



# Rendering the future governable: Navigating temporality and uncertainty in Oslo's climate transformation

Jakob Grandin

Department of Geography and Centre for Climate and Energy Transformation, University of Bergen, Postboks 7802, N-5020 Bergen, Norway

## ARTICLE INFO

### Keywords:

Climate  
Governance  
Cities  
Temporality  
Governmentality  
Urgency

## ABSTRACT

This paper examines the procedures through which climate change can be rendered governable in the present. Climate change has generally been approached as an abstract, global, and long-term problem, thereby disconnecting it from the places and times in which decisions are made. Relational thinking in geography has articulated the local and regional levels of climate governance, hence foregrounding the practices through which the climate is situated in concrete local and organisational contexts. However, in *time* climate change has remained an abstract and long-term problem. This calls for studies of how the need for rapid climate action can be established in the present, and how climate governance can be aligned with the temporal rhythms in which organisations operate. This paper examines Oslo's "climate budgets", an innovative governance tool which integrates climate planning into the regular municipal budgeting cycle. It brings attention to the practices through which different temporalities of climate action are aligned, how climate change is rendered legible, and how uncertainties are managed. Drawing on the literatures on temporality and governmentality, it develops a conceptual approach to assess the practices through which responsibility for global, long-term concerns can be articulated in the present.

## 1. Introduction

This paper examines the practices involved in situating climate change in particular times and places, thus rendering it governable. This is important because climate change has generally been approached as a global and distant problem which has emphasised multilateral solutions and long-term thinking. This attentiveness to global and long-term averages contrasts with the everyday, contextualised experience of climate change (Hulme, 2007) and "separates people from climate change in both the articulation of the problem and its proposed solutions" (Head and Gibson, 2012, page 699).

Drawing on relational thinking in geography which has illuminated the relationships between local places and global change (Massey, 2004, 2007), Bulkeley (2005) and others have articulated the local and regional levels of climate governance. This literature has examined the practices through which climate change is situated in concrete spatial contexts, for instance the local places and organisations (cities, corporations, individuals, etc.) where decisions are made (Bulkeley, 2016; Haarstad, 2016; Lövbrand and Stripple, 2011). This effort, often drawing on governmentality perspectives (Miller and Rose, 2008; Oels, 2005), has outlined the disparate set of methods involved in imagining,

representing, and ordering climate change (Stripple and Bulkeley, 2013), for instance in the construction of carbon markets, forestry management, lifestyle metrics, carbon quotas, and climate refugees (Lövbrand et al., 2009; Lövbrand and Stripple, 2011, 2012; MacKenzie, 2009; Methmann, 2013; Methmann and Oels, 2015).

However, in *time* climate change remains an abstract and long-term problem of which the direct relevance for decisions in the present is not clearly defined. This is a problem because it clouds the need for proactive planning and immediate climate mitigation, sanctioning what climate futurist Alex Steffen (2017) terms "predatory delay" (see also Lamb et al., 2020). Furthermore, as a long term-issue, the governance of climate change is seen to call for foresight, modelling and the management of risks and uncertainty (Adam and Groves, 2007) in what Luhmann (1976, page 146) referred to as "transform[ing] in a highly selective way distant temporal relevances into present social ones."

Based on the premise that climate change is constructed and performed in the present through a range of anticipatory technologies (Anderson, 2010), this paper argues that some of these climate futures are more actionable than others (cf. Guyer, 2007). Through the use of aggressive economic discount rates (Emmerling et al., 2019; Hansson et al., 2016) or wild expectations of technological breakthroughs

E-mail address: [jakob.grandin@uib.no](mailto:jakob.grandin@uib.no).

<https://doi.org/10.1016/j.geoforum.2023.103814>

Received 9 August 2022; Received in revised form 14 June 2023; Accepted 16 June 2023

Available online 26 June 2023

0016-7185/© 2023 The Author. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

(McLaren and Markusson, 2020), many anticipatory technologies solidly place climate action in a far and abstract future. As a result, the impression is left that only marginal action in the present is needed to meet climate targets (Markusson et al., 2018).

