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To cite this article: Hanne Svarstad (2021) Critical climate education: studying climate justice in time and space, *International Studies in Sociology of Education*, 30:1-2, 214-232, DOI: [10.1080/09620214.2020.1855463](https://doi.org/10.1080/09620214.2020.1855463)

To link to this article: <https://doi.org/10.1080/09620214.2020.1855463>



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Published online: 17 Feb 2021.



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Critical climate education: studying climate justice in time and space

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ABSTRACT

What education should children and youth be offered about climate mitigation choices? Drawing on critical pedagogy, political ecology, and environmental justice, I here suggest the elaboration of a critical climate education that would provide citizens with knowledge and skills to respond to the climate crisis with responsible action. I argue that students need to learn to critically examine options in their own countries for reducing greenhouse emissions and to discuss whether or not each of these measures may contribute to climate justice in time and space. A critical climate education should also offer insight into reasons why some climate mitigation alternatives have been embraced instead of options that could provide more climate justice in time and space. The need for a critical climate education is illustrated with a case study about climate mitigation choices that have been made in Norway without concern for climate justice.

ARTICLE HISTORY

Received 2 May 2020
Accepted 17 November 2020

KEYWORDS

political ecology; climate mitigation; environmental justice; climate justice; critical education

Introduction

While the COVID-19 pandemic was met with immediate and strong measures, the global climate emergency has been known about for decades without resulting in necessary cuts in greenhouse gases. A likely explanation is that from a relatively early stage, the coronavirus was seen to be a serious and instant threat to people all over the world and of all social classes. In contrast, however, most of the seriously affected victims of the climate crisis are far away from present policy-makers – either in time or in space. Climate researchers have over the last decades provided increasingly urgent warnings about the serious consequences of global warming from emissions of greenhouse gases. We are facing a climate emergency, but measures have so far been inadequate to avoid serious threats for the future or to avoid current injustices towards marginalised and poor people.

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This paper addresses the question of what children and youth need to learn about choices of measures to mitigate climate change. The challenges of global climate change will require responsible action for decades to come, but such action is not likely to be taken unless citizens learn how to examine the reasons behind the climate emergency and how to explain why major mitigation choices so far have failed to provide effective and just solutions. In this paper, I propose a critical climate education (CCE) that would offer students knowledge and skills that people must have in order to meet the climate crisis with responsible action.

The approach draws from three academic fields. First, it follows in the Freire tradition of critical pedagogy in which students learn to elaborate insights about injustices and oppression, and to build competence for how to work for change. Second, the approach is based on political ecology. This is a tradition for in-depth research on human–environment relations with emphasis on both material and discursive conflicts and their associated power linkages. A leading approach within political ecology provides a combination of realism often following in the Marxist tradition with social constructivism inspired by Gramsci and Foucault. Thus, ‘truths’ provided by dominating discourses are critically examined. Third, I draw on the tradition of environmental justice, including climate justice, and I elaborate the argument that climate justice in time and space provides the most important goals to guide decisions of climate mitigation choices. Climate education should therefore also have this focus. This would be in accordance with the two ultimate goals of sustainable development as stated in the report of the Brundtland Commission (World Commission on Environment and Development (WCED), 1987): a development that meets the needs of people all over the world at present (justice in space), without compromising the ability of future generations to meet their needs (justice in time).

Critical pedagogy and political ecology are both fields that emphasise the importance of building knowledge across different levels. In line with these fields, I argue that the slogan of ‘think globally and act locally’ is not satisfactory. School children and adult citizens need instead to be given the opportunity to develop insights into and across all scales, from the individual to the global. This is necessary in order to make possible democratic action on an informed basis. Moreover, I argue that political action at the national level is particularly important to be able to handle the climate crisis and that students therefore need to learn to critically examine choices of climate change mitigation in their own countries.

In order to illustrate what the suggested CCE may contain, I present a case study of key aspects of Norway’s climate mitigation choices. I show how the chosen mitigation options have, so far, not been based on considerations of climate justice in time and space. For citizens to gain knowledge to make informed choices, I argue that they have to learn how to critically examine

why the climate situation has become as it is. Thus, I discuss the historical foundations of the present policy of climate change mitigation in Norway.

In the next section, I explain the ways in which I draw from the traditions of critical pedagogy and political ecology to build elements of a CCE. In the section following that, I present the tradition of environmental justice, including climate justice, and elaborate the argument for emphasising climate justice in time and space. Thereafter, I provide empirical evidence regarding climate mitigation options in the case of Norway. In the closing section of the paper, I summarise this paper's elaboration and substantiation of the argument that there is a need for a CCE, and I suggest four necessary steps for bringing CCE from ideas and into classroom teaching.

