemporary culture of leisure and well-being. In colder latitudes with communities that perform activities limited by the thermal variable, the expectation of an increase in temperature could be a desirable change (i.e.: for the productivity and oenological quality of certain vine varieties in central and northern Europe; for the increase of the production of cereals in the American Midwest – the corn belt –, or for fomenting the sun and beach tourism in the European Atlantic coastline).

- b) Our sensory apparatus can capture the evolution of weather patterns and adapt to the daily and seasonal thermal variations. But it is unable to record the subtle variations of the average global temperature, quantified in tenths of a degree per decade on a scale of long periods of time. They are basically imperceptible. Accepting that climate change is underway literally becomes a “question of faith” in science. Due to this, weather phenomena that are part of natural fluctuations can be interpreted as evidence for or against climate change, given the need we have to give meaning to reality and to objectify a new event. Thus, a wave of Siberian cold in an area especially sensitive to climate change such as southern Europe can be interpreted as evidence refuting that the climate is becoming warmer, just as a heat wave in the same region can be assumed as evidence of an opposite process, although they could be normal meteorological episodes in said latitudes.
- c) If our senses show little sensitivity to capture the physical signs of climate change, our ability to process information is also limited and operates according to principles of economy and simplification in everyday life. These cognitive limitations, added to the uncertainty, complexity and scale of climate change, constitute an important difficulty for us to perceive and represent them appropriately.
- d) As we have pointed out, when transferred to the common culture, scientific information is processed based on epistemological patterns that are different from those that govern the scientific field. Specialized literature identifies some of the socio-cognitive patterns that, from this perspective, distort the representation of climate change and our assessment of its threat potential (Grothmann and Patt, 2005; Dietz and Stern, 2002; Jaspal and others, 2014):
- ✓ Our tendency to perceive the atmosphere as an immense and empty space, capable of absorbing everything, that has remained unaltered and unalterable throughout the natural history of the planet. This common belief is opposed to the scientific observation that it is rather a fragile system, consisting of multiple layers whose total thickness is proportionally very small compared to the volume of the Earth and that has been changing in composition and dynamics over time.

- ✓ Our confusion between weather and climate. If we experience daily temperature changes of several degrees between minimums and maximums, to which we respond without substantially altering our lives, how could the increase by a decimal point in the average temperature of the planet over a much longer period of time be considered a significant threat? Our frequent confusion between weather and climate hinders a more precise representation of climate change.
- ✓ Our tendency to think that warming is a linear process and to trust that the changes that take place will follow a gradual progression that will allow us to adopt strategies of response and adaptation with opportunity.
- ✓ As mentioned before, we tend to highlight the importance of extreme environmental phenomena, but we have great difficulty in capturing gradual and progressive changes (Weber, 2010; Bellamy and Hulme, 2011; Spence and others, 2012).
- ✓ Our belief that individual action is irrelevant compared with the magnitude of the problem. Feeling overwhelmed or over-determined constitutes one of the main psychosocial barriers that hinder the shift from awareness of climate change to responsible action. Even when we perceive the problem, we can consider that individual response is inconsequential and useless given its epic scale.
- ✓ The social representation of climate change is being built by reusing ideas, beliefs and environmental representations in general and other environmental problems in particular. The difficulty experienced by most of the population, who take a layman's view to science, in order to understand climate change is compensated by the activation of socio-cognitive processes that allow us to recycle ideas and shared representations on other related issues. The most prominent example is the widespread belief that there is a causal relationship between the depletion of the ozone layer and climate change (Reynolds and others, 2010; Ungar, 2000). This belief is so widespread that we can speak of a "cultural universal" in advanced societies. It is also a paradigmatic example of how we integrate and reinterpret in the sphere of common

culture images, information and concepts generated in the scientific field. The way in which we apply socially established knowledge, be it scientifically valid or not, to make climate change intelligible can be a major obstacle, since it is easier to create a new representation than to modify an already established one (Adams, 2001; Smith and Joffe, 2013).