At the same time, local governments across the world have declared climate emergencies, recognising the need for immediate action (Haarstad et al. 2023; McHugh et al., 2021). Similarly, the literature on citizens' climate assemblies has foregrounded the plethora of ways in which climate change is now increasingly being situated in the present – through the means of local and national government but also through public manifestations, annual investors' meetings and in the courts (Davies et al., 2021; McCann, 2023; Sandover et al., 2021). Yet, the distinct practices through which the different temporalities of climate action are aligned are still poorly understood. This calls for inquiries into the procedures through which the need for rapid climate action can be established in the present, how these measures can be aligned with the temporal rhythms in which organisations operate, and with what effects (Abram, 2014; Sareen et al., 2021).

This paper examines these issues through the case of Oslo's "climate budgeting", an innovative governance tool which integrates climate planning in the regular municipal budgeting cycle (Climate Agency, City of Oslo, 2018). The climate budgeting methodology illustrates the practices of translation involved in restructuring climate change from a far future concern to a near term issue which is integrated in the temporal cycles of municipal governance. Pioneered by Oslo in 2017, climate budgets are now deployed by cities throughout Norway and is celebrated internationally as a good practice which is mobilised through webinars, conferences, and policy work.

Confidently communicated through the slogan: "We'll count carbon dioxide the same way as we count money,"<sup>1</sup> the climate budget quantifies yearly sectoral emissions targets and identifies the measures to reach them. In practice, however, this "counting of carbon dioxide" is a quite complicated procedure, involving a range of actors and quantitative modelling approaches in which significant uncertainties still remain. The climate budgeting process therefore provides an illustrative case of the rationalities and technologies of government involved in translating climate change from a long-term, global, and abstract challenge into concrete local, and sectorially situated problems that are to be addressed within the present budget cycle.

Drawing on evidence from technical reports, seminars, and interviews, this paper analyses the implementation of climate budgeting in Oslo and how it aligns the temporalities of climate action. This links to the practices through which climate change is selectively rendered legible in the climate budget and how uncertainties are managed. The paper seeks to address questions concerning how climate budgets establish the relevance of immediate climate action by aligning the temporalities of climate action, which aspects of climate change that are rendered governable through climate budgeting, and how uncertainty is managed. By explicating the rationalities and practices through which climate change is made relevant in the present, this paper contributes to the academic debates on climate temporalities, urban governance, and climate governmentality.

The paper proceeds as follows. The next chapter (Section 2) draws on theories on anticipation and temporality to situate climate change in time. This discussion leads to an explication of how climate change might be translated between different temporal scales, emphasising (a) the alignment the temporalities of climate action, (b) the selective rendering legible of the climate, and (c) the management of uncertainties (Section 3). After a discussion of methodological considerations (Section 4), these insights are applied in an assessment of the use of climate budgets in Oslo (Section 5), which explicates how the tool translates and situates climate change temporalities and manages

uncertainties. The paper concludes by discussing how climate budgeting frames climate action in ways shaped by extant logics of urban governance, but also offers a means to combine climate urgency with deliberative governance (Section 6).

## 2. Situating climate governance in time

Niklas Luhmann (1976, page 130) stated that "the future cannot begin"; the future is a horizon which is always moving away from us and that we cannot grasp. Nevertheless, constructions of the future contribute "to the definition of the situation" (Luhmann, 1976, page 140). There is therefore a need to articulate the ways in which the future might be made relevant in the present, as well as the political implications of such practices. As a long-term and future problem, the management of climate change is seen to call for foresight, modelling, and the management of uncertainty. From this perspective, the future is not given, but actively constructed and performed in the present through different anticipatory technologies (Adam and Groves, 2007; Adey and Anderson, 2011; Anderson, 2010). Hence, possible futures are made present through anticipatory practice: the models, visions, scenarios, and war games through which the future is calculated, imagined, and performed (Anderson, 2010). These practices, then, "transform in a highly selective way distant temporal relevances into present social ones" (Luhmann, 1976, page 146); constructed futures serve to legitimise and mobilise present action, hence rendering the future governable.

However, as these constructions of the future give direction to decisions in the present, the different temporal orientations through which the relevance of the future is established have political implications (Guyer, 2007; Opitz and Tellmann, 2015). For instance, Guyer (2007) explicates the political implications of three temporal orientations, namely the far future, the near future and narrow presentism. Whereas abstract far future time horizons may promote passivity because the forces governing the future are largely seen to be beyond our control, the punctuated time of narrow presentism brings attention to immediate events, leading to a "new nonchronological and nontemporal pattern of immediacies" (Jameson, 2002). Hence, both temporal orientations are prone to undermine agency and reinforce deterministic ideas of an inevitable future. In contrast, Guyer (2007, page 409) proposes the near future time horizon as the domain of "tracing out mutual influences," of planning, struggling, hoping, and reasoning. As such, the temporal orientation of the near future is a sphere of deliberate agency concerning the future.