Critical climate education

In this section, I introduce elements from critical pedagogy and political ecology which contribute to the suggested approach of CCE. I also discuss how such an education might emphasise different scales.

With *Pedagogy of the Oppressed*, Paulo Freire (1970) laid the foundation for the academic tradition and educational practice that has come to be called critical pedagogy. Freire argued that in traditional schooling, teachers 'deposit' abstract knowledge into the supposedly empty heads of students. The teaching of this knowledge was disconnected from the students' lived experiences. He proposed instead that students need to bring their knowledge and experience from the social realities of their everyday lives into the classroom, where they can elaborate a critical understanding of those realities through dialogues involving other students and the teachers. Freire based this on the situation of landless workers and their children in rural Brazil. He argued that education should involve dialogue in which students learn to critically reflect on their situation and the reasons for the injustices and oppression they had experienced. In the process, they would build competence for developing collective strategies to fight oppression and injustice.

The present field of critical pedagogy builds on a broad range of radical traditions, including Marxist and Neo-Marxist influence and Critical Theory of the Frankfurt School, with its focus on knowledge for emancipation (Cho, 2013; Darder et al., 2015). The field also draws on Antonio Gramsci's hegemony theory about how teachers and other state employees participate in the maintenance of 'truth' production based on the interests of the powerful in society (Gramsci, 1971). Many issues are addressed by critical pedagogy scholars, including those of educational reforms that are shaped as neoliberal commitments to the market and reproduce social inequalities (Apple, 2011; Cho, 2013).

There are also important contributions to ecopedagogy, a label applied to critical pedagogy concerning environmental issues (see Misiaszek, 2018; Kahn, 2010; Misiaszek, 2019). From these perspectives, the mainstream fields of

Environmental Education and Education for Sustainable Development have been criticised for ignoring social injustices of environmental degradation and reproducing economic oppressions within neoliberal framings (Misiaszek, 2018; McKeown & Hopkins, 2003; Misiaszek, 2019). Instead, Misiaszek argues that ecopedagogies can be used to unpack the hidden curricula of development and sustainability through teacher–student dialogue, and by questioning benefits and oppression at and between local up to planetary spheres (Misiaszek, 2019, p. 4).

For children and youth, the climate crisis constitutes a reality that many are concerned about. Through media, at school, and sometimes through direct experiences, they are confronted with problems associated with global warming today as well as the serious threats it poses for the future of everybody, including themselves. I argue that a CCE that draws on critical pedagogy would offer students knowledge and skills that are necessary if citizens are to meet the climate crisis with responsible action. Such education would at the same time provide the students with consolation that there can be ways out of the crisis.

Political ecology is an interdisciplinary field that relies mainly on social science, but the research also sometimes includes elements of natural sciences. ‘Ecology’ reflects the field’s broad focus on environmental issues, while ‘political’ indicates a close relation to political economy approaches. Being a critical research tradition, political ecology focuses on conflicts and power relations in environmental governance (Perreault et al., 2015; Robbins, 2020; Stott & Sullivan, 2000; Svarstad et al., 2018). Studies in political ecology are often conducted as in-depth case studies of environmental interventions experienced by local communities and initiated by powerful actors such as corporations, governments and conservation NGOs. The topics include the establishment of new economic activities such as mines, plantations, or the establishment of new conservation areas. Insights about conflicts and various impacts are gathered at local sites, while influences and structural connections to activities at other spaces are traced nationally and internationally (Blaikie et al., 1987; Paulson et al., 2005). Political ecology research tends to be critical realist combining approaches from realism and social constructivism. Aspects of critical realism often include studies of economic structures built on Marxist political economy as well as social constructivism studies influenced by a broad spectrum of discourse and narrative analyses as well as inspiration from the hegemony theory of Gramsci and Foucault’s governmentality theory. When comparing leading discourses and sometimes hegemonic ‘truths’ about an issue and what the researchers find by own examinations of the same issue, political ecology scholars often uncover substantial deviations (Benjaminsen & Svarstad, 2019).