- e) The fact that climate change is a problem closely linked to the lifestyles that we enjoy or desire makes the subjective cost of adopting significant changes be perceived as very high in terms of renouncing the well-being we have already achieved. When subject to the tension generated by the contradiction between the awareness of the problem and individual inaction, people tend to derive responsibility for the generation of the problem towards other agents and, therefore, also the search for solutions and alternatives: towards industries, governments, pressure groups, international organizations, politicians, etc. (Lenzen, 2001). Thus, our individual responsibility is diluted in collective responsibility and also suffers the paradoxes of the “tragedy of the commons” (Hardin, 1968): when personal action involves sacrificing certain levels of individual well-being – objective or subjective – for the benefit of others, our procrastination is justified and legitimated either by the inaction of those others or by the perceived inefficiency in institutional responses. Given these dilemmas, the mechanisms to avoid cognitive dissonance appease the perception of the contradictions between what is desirable and what is real.
- f) Climate change appears in a scenario in which there are many problems that are projected onto each one of us as global or local threats, from global terrorism and immigration to the financial crisis, passing through North-South inequalities, the threat of collapse of the “welfare state”, unemployment or citizen insecurity. So many simultaneous crises turn our perplexity into normality, which generates hesitations about which threat requires priority attention. Climate change does not figure in the top of the hierarchy of concerns of most of us, which logically tends to include the most pressing problems in the day-to-day present. This scale of priorities

favors the tendency to reject and postpone those that are perceived as more abstract, mediate and distant (Meira, 2008, Meira and others, 2013).

### **On the possibility of collapse**

This article is based on the assumption that our civilization faces the possibility of a collapse derived mainly from breaking the boundaries of the biosphere. A collapse that, far from being projected onto a more or less distant future horizon, may already be under way. Human history shows how previous civilizations suffered collapses preceded by periods of decay of variable duration and intensity and, what is more relevant to understand the present, without being aware of the signs of their decline or without the ability to respond and to avoid it (Tainter, 2003; Diamond, 2005; Taibo, 2016). However, there is a fundamental difference between past collapses and the one that may be in progress at present: now we are facing a global collapse, whereas the previous ones were at a local or regional scale. This implies that no human society can avoid its consequences, although the levels of human suffering generated may vary according to each region of the planet and throughout time. A realistic reading of the IPCC series of reports points, at least, to a situation of exceeding limits, in which the trajectory we follow as a civilization will result, unless significantly altering our course in the next decade, in an end of the century that can be described in many ways, but that can be synthetically expressed as the chronicle of an announced climate collapse, with catastrophic ecological, social and economic consequences for humanity. Since the publication of the Limits to Growth report (Meadows et al., 1972), warnings about a collapse due to exceeding the biophysical limits of the biosphere have not stopped coming (Corell et al., 2009; Rockström et al., 2009; Ehrlich and Ehrlich, 2013; Turner, 2014; Steffen and others, 2015). Taibo (2016) speculates on three possible collapse scenarios whose causes he identifies in the climate crisis, in the expansive and antihuman logic of global capitalism, and in the increasing scarcity of key resources – minerals, food and oil – to sustain the exponential rhythms of demographic and material growth of present-day humanity:



1. **A slow collapse.** In this scenario, the exhaustion of resources, environmental deterioration and socio-economic erosion occur gradually, allowing the implementation of mitigation and adaptation options. This situation could go on for many years, with increasing traumatic disturbances; over time, the decline will be increasingly evident.

2. **A collapse with global-local peaks.** This scenario is similar to the previous one but is marked by periodic and sudden environmental or social crises at local and global scales, increasingly intense and frequent. The process will not be linear, neither at the biophysical level nor at the social level.

3. **An abrupt collapse.** The impacts of the energy decline and the consequences of climate change are so severe that the social fabric and the global economy degrade rapidly, causing violent competition for scarce resources, mainly food, water and energy.