These three temporal orientations of the far future, narrow presentism, and the near future have implications for how climate change is governed here and now. For instance, framing climate change as a problem in the far future might result in the depreciation of present responsibility. McLaren and Markusson (2020) warn that the ways in which continuously reframed climate targets are intertwined with technological promises and modelling methods might lead to "mitigation deterrence" when increasingly speculative technological imaginaries are introduced to allow for climate targets to be met (at least in the models) in the future despite present inaction. Therefore Integrated Assessment Models (IAMs) – the economic models regularly used to assess different climate mitigation options – optimise costs and benefits by substituting near term emissions cuts with anticipated greenhouse gas removal (GGR) technologies in the future: "late GGR typically replaces early mitigation" (McLaren, 2020). This situation is compounded by the use of high economic discount rates which depreciate the costs of future climate mitigation and adaptation, hence "lower[ing] the mitigation effort of current generations at the expense of future ones" (Emmerling et al., 2019).

Similarly, governing climate change as events in the narrow present – temporally organised as crises and emergencies when climate change manifests itself as heat waves, floods, droughts, tropical storms, forest fires, and people that are forced to flee their homes (Methmann and

<sup>1</sup> Oslo Vice Mayor Robert Steen, quoted in Worland, "Oslo Plans 'Climate Budget' to Cut Emissions in Half", *Time*, 29 September 2016.

Oels, 2015; Oels, 2013; Park, 2022) – undermines the scope for proactive governance. The aspirations of progress that were underpinning national planning are replaced by what Beck and Levy (2013) describe as a multitude of contingent and fragmented temporalities which are broken up by risk. When the future folds into the present as emergencies, it does so, as Cooper (2016) argues, “from a future without chronological continuity with the past”. This way of organising climate change in time also has its distinct political logic: when society is governed through temporary scenes of catastrophe, political responses easily become repressive and tend to reproduce and intensify societal inequalities (Anderson, 2015). The climate governance literature has similarly warned that climate emergency framings may undermine the space for deliberation in policy and planning (Haarstad et al., 2023; McHugh et al., 2021). Rather than the proactive mobilisation of desirable futures, then, action becomes refashioned as the “postponement of the future” (Hu, 2018, page 96).

Distinct from far future time horizons and narrow presentism, the near future is the domain of deliberation and planning. Indeed, Abram (2014) argues that the near future is an important temporal orientation at the municipal level where planners are well versed in negotiating multiple time horizons at once (cf. Hillier, 2008). Here, long-term land use plans spanning beyond the electoral period are supplemented by more near-term detailed plans. However, such detailed plans may be created by “private developers [who] are not leading the way towards transformative change” (Amundsen et al., 2018, page 26). Similarly, more long-term strategic municipal climate plans are often supplemented with more near-term operationalisations of the climate plan. Near-term planning may also allow for the management of conflicts between different goals, although at a local level “planners lack the tools to handle conflicting goals properly, and local politicians have incentives to avoid handling goal conflicts within electoral cycles” (Oseland and Haarstad, 2022, page 2). Similarly, citizen’s climate assemblies purport to create space for democratic deliberation in relation to growing climate urgency (Davies et al., 2021; Sandover et al., 2021).

In short, when examining how the future can become an immediate concern which gives direction to the present, the nature of those temporal orientations matters. Moving between these different temporal orientations takes active efforts of translation which emphasise particular framings of problems which in turn serve to legitimise particular solutions and modes of governance. We will now proceed to discuss the practices involved in translating climate change across time horizons.

### 3. Practices of translation across time horizons

The preceding chapter has articulated the implications of different temporal orientations for climate governance. We have seen how enabling proactive climate governance in the present depends on the capacity to translate climate change between different temporal scales, e.g. from the abstract far future to the near future which is the domain of planning and deliberation. The climate governance literature has shown how such attempts in “rendering climate change governable” (Oels, 2005) are intertwined with particular knowledge practices and shaped by particular rationalities and technologies of government (Lövbrand and Stripple, 2013; Miller and Rose, 2008). This literature has drawn on Foucauldian notions of governmentality (Lemke, 2002) in order to unbox the arrangements through which climate is represented, ordered, and governed (Stripple and Bulkeley, 2013).