Political ecology is a tradition of in-depth empirical research about environmental issues, and at the same time it is characterised by discussion of empirical findings in the light of a broad repertoire of critical theories. This is not

a tradition that so far has engaged much with education research, although there are a few seminal contributions to political ecologies of education. For instance, Meek and Lloro-Bidart (2017, p. 213) outline a political ecology of education perspective ‘that sheds light upon how power relations, political economy processes, and their structural arrangements mediate education’. Stahelin (2017) provides a Gramscian political ecology framework about how the production of environmental knowledge in education reflects specific ideologies and particularly the hegemony of neoliberal statecraft, while Henderson and Zarger (2017) critique environmental education research that tends to be based on a knowledge-to-attitude-to-behaviour change paradigm. This paper’s suggestion of a CCE that draws on main aspects of political ecology and is in line with these three contributions to political ecologies of education.

In mainstream approaches to environmental studies, one sometimes sees researchers arguing that environmental and climate change issues should not be mixed with politics. Following Robbins (2020), we can refer to these views as ‘apolitical ecology’. They do not openly expose that they are based on values and political preferences. Values often emphasised in political ecology studies are the rights for all to have livelihoods to meet their basic needs.

At what scale should CCE focus? The well-known slogan, ‘think globally and act locally’, is frequently applied not only to sustainable development in general but also to climate action. Moreover, some actors tend to reduce the climate crisis to a matter of private decisions for individuals to take in their everyday lives. In this thinking, students should not be exposed to ‘politics’ about climate change mitigation. This would be an apolitical and uncritical type of climate education and indirectly the political alternative of raising children and youth to think that small individual actions are all that is required to avoid the worse climate warming scenarios.

My take on the question of scales is bifurcated. On the one hand, students need training in discussing the climate crisis and possible actions both globally, nationally, locally, and individually. They need to learn how global warming is an environmental phenomenon that is based on structures, decisions and acts on all levels, and they need to build necessary skills in order to become citizens who can take part in deciding responsible actions on all levels. On the other hand, I argue that it is important for students to focus particularly on the national level, because this is the level at which democratic decision-making can lead to the most important emission cuts. A premise under the Paris Agreement (United Nations, 2015) on climate change is that each country makes its own decisions regarding its total contribution to climate mitigation and how to contribute to reducing emissions. Thus, it is up to the country’s government whether or not to establish climate mitigation policies in accordance with the principles of climate justice in time and space.

Climate justice in time and space

In this section, I show how my notion of climate justice in time and space is drawn from the academic field of environmental justice, and specifically the subfield of climate justice.

Mitigation alternatives differ in terms of impacts, and discussion of impacts is always attached to aims and values. I argue that the two interconnected goals of climate justice in time and space ought to be prioritised in such decisions and that these are the goals that students should first of all learn about, and that they should be given the opportunity to develop skills in discussing whether or not specific mitigation choices may contribute to fulfil these goals.

Climate justice is a label applied to the aims, principles and norms concerning actions and impacts related to climate change. Moreover, protests from the climate justice movement have taken place at the biannual climate change negotiations since the turn of the millennium. In addition, climate justice is an academic field of normative theory belonging to and drawing from the broader scholarship of environmental justice.

The environmental justice movement evolved in the USA in the 1970s and 1980s as a civil rights struggle against the placements of hazardous waste that tended to be located in poorer neighbourhoods and often inhabited by people of colour. Sociologists, geographers and others established the scholarship on environmental justice as an academic field inspired by the social movement, and also in interplay with this movement. In the 21st century, a wider range of environmental issues have been addressed with environmental justice perspectives, including climate justice, and the geographical focus has also been broader and encompasses many parts of the world (see, for instance, Holifield et al., 2017).

Influenced by the tradition of radical political philosophy of Nancy Fraser and others, David Schlosberg has introduced a radical environmental justice framework that focuses on the justice perspectives of distributional justice, justice as recognition and procedural justice, as well as an element of justice as capabilities drawing on the capabilities theory of Amartya Sen and Martha Nussbaum (Schlosberg, 2007; Svarstad & Benjaminsen, 2020). Climate justice in time and space is first of all about distributional justice, with attention on the distribution of cuts of climate emissions and the connected distribution of burdens related to such cuts. At the same time, other types of radical justice concerns are also relevant. For instance, there are groups of people who are negatively affected by a mitigation choice although this may not be recognised by the rest of society and the affected groups may not be in a position to participate in the decision-making. There may also be groups whose negative impacts are not recognised. Privileged groups, on the other hand, may be able to make their interests and perspectives known and taken into account.