It is not easy to incorporate this panorama into the field of environmental education. It is so because of the optimistic and idealistic nature of pedagogical thinking and of the educational practices to which it gives rise. A pedagogical praxis anchored, since the Enlightenment, in a conception of progress that is part of the ethos of Modernity and that understands history as an expansive, constant and endless improvement of the human species thanks to its cognitive and social capacities, amplified by the spectacular technological, scientific and economic development experienced since the middle of the 20th century. But faced with this credulous optimism of Modernity, Jonas (1995, 356) proposes the reform of a critical perspective based on responsibility:

“to the principle of hope, we oppose not the principle of fear, but the principle of responsibility. But fear is certainly part of responsibility as much as hope; and since the face of fear is less attractive and even, in some circles, is the object of moral and psychological contempt, we must once again give it the floor, because today it is more necessary than in other times in which, given the existing confidence in the smooth running of human affairs, it could be dismissed as a weakness of pusillanimous

and fearful individuals (...). To avoid fear where it fear is due would be anguish". (Free translation).

In the field of environmental education, even in the most critical and emancipatory visions, pedagogical optimism is often transformed into voluntarism, if not into pure ingenuity, by seeing in education the key or one of the keys to overcome the socio-economic crisis for its alleged power to modify behavior or to incorporate the principle of sustainability, but without questioning the foundations of modernity or the predatory nature of global capitalism.

### **Educating for collapse?**

Considering the difficulty to politically design a roadmap that may increase the chances of mitigating the climate change by the end of the century, it may be time to start thinking about an environmental education aware of the likelihood of a collapse of civilization whose consequences can be – or already are – dramatic in terms of human suffering. When the project of environmental education began in the '60s and '70s of the 20th century, the expectation was to contribute from the educational field to the regeneration of a civilization model that had begun to show evident signs of imbalance with the bio-physical limits of the biosphere. Precursors such as Stapp (1969) understood the relevance of conceiving educational processes aimed at raising awareness among the population and triggering civic responses to the socio-environmental crisis. In its 50 years' run, this regenerative pedagogical project has run into the inertia of the establishment, victim of its internal weaknesses, of its nature as a countercultural field and of its subsidiary role to other more relevant fields and with more power, fundamentally to the economic field. These weaknesses have become more acute, if possible, in the last quarter of the century, with a hegemonic global capitalism committed to an impossible goal: infinite growth in a finite world. The same difficulty of agreeing on a policy of effective response to the climate crisis illustrates the inability of the establishment to respect the limits of the biosphere and to guarantee a dignified, just and sufficient satisfaction of human needs in the short, medium and long term.

It is time to take up the questions formulated in the introduction: What can environmental education contribute in this scenario of collapse or pre-collapse?

How to promote a reflexive citizenship that can modify the trajectory of exceeding the limits of the biosphere that is expressed in the climate crisis? What means and tools can contribute, at least, to mitigate the collapse, considering that education cannot do everything?

While fear and despair are often considered anti-pedagogical emotions, and feeling overwhelmed, helpless and guilty can make people avoid getting involved (Norgaard, 2011), it is necessary to face with pedagogical realism the possibility of a socio-environmental collapse despite the barriers created in educational systems by the neoliberal ideological hegemony, the economic system and the social interests to avoid addressing the root of the problem (Klein, 2014; Hursh, Henderson and Greenwood, 2015; National Center of Science Education, 2012). The history of modernity, as a stage in civilization, is no more than two centuries old. As it has been pointed out, the idea of progress has been linked, unfailingly, to the idea of growth, and this link, incorporated into the popular consciousness, legitimizes the global market economy and acts as a powerful cultural barrier for the socio-ecological transition. It is not by chance that the paradigm of “degrowth” or the possible concept of “sustainable degrowth” have been systematically ignored by the discourse and institutionalized praxis of Environmental Education or Education for Sustainable Development. They are radically anti-systemic, given that they point both to the structural causes of the global socio-environmental crisis and to the alternatives to overcome it by assuming the imperatives of ecological sustainability and social equity.

Despite being included in the UNFCCC report (UN 1992), educational responses to the climate challenge have been limited, unstructured and without a solid political, theoretical and methodological framework to support them. Their presence has been marginal both in climate policies, and in educational policies. This deficit can be associated with the same difficulty in reaching an effective global agreement to reduce GHG emissions. The omission of the educational dimension in international climate policies is formally corrected in the Paris Agreement, which incorporates it in Article 12 : “Parties shall cooperate in taking measures, as appropriate, to enhance climate change education, training, public awareness, public participation and public access to information, recognizing the importance of these steps with respect to enhancing actions under this

Agreement” (UNFCCC, 2015, 10). The practical implications of this article are to a large extent to be defined. Each signatory country must design its adaptation and mitigation policies to align the evolution of its GHG emissions to the global objectives that allow to place the average temperature of the planet at +1.5° C. It is expected that each country, depending on its circumstances and vulnerabilities, shall integrate the educational dimension into the mitigation and adaptation policies that it designs, as well as incorporate the climate crisis among the priority aims of the national education policy.