Different regimes of climate governance draw on different knowledge practices which frame climate change in particular ways. Accordingly, different framings of climate change lead to distinct fields of visibility, technical practices, and preferred policy options. For instance, a formative paper by Oels (2005) outlined a shift in climate governmentalities from a regime constituted by biopower and global planetary management to an emphasis on advanced liberal government which focuses on market-based solutions and cost-effectiveness. As such, climate governance regimes have implications for what kind of

policy options are made preferred and available. Furthermore, these dominant climate governmentality regimes have marginalised more critical discourses where climate change has been framed in terms of overconsumption and problems inherent in the capitalist system (see Bäckstrand and Lövbrand, 2006). At the same time, regimes are not necessarily coherent across scales. Therefore, national measures might be shaped by “overarching state rationalities”, while “local levels may be able to take on technologies of government not normally associated with such a rationality” allowing for the proliferation of bottom-up climate strategies (Juhola et al., 2011).

Adding a governmentality lens to the analysis of the temporalities of climate governance foregrounds how establishing the present relevance of climate change demands active work of translation between temporal scales. This work is shaped by prevailing governance regimes, hence rendering particular aspects of the climate relevant for decisions in the present while blurring others. We will now examine three dimensions of these practices of translation across temporal scales: (a) aligning the temporalities of climate action, (b) selectively rendering future climate change legible, and (c) managing uncertainties. These three dimensions are inductively derived from the empirical analysis (see Sections 4 and 5) in dialogue with the conceptual literature presented in Sections 2 and 3.

First, *aligning the temporalities of climate action*: In order to make climate change governable it needs to be aligned with the temporal cycles of the concerned organisations and institutions. For instance, Sareen et al. (2021) found that the “temporal organisation of events is a key constraint” in municipal sustainability initiatives. In other words, climate change needs to be aligned with the temporalities of municipal organisation which, according to Abram (2014, page 136) “is a constant balancing of temporal cycles and of managing the progression through interlocking activities, and of meeting successive deadlines” (Abram, 2014, page 136). Such temporalities of municipal planning are both “fleetingly concretized into planning documents” and organised in cyclical calendars such as electoral cycles and the annual budget cycle (Abram, 2014, page 132). This highlights the need to negotiate multiple different but interconnected temporal cycles, speeds and time scales, and handle delays at multiple geographical scales.

Second, *selectively rendering future climate change legible in the present*: This alignment of the temporalities of climate action depends on active practices of translation between different temporal orientations, linked to what Anderson (2010) understands as anticipatory technologies. Following the governmentality literature, these translations across temporal orientations are understood to draw on particular rationalities, modes of imagination, and language to “represent [a domain] in a form amenable to political deliberation, argument and scheming” (Miller and Rose, 2008, page 31). In other words, making climate change governable depends on attempts to represent and order climate change across time horizons to make it legible for the concerned actors. Central to these efforts have been practices of calculation and quantification and also a deliberate simplification of the issues that are rendered legible (Stripple and Bulkeley, 2013). This reduction of the inherent complexities of a problematic by geographically, institutionally or conceptually delimiting the scope of the regulatory object also leads to a particular framing of the problem (Lidskog et al., 2011). Such “framing conditions” shape which technological approaches appear as preferable (Stirling, 2008). As a result, practices of translation across time scales serve to reduce and frame complex issues in certain ways which make particular lines of action rational and (im)possible.

Third, *managing uncertainties*: When translating climate change across temporal orientations, actors also need to accommodate the fact that the future is unknowable and inherently uncertain. As Scoones and Stirling (2020, page 2) observe, “[u]ncertainties are inevitable in this negotiation of diverse, possible futures concerning different pathways and their consequences”. Therefore, the management of uncertainty is often a central concern when rendering a problematic such as climate change legible and governable. Often this means blackboxing the

uncertain, effectively bracketing off inherent uncertainties (in e.g. the global warming potential of different gases) that could prevent the efficient operation of governance (MacKenzie, 2009). However, such reduction of uncertainty may also reinforce logics of control and lead to the “invisible foreclosing of possible futures” (Scoones and Stirling, 2020, page 2).