The social movement and the academic field of environmental justice were both established from concerns about injustice for poor and marginalised people living in spaces that were chosen for location of polluting and harmful production activities and garbage dumps. The term climate justice, on the other hand, has so far mostly been used to refer to injustices in time, but also about situation today where people in poverty are seriously affected by extreme weather and sea-level rises that are discussed as early consequences of climate change.

The notion of climate justice in time and space is a way to draw attention to what I consider the most important criteria for evaluation of various types of emission cuts. With the dimension of climate justice in time, I focus on the situation of people who will live in the future (the coming generations as well as those who today are young) in relation to present adults. Climate justice in time implies that a country's climate policy reduces climate emissions sufficiently and fast enough to avoid the most serious consequences for future generations. We can expect that climate change itself will gradually increase as a cause of deprivation, and without strong climate mitigation measures, the consequences of climate injustice will be most serious.

In line with the general focus of the movement and academic field of environmental justice, I use the notion of climate justice in space to draw the attention to spatial dimensions. In the most basic sense, climate justice in space implies that emission cuts are chosen in ways that distribute burdens in a just manner among people who live in all parts of the world today. We can begin an examination of climate justice in space with looking at justice of climate mitigation measures between people in industrialised countries of the Global North and developing countries of the Global South. More specifically this is a distinction in wealth, on a scale from affluent people living in high-income countries as well as at wealthy sites in other countries, to those who struggle to fulfil their basic needs for food and survival. While many of the latter live in low-income countries, there are also pockets of people facing absolute poverty in wealthier countries. Climate justice in space can be specified to imply that mitigation measures do not harm people who live in absolute poverty or are otherwise particularly vulnerable.

I draw upon the contribution to climate justice by Caney (2014) who distinguishes between harm avoidance and burden-sharing justice. While harm avoidance justice mainly concerns future generations, Caney specifies current burden-sharing justice with different criteria for the obligations that different actors should have in contributing to climate cuts. Climate justice in space concurs with Caney's principle of burden-sharing justice by putting the responsibility for mitigation on those who have caused the problem, on those who have benefitted from activities causing climate change, as well as on those who have the ability to pay for mitigation. The principle of climate justice in space also entails the imperative of not placing a mitigation burden

on people who are currently vulnerable and who struggle to meet their basic needs.

Climate justice in time and space can be considered as a specification of a definition of sustainable development for the issue of climate change. This is the well-known definition by the World Commission on Environment and Development (WCED) (1987) of 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' On the one hand, climate justice in time and space is about injustice against people in the future who will be seriously affected if effective mitigation measures are not implemented today. On the other hand, this is also about injustice against people who today are confronted with mitigation measures that deprive them from meeting their basic needs. While the first group of victims of climate injustice is certainly present in the climate discussions today, the second group is seldom mentioned. In this group, there are mainly people living in rural areas in developing countries, and they are, for various reasons, ignored and not recognised in most discussions on climate mitigation.

Concern for climate justice is to some extent reflected in the international climate change regime. In the Paris Agreement, the Parties to the UN Framework Convention on Climate Change agreed to a goal of limiting global warming to well below 2°C above pre-industrial levels and also aiming to limit it to 1.5°C. With reference to concern for equity, sustainable development and efforts to eradicate poverty, the Paris Agreement recognises that developing countries need longer time than other countries to reach peaking of greenhouse gas emissions (United Nations, 2015). Thus, the Paris Agreement can be seen to provide a recognition of norms of climate justice between countries, although each country government decides itself the size on its contributions to the necessary cuts. In a special report in 2018, the IPCC argued that in order to limit global warming to 1.5°C, global human-caused emissions of CO₂ would need to fall by about 45% from 2010 levels by 2030 and down to zero around 2050, and this would need much faster reductions than the total promises so far from the countries in the Paris Agreement (IPCC, 2018). Greta Thunberg often refers to the urgency of the Paris Agreement and the IPCC's special report, and she emphasises the need of rich countries to conduct fast cuts and thereby provide opportunities for people in poorer countries to heighten their standard of living by building infrastructure (Thunberg 2019).

Following the presentation of main aspects that a CCE can draw on from the traditions of critical pedagogy, political ecology, and environmental justice, I will now proceed by presenting a case study of climate mitigation choices in Norway. It is based on a political ecology approach in which realism is combined with a focus on leading discourses, and discussions of climate justice in time and space are demonstrated. The case illustrates the need for a CCE that can equip citizens with knowledge and skills to critically examine their countries' climate mitigation choices.