Unlike other socio-environmental problems for which an institutional educational response is requested, the imperative need to begin reducing emissions must turn the climate crisis into a priority educational axis, to the point of thinking about the implementation of a national and international “emergency curriculum” to raise awareness of the seriousness of the threat and to promote a massive and rapid response (Miléřa & Sládek 2011; Heras, 2014; Henderson and others, 2017; Allen & Crowley, 2017 ). “The climate emergency”, states Whitehouse (2017, 64), “is more than a socio-scientific topic to be investigated, however effectively (...). The climate emergency is a real condition that has current and direct impact on babies’, children’s and young people’s lives. This means climate education, in its many forms will, by necessity, shortly move towards the centre of curriculum practice”. Not only must we place climate change at the center of the curriculum, but also reinforce educational resources outside the school system, activating, as suggested by Heras (2014), social learning systems and creating knowledge networks among equals to involve all types of public in climate action.

Addressing this imperative implies aligning education policy with transition strategies towards decarbonized and resilient societies in the face of the consequences of climate change. The curricula of all educational levels and in all countries must incorporate the priorities of mitigation and adaptation to climate change in all its dimensions. The universalization of education turns the time spent in the educational system into an often unique opportunity to connect people with the threat of climate change and with the alternatives to avoid the scenario of a collapse of civilization it is leading us to. The school experience can and should be transformed into a context in which to transpose the best available

science on the climate crisis so that the population understand and better gauge the threats that we face, the responsibilities that we have, and the alternatives that we can use to build socially in order to avoid an infernal climate.

The international curricular panorama, however, does not reflect the environmental and social importance of the climate challenge. A study carried out by the International Bureau of Education on the presence in the national curricular framework of 78 countries, shows that only 35% include the topic “climate change” in their contents (IBI, 2010, 19). Another issue is the treatment that climate change receives as an educational content. Research on this issue is scarce. In general, it is possible to point out that climate change is usually linked curricularly to the physical-natural sciences, which pay special attention to its processes, causes and bio-physical consequences. The human, ethical and social dimensions receive marginal attention, nor are mitigation or adaptation actions usually contemplated (Kagawa & Selby, 2012; Serantes & Meira, 2016; Colliver, 2017; Chang & Pascua 2017; Monroe and others, 2017). Issues such as ecological transition or decarbonization are absent from official curricula. Faced with this situation, Whitehouse (2017, 64) argues that it is necessary to shift climate change “to the center of curricular practice”.

How to advance along these lines? The timing of the crisis requires acting diligently and without delay. The available literature offers some clues. Monroe and others (2017) conduct a meta-analysis of educational experiences to identify replicable aspects that might allow designing more effective actions. This study formulates six main recommendations: focus the educational practice on contents that are relevant and meaningful for the target persons; use attractive and active teaching-learning methods; generate dynamics that facilitate debate and argumentation to explore the controversies surrounding the climate crisis; design activities that allow interaction with scientists linked to climate science; take into account students’ misconceptions and beliefs about climate change and use them as a foundation to build the learning experience; and develop at the community level projects and school experiences on climate change.

To these recommendations, two complementary curricular development lines could be added: the first is the incorporation of the climate crisis and the ecological transition as fundamental contents in the initial and permanent teacher

training processes; the second is the incorporation of the environmental and social complexity of climate change into standardized didactic materials, mainly school given that they continue to be the most commonly used didactic resources for content mediation in education systems.