Making climate change governable in the present depends on practices of translation which reorients the temporalities of climate action, renders climate legible, and manages uncertainties. However, translating climate change across temporal orientations implies a reduction of inherent complexities and uncertainties which make some interventions more rational than others. After outlining the methodological procedures, we will examine how these practices play out in Oslo’s climate budgeting approach.

#### 4. Methods

This paper draws on evidence from Oslo’s climate budget and climate strategy documents as well as their technical documentation and manuals (see Appendix 1 for a complete list of documents analysed). Most of these documents have been produced by Oslo’s municipal administration, while some are commissioned reports from consultancies and research institutes. Since Oslo is enthusiastically marketing climate budgets as a governance tool nationally as well as internationally, this technical documentation is extensive.

Data from document analysis has been contextualised through participation in conferences, seminars, webinars, and 7 semi-structured interviews with key actors and stakeholders involved in Oslo’s climate projects (see Appendix 2 for a complete list of conferences, seminars and webinars). The interview respondents were strategically selected on the basis of their engagement with climate budgets and/or Oslo’s climate projects. The interviews were conducted in Norwegian, were between 30 and 60 min in length, and followed a thematic interview guide which was updated prior to each interview based on a first analysis of earlier empirical evidence. The overarching themes explored were Oslo’s climate ambitions and the climate budgeting methodology, the relationship between different municipal authorities and the role of international collaboration.

Reports, notes from webinars, and interview transcripts were analysed thematically by the author. In this process, patterns and themes were built from the bottom-up as a set of codes were derived based on a preliminary reading of the empirical material and were then collated into themes in dialogue with the conceptual literature (Squires, 2023). The themes focused on which aspects of climate change were considered in the climate budgets, how they related to the temporality of climate action, how uncertainties were managed, and what was seen as the main strengths and weaknesses of the climate budgeting approach.

#### 5. Climate budgets in Oslo

Oslo, the capital of Norway, has in recent years established itself as a frontrunner in urban climate action. In 2016, the Oslo city council committed to reducing carbon emissions by 50% by 2020 and 95% by 2030 (compared to a 1990 baseline) and has in subsequent years launched a number of high-profile initiatives to meet these targets, including development of bicycling infrastructure, the creation of a car-free city centre, and fossil free construction sites (Oslo Kommune, 2016, 2020). These efforts have led to considerable international recognition; Oslo has the status of an Innovator City in the C40 Cities network and was the 2019 European Green Capital.

Among the initiatives that have gained the most national and international attention is Oslo’s pioneering work with climate budgets (Climate Agency, City of Oslo, 2018). Climate budgets can be seen as an operationalisation of municipal climate targets and action plans by integrating their goals and implications into the overarching financial budget process. A maximum volume for carbon emissions for each year

is determined, and the climate budget contains the measures and instruments needed to stay within this emissions cap. Oslo’s climate budgeting has subsequently been picked up by international networks, most importantly the C40 Cities network which has promoted it as a tool to actually implement the ambitious plans that many cities already have. Indeed, the climate budget’s focus on quantifiable measures resonates well with the enthusiasm for data within the C40 network, which asserts that “science and data inform our thinking, not ideology or politics”.<sup>2</sup> The climate budgeting methodology has also been mobilised nationally through Norwegian municipal partnerships (Climate Agency, City of Oslo, 2021).

The work on climate budgeting in Oslo has brought together a broad network of different actors that contribute to different parts of the process. While the climate budget is owned by the municipal Department of Finance, the technical expertise and actual work in coordinating the development of the climate budget is situated at the Climate Agency which is part of the Department of Environment and Transportation. Moreover, all municipal departments and agencies are expected to contribute with measures to decrease carbon emissions. A number of public and private organisations are also providing technical support in different stages of the climate budgeting. An emissions baseline scenario for Oslo was developed by the research institutes CICERO and The Institute for Transport Economics (Aamaas et al., 2019). Several private consultancies are involved in modelling the emission reduction potential of different measures proposed in the climate budget. Furthermore, the final performance of the different initiatives is verified by national statistics on municipal carbon emissions provided by the Norwegian Environment Agency and the national statistics agency Statistics Norway.