The climate emissions and mitigation measures of a country

Each country has its own history of climate emissions from the industrial revolution and up to the present. CO₂ is the gas that provides the largest contribution by far to the greenhouse effect. Historical contributions to greenhouse gas emissions since the mid-19th century accumulate in the atmosphere and cause temperatures to increase. For millennia, the CO₂ content in the atmosphere did not go above 300 parts per million, but in 1960 it reached 317, and in March 2020 it amounted to as much as 414.5 parts per million (Energi og klima, 2020). This large growth of CO₂ in the atmosphere the last decades implies that it is not possible to emit much more climate gasses without causing the global temperature to pass 1.5 or 2°C. The remaining 'carbon budget' for the amounts of climate emissions that can be made in total without causing serious global warming is, in other words, rapidly decreasing. The industrialised nations in the Global North are responsible for enormous historical emissions of climate gases. China, India, and other recently industrialised countries have low historical emissions but considerable increases during the last decades. People who live in absolute poverty in either low- or medium-income countries have, however, scarcely contributed at all to the climate crisis.

In this case study from Norway, I start with the general picture of climate emissions and proceed with two subcases of climate mitigation options. Norway is a country in which hydropower played a central role in industrialisation from the beginning of the 20th century. This was therefore an industrialisation based on renewable energy and low carbon emissions. However, after offshore petroleum fields were discovered in the North Sea, Norway has from the 1970s to the present generated large revenues based on the extraction and export of oil and gas. The parliament *Stortinget* decided in 2008 and 2012 that the annual climate emissions in 2020 should be cut with 30% compared to the 1990 level. Nevertheless, by 2018 the emissions had instead increased from 51.5 to 52.0 million tons CO₂ equivalents (Statistics Norway, 2020).

When fossil fuels are exported from Norway, CO₂ is emitted in other countries. Fæhn et al. (2013) calculate that Norwegian petroleum in 2012 resulted in emissions of about 500 million tons CO₂ and constituted more than 11 times the emissions from inside the borders of Norway. According to international agreements on climate change, countries are only responsible for emissions within their own borders. Consequently, when fossil fuels from Norway are burned in other countries, the climate emissions are not counted as a Norwegian responsibility. There are, however, differences between formal rules of international agreements and ethical norms about climate justice. Thus, for Norwegian citizens, it is important to discuss whether or not their country has ethical responsibility for the climate emissions based on Norway's large income from exporting fossil fuel products.

In order to discuss climate justice of the actions by a specific country, it is necessary not only to look at total emissions but also to look at the emissions per capita. Norway is an example of a country with small total emissions compared to large nations. However, the emissions per capita are relatively high, even though electricity is mainly produced by hydropower. Moreover, if carbon emissions from exported petroleum products are taken into account, the emissions per capita are extremely high. In comparison, China has recently become the world largest emitter of greenhouse gas, with 28% of total emissions in 2018 (Energi og klima, 2019), and the emissions per capita have risen much since 1990. Nevertheless, emissions per capita were in 2018 lower than that of Norway. Moreover, when comparing Norwegian emissions per capita to low-income countries, the average emission, for instance, of each Tanzanian citizen was in 2018 50 times lower as that of an average Norwegian, and those of each Malawian citizens were 100 times lower (calculations based on figures of European Commission, 2019).

When discussing climate justice of a country's emission reductions, it is also relevant to look at the country's economic strength to finance emission cuts. Norway is a country with one of the highest per capita incomes in the world, and the Government Pension Fund Global manages large financial reserves based on petroleum income invested abroad. At the beginning of 2020, the size of this fund was more than one thousand billion USD (Norges Bank Investment Management, 2020). This is much money for a country of only 5.4 million people.

Over the last three decades, Norway has chosen certain measures to cut climate emissions. A fast phasing out of petroleum activities and leaving the remaining fossil fuels resources in the ground would be a significant contribution from Norway to mitigate global warming. Up to the last few years, however, this has not been a topic of discussion in Norway. Instead, other options have been chosen along with continued petroleum extraction.

One of the often emphasised options is to electrify the platforms so that the petroleum extraction is fuelled by hydro power instead of by petroleum. This is calculated to reduce Norwegian carbon emissions by about 14.2 million tons CO₂ equivalents (Miljødirektoratet og Statistisk Sentralbyrå, 2019). This is a very small cut compared to the emissions when the extracted petroleum is burned for energy purposes. Thus, it is difficult to interpret this as anything else than a way of legitimizing a continued petroleum activity and thereby a continuation of an activity that causes high greenhouse gas emissions. A similar measure is to develop technology to capture and store CO₂. Norway has spent much money on this since the idea was launched by former Prime Minister Jens Stoltenberg in his new year's speech for 2007, referring to it as 'Norway's moon landing'. However, the attempts have been very expensive, and so far without having reached a successful 'landing' with the technology in place.