The response time is now, more than ever, a central educational variable. The change towards a climate-viable future will not be possible if it does not start now, in a socially cross-cutting manner and involving all generations. Given the inertia of the climate system, the margin for socio-ecological transition spans over little more than a decade. Educational strategies aligned with realistic climate policies must address all population groups, but give priority to those adult collectives whose activity as producers and / or consumers, or whose role as politically active citizens or as decision makers, can be crucial for promote climate policy or to hinder it. As Henderson and others suggest (2017, 4), “What ought we, as educators and researchers, do? The first thing is to see clearly that employing education as a social change lever, and educational settings as sites of socialization toward alternative futures, is our strongest suit”.

Nevertheless, the emotional burden of the issue, shaped by its threat potential and by people’s self-perceived effectiveness with regards to their ability of doing something as a response to this threat, is the key to their readiness to take on an active part within the framework of adaptation and mitigation policies. Climate change is usually presented as a global and complex problem, whose causes and consequences evade to a great extent the space in which people or communities can take action. Faced with a threat that is presented as severe, but, at the same time, as unmanageable and distant, the feelings that tend to emerge are a fatalistic combination of fear and impotence: as an “I” (or “we”), anchored in a specific time and place, people may feel that their action is irrelevant faced with the magnitude of the problem and with the possible solutions which, indeed, must reach a global scale in order to be effective. Studies on the social representations of climate change speak of a state of “over-determination”, a mixed emotion that combines fear, guilt -or a feeling of accountability- and impotence, which usually has a paralysing and demobilising effect (Höjjer 2010, Smith & Joffe 2012, Heras et al., 2018). In this respect, Henderson and others (2017) warn that when an educational action generates a fatalistic emotional

climate, most of the people involved, both learners and educators, feel overwhelmed and tend to adopt escapist attitudes and behaviours, selectively ignoring the threat and taking refuge in everyday routines. Much of the difficulty in placing climate change at the centre of personal and collective agendas has to do with the weight of these negative emotions. As stated by Kelsey & Armstrong (2012, 190), “an educational movement that leaves its participants in despair, hopeless, [and] immobilized by dread (...) is neither morally defensible nor likely to lead to sustainability outcomes” (cited in Henderson et al., 2017, 417). One of the educational challenges is, precisely, how to present the possibility of collapse without this very possibility generating a paralyzing fear.

To avoid demobilising pessimism, research suggests that it is necessary to stimulate self-sufficiency and empowerment at an individual and collective level, showing and putting in practice adaptation and mitigation alternatives in the school and community contexts in which the educational action is contextualised (Wibeck 2014, Allen & Crowley 2017). As Heras (2014, 59) expresses, “knowing the solutions (and putting them in practice at different possible levels: personal, school, community) makes it possible for us to stop seeing climate change as a depressing issue with no way out and begin to conceive it as a formidable social challenge faced with which it is possible to intervene” (our parenthesis). Educational centres and programs must become alternative public spheres where to test and experiment with alternative practices that facilitate the transition to a low-carbon society, without ignoring the cumulative effect that these changes may have at the macro-social level. It is important not to forget that global GHG emissions are, ultimately, a consequence of the sum of multiple specific actions, so billions of alternative actions also have a positive cumulative effect on the global balance of these emissions.

Other authors also focus on participatory and situated learning (Bangay & Blum, 2010; Kulnieks, Longboat & Young, 2013), through research-based pedagogical approaches (Hestness et al., 2011), with emphasis on the personal (i.e., previous experience in disasters, reflection on the practice itself) or highlighting the political role of citizens (Filho, Pace & Manolas, 2010; Herman, 2015) to strengthen the sense of responsibility and agency.

In short, there are many changes to be made. Although in the end, our task, as we see it today in this urgent crossroads of our civilization, is to recover a critical perspective that may allow us to question in pedagogical terms, the alleged benefits of perpetual growth and comfort offered by the establishment, which are radically unsustainable. It is a matter of rethinking that the limits are real, that they have already been exceeded in various aspects and that the only way to stop the destructive impulse in which we are engaged is by modifying substantively the inertial trend in which the world navigates under the illusory siren song of the global consumerist society. In short, education for climate change must be oriented towards the degrowing and recovery of a horizon of meaning in our lives, apart from the vain mirage of the material world. We do not know what the future might bring, but we do know what possible futures we do not want.

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