Recently, however, phasing out the petroleum production has finally become a topic that the media has begun to address, and politicians have started to discuss questions of how employment may be gradually channelled away from the petroleum sector and over to activities such as production of equipment for renewable energy. The school strikes and other large climate demonstrations have contributed to this.

Another major Norwegian climate measure consists of efforts to reduce emissions from deforestation and forest degradation in developing countries (REDD). Politically as well as economically, Norway has taken the lead in the cluster of the so-called REDD programmes. Proposed at the climate conference in Montreal in 2005, REDD was adopted at the climate conference in Bali two years later. A plus sign has been added (REDD+) to indicate additional targets, such as community benefits. At the climate conference in Bali in 2007, Prime Minister Stoltenberg (Labour Party) announced Norway's REDD initiative,¹ declaring that Norway would commit more than a half billion USD a year. Since then, Norway has been by far the largest financial contributor to REDD. When a conservative government took over in 2013, Norway's REDD support continued at the same high level of funding and prioritisation within Norway's climate policy. By the end of 2017, Norway had in total spent 22.4 billion NOK (approximately 2.24 billion USD) on REDD (Government of Norway, 2018). The Norwegian REDD funding goes partly to bilateral partner countries and partly to multilateral programmes, and a large number of tropical countries are involved through one or more programmes.

So, can REDD be considered a strategy that provides climate justice in time? Over the last years, large forest areas with REDD interventions have gone up in smoke in South America as well as in Asia. Brazil is a case showing how vulnerable REDD is as a carbon storage strategy, when the election of a new president in 2018, Jair Bolsonaro, resulted in a new policy, and forests were no longer protected. It has become clear that substantial REDD efforts have had limited and often temporary effects of reducing carbon emissions so that REDD cannot be seen as an effective climate approach to secure lively conditions for future generations.

Can REDD then be considered a strategy that provides climate justice in space? Through in-depth case studies, it is possible to uncover what effects such interventions have on different groups of inhabitants in specific areas, and such studies may provide insights to mechanisms that may also be found in other areas with REDD interventions. A case study over several years examined consequences of Norway's REDD programme in an area of Tanzania characterised by much poverty. The project imposed strict restrictions on use of forest resources. Three overlapping groups were found to be adversely affected by the restrictions on forest use. First, people living close to the conserved forests and without alternative forested areas nearby tended to be more seriously affected than others. Second, villagers with relatively small farms or without farmland at

all were more affected than others. This is because many villagers who lack sufficient farmland depend more on forest resources to sustain a living, for instance, by charcoal production. Third, women tended to be more affected than men, because of their roles in the gendered division of labour, and particularly with collecting firewood for domestic purposes. The project's facilitation of carbon trade was meant to provide compensation for these negative effects, but the implementing NGO failed to get the required certification for carbon trade. In addition, project activities during the life of the project (2010–2014) were meant to give villagers alternative livelihood sources. Several of these activities might be positive in themselves, but the implementation and associated benefits turned out to be limited. This was the case with tree-planting, sustainable production of bricks and charcoal, as well as with the introduction of more energy-efficient cooking stoves (Svarstad & Benjaminsen, 2017).

REDD takes place in many and often remote areas, in a large number of tropical countries. As for other development assistance programmes, the donors engage consultants to evaluate the REDD activities. These consultancies are, however, based on very limited funding and timeframes, and independent research is unfeasible (Svarstad & Benjaminsen, 2017). Consequently, donors such as the Norwegian government, who want to claim that they take part in a successful programme with local gains, can get away with such a claim. At the same time, affected people are not seen, heard or recognised. The case study in Tanzania reveals a type of neo-colonialism, a climate colonialism, in which land and natural resources in a foreign country are appropriated from local citizens for the purpose of climate mitigation in the interests of the funding country (Benjaminsen & Svarstad, 2018).

Internationally, there are some scholars who have been given the rare opportunity to conduct independent and in-depth research on REDD sites. These studies often indicate that poor and vulnerable people have been affected negatively (e.g., Asiyambi, 2016; Asiyambi & Lund, 2020; Chomba et al., 2016; Krause et al., 2013; Pasgaard & Chea, 2013). Thus, REDD is a climate mitigation strategy that does not ensure climate justice in space.

In this section, I have used the case of Norway to illustrate the type of elements that should be emphasised in a CCE where children and youth learn to explore and discuss justice dimensions of climate measures. I have shown how Norway has contributed considerably to climate emissions during the last 30 years, particularly when looking at emissions per capita, and taking into account emissions from Norway's export of fossil fuels. Moreover, Norway has economic strength, especially because of high petroleum revenues. These are elements that should generate expectations that Norway contributes substantially to mitigation measures, taking responsibility for people at present and in future who contribute little to climate change, who live in poverty and vulnerability, and who therefore should not be expected to contribute to climate mitigation. A mitigation option for

Norway that would combine concerns for climate justice in both time and space, is to phase out the country's petroleum activities as soon as possible. However, the present Norwegian climate policy instead continue with a fossil economy along with the appropriation of land for REDD activities in tropical countries.

Exploring countries' histories of climate change policies

Since around 1990, there has been a large and growing understanding among scientists and politicians worldwide that human-imposed climate change constitutes a major challenge. Nevertheless, global climate emissions have continued to grow.

As a necessary step on the road to responsible climate action, children and youth need to learn about and understand why high carbon emissions have continued for decades after the detrimental consequences for the global climate became clear. Central elements to explain this lack of suitable actions are found in the shaping of climate policies in each country. Students need to learn about what happened when their countries' climate policies were elaborated and up to the present. This is crucial knowledge if children and teenagers are to develop into citizens who are able to contribute to the shaping of their countries' climate policies in sustainable directions. Again, I use Norway as a case to illustrate what such knowledge may help uncover, given that it is based on insights from solid research.

In 2004, Hoven and Lindseth presented a discourse analysis of the elaboration of Norwegian climate policy between 1989 and 2003. They identified two discourses; the one that came to dominate, they termed 'thinking globally'. The other discourse, 'national action', had a large impact initially, but its importance soon diminished. 'National action' emphasises the responsibility of an affluent country, such as Norway, to reduce its own climate emissions. In 1987, the Brundtland Commission recommended that the global consumption of fossil fuels be reduced by 50% over the next 30 to 40 years. Two years later, Norway with Brundtland as Prime Minister, was one of the first countries to decide on a target for reduction of climate emissions. This so-called stabilisation target was to stop the growth of CO₂ emissions by around year 2000 (Government of Norway 1988–89). However, this target was soon replaced by a principle of 'international cost-effectiveness', which has been key to Norway's climate policies ever since, and which is based on a combination of two ideas; first that climate emissions should be reduced where it is possible to get the largest cuts for the same cost, and second that reduction of climate emissions is often likely to be cheaper in other countries. These countries might be located in Europe, although low-income countries in the Global South might be seen as particularly relevant, since costs in these countries tend to be especially low.

The principle of international cost-effectiveness was first used when the government decided to focus on the establishment of international markets for carbon trade. For a company in Norway, this implies that emissions requirements from the government can be met by buying carbon credits from a factory abroad that cuts its emissions, instead of making the same cuts itself. The Norwegian REDD programme is based on the principle of international cost-effectiveness, and with an ambition from the beginning that continued climate mitigation in the REDD sites gradually should be funded by carbon markets. Nevertheless, the programme was proposed by two Norwegian environmental organisations, and from the very start it has been viewed as a programme not only to mitigate climate change but also to conserve tropical forests. Thus, the programme must be seen as having been established through a coalition representing the two interests of conserving forests and ‘conserving’ economic activities in Norway with large climate emissions.

The sociologist Sjur Kasa (2016) shows how lobby activities from companies and labour unions in the petroleum sector and other large climate emitters were successful in influencing the Norwegian climate policy. The historian Yngve Nilsen (2001) presents a detailed record of important individuals, research institutions and networks involved in the establishment of climate policy in the early 1990s, with initiatives from the petroleum lobby of corporate and union leaders, and involving politicians and economists. Another historian, Kristin Asdal (2014), shows how economists in the Ministry of Finance played a central role in changing Norway’s climate policy in order to avoid threatening the country’s economic interests by securing continued petroleum revenues. A Norwegian institute for climate research, CICERO, was established not only to conduct research but also to take a central role in establishing an international network that promoted international cost-effectiveness and carbon trade as core elements of the international climate regime that developed around the negotiations and follow-up meetings of the UN’s Climate Change Framework Convention (UNCCFC) (Nilsen, 2001).

A successful lobby activity from Norway resulted in specific wording in the Framework Convention presented at the ‘Rio Earth Summit’ in Rio de Janeiro in 1992 that the countries’ commitments could be carried out in cooperation (Nilsen, 2001). The idea was brought into the Kyoto Protocol in 1997 and continued in the Paris Agreement in 2015. Hence, the Norwegian petroleum lobby was successful in their aims of influencing the establishment of the Norwegian climate policy, and the international climate regime adopted similar ideas.

The financing of climate cuts in other countries has been the most important approach subscribed to by the Norwegian government since the early 1990s. This has made it possible for the government to present Norway internationally as well as to its own citizens as a leading country in climate mitigation, while at

the same time maintaining a high level of fossil fuel production. This is based on a discourse where international cost-effectiveness and market-based climate mitigation provide central foundations. Instead of reproducing this discourse, students need to learn about how this way of thinking came to be hegemonic, and how it deviates fundamentally from the aims of climate justice in both time and space.

A critical climate education from ideas to practice

This article builds on the premise that responsible climate action require that citizens have sufficient critical knowledge and skills to urge their governments to use suitable and just climate mitigation measures. As an important means to develop such competence, I argue the need for a CCE so that children and youth can learn to examine climate mitigation options in comparison to the overarching targets of climate justice in time and space. I have shown how this approach can draw on the traditions of critical pedagogy, political ecology and environmental justice, and I have presented a case study showing that climate mitigation choices in Norway do not contribute to climate justice in time and space and that these choices have been made without awareness amongst the citizens. The case therefore illustrates the need for CCE.

There is a long way from ideas to practice of the suggested CCE in classrooms and other relevant settings. I will end up the paper with discussing four steps that may be taken. In this article, I suggest that climate justice in time and space should provide the most important goals for climate change mitigation and that students learn to discuss whether or not specific measures may contribute to each of these goals. These targets can be presented in a relatively clear manner, in contrast to the ways that consequences of different mitigation alternatives often appear as incomprehensive for most citizens. Nevertheless, as the first step, the elaboration of a CCE for classroom use would imply more specifications of the notion of climate justice in time and space, and discussions of this notion in comparison with a range of other normative theories and justice principles.

Second, a CCE would be based on the students' own investigations and discussions of specific climate mitigation options. At the same time, there is a need for academic research with critical examination of climate mitigation alternatives, and this should focus on the relevant options for emission cuts in each country. Such research would be important in order to educate teachers in CCE and to elaborate school curricular materials, including textbooks.

Third, the teaching of CCE would need to be elaborated in context to be suitable in different parts of the world as well as in different countries and localities. Besides, it would be necessary to develop teaching suitable for the

various school class levels. While the oldest students could be relatively independent and work in groups or on individual projects to examine aspects of mitigation measures that they select themselves, the youngest children would need to be introduced to the topic in ways which are appropriate to age and stage. Researchers of teachers' education could contribute to the elaboration of detailed suggestions of subject didactics for CCE in specific contexts, school teachers could be given the opportunity to try out the approach in practice, and education researchers could conduct formative dialogue research on such trials to build knowledge on elements that result in high learning outcome.

I argue that CCE should draw on the fields of critical pedagogy, political ecology and environmental justice as well as putting major emphasises on climate mitigation options and examinations of their climate justice in time and space. The fourth and last step towards CCE is to consider it open to further elaborations. For instance, students who realise that present climate mitigation options are not satisfactory might be ready to examine further why present ways of organising the economy are unsustainable, and what alternatives could provide better platforms for climate justice and a sustainable future. They would need teachers and teaching resources that could support such studies. Thus, it would be important also to elaborate CCE towards examinations of more encompassing development options, such as green growth strategies within the dominant neoliberal structures as well as alternative degrowth strategies.

At each of the four steps, research would be required. Bringing CCE into practice would also require engagement from teachers, institutions for teacher's education and national authorities. Millions of students all over the world have engaged in school strikes for the climate and thereby providing eye-openers for adults. An important response would be to offer an education that equip citizens with the required critical knowledge and skills to elaborate climate justice solutions.

Note

1. The name of the Norwegian part of REDD+ is called Norway's International Climate and Forest Initiative (NICFI).

Acknowledgements

I am grateful for valuable comments on the paper from Tom Griffiths, Tor A. Benjaminsen, members of my research group at OsloMet, special issue editor Greg Misiasek, and two anonymous reviewers.

Disclosure statement

No potential conflict of interest was reported by the author.

Funding

This work was supported by the Research Council of Norway through the Greenmentality project (proj. no. 250975).

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