We will now proceed to discuss how climate budgeting reorients climate governance in Oslo, focusing on how it aligns the temporalities of climate action (5.1), renders climate change legible (5.2), and manages uncertainty (5.3).

##### 5.1. Aligning the temporalities of climate action

The climate budget worked to align the temporalities of climate action with the temporal cycles of municipal planning. It was explicitly born out of the need to restructure climate change in order to make it a near future concern. At the CitiesIPCC conference on urban climate action in Edmonton, Canada in March 2018, Oslo Vice Mayor for Transportation Lan Marie Berg emphasised the insufficiency of setting climate “targets that are far into the future, for the next administration to solve”.<sup>3</sup> Instead, it was of essence to establish the need for immediate action. The climate budget, Berg argued, “is a tool to operationalise on an annual basis our climate goals.”<sup>4</sup> Similarly, at a seminar with the Eurocities network, a senior Oslo official noted that the climate budget was developed in response to the feeling that “climate policy and the discussion around setting targets and measures for emission reduction were pushed too far into the future.” Furthermore, “there was really no way for the public or the NGOs or the media to check whether countries were progressing fast enough on delivering these commitments.”<sup>5</sup> The climate budget, it was argued, would secure transparency and accountability as the city worked to meet its climate ambitions.

In practice, this means that the operationalisation of the climate plan

<sup>2</sup> Michael Bloomberg, C40 Board President, at the C40 World Mayor’s Summit in Copenhagen, October 10th, 2019.

<sup>3</sup> Lan Marie Berg, Vice Mayor of Environment and Transportation, Oslo, at CitiesIPCC conference, Edmonton, Canada. Session on Solutions for the Transition to Low Carbon and Climate Resilient Cities, March 6th 2018.

<sup>4</sup> Ibid.

<sup>5</sup> Senior Oslo official, pre-recorded message for the Eurocities mobility forum, March 2019. Recording available here: <https://www.youtube.com/watch?v=BKM-G1sfhm0> (retrieved 20 June 2022).



through the climate budget is aligned with the ordinary planning and reporting cycle of the financial budget (Climate Agency, City of Oslo, 2018). First, the yearly need for cuts in greenhouse gas emissions is articulated through the translation of long-term climate targets into yearly emissions budgets. Measures to reduce emissions to close the emissions gap are then identified, and their emission reduction potential modelled. These measures are proposed by all municipal departments, and the overall work is coordinated and supported by Oslo's Climate Agency. The measures, along with their estimated emission reduction, estimated costs and funding sources, as well as the agency responsible for implementation is then entered into the climate budget. The climate budget is approved along with the financial budget by the city council. Progress of the implementation of the measures in the climate budget is reported three times per year, following the same reporting cycle as for the city's performance on economic indicators. The final outcome is verified by national statistics on municipal carbon emissions, produced by Statistics Norway and the Norwegian Environment Agency.

Officials in the municipal administration highlighted that a key benefit of the climate budget is that it allows them to identify gaps between needed cuts and existing measures, and then evaluate responses to bridge this gap. One person involved in the project noted that a "strength is that it becomes evident if you do not carry out enough measures, and therefore one has to implement new measures and instruments".<sup>6</sup> In other words, "the system triggers a need to take action,"<sup>7</sup> and makes sure that action and funding is prioritised to meet the climate target.<sup>8</sup>

However, officials also discussed difficulties in aligning the climate work with the temporal cycles of the economic budgeting process. For instance, at a webinar, an official involved in a climate budget pilot project in a neighbouring municipality noted that economic budgeting and climate budgeting require different amounts of time. In particular, the modelling of the potential emission reductions of proposed measures was time intensive. This meant that it was difficult to have the estimated emission reductions of different measures ready in time if the climate budgeting process was initiated at the same time as the economic budgeting.<sup>9</sup> Furthermore, an official raised the issue that there might be a risk that the long-term might be forgotten when climate budgeting concentrates the climate mitigation efforts to immediate interventions in the next four years.<sup>10</sup>

Another challenge was that the rapid cycles of climate action in the climate budgets was not aligned with the temporal cycles of national statistics. For instance, the climate budget work draws on municipal scale carbon emission statistics provided by the national Norwegian Environment Agency. Since these statistics take one and a half years to prepare, the municipality experiences a two-year delay in the verification of the emission reductions from implemented measures.<sup>11</sup> An official involved in Oslo's climate budgeting observed that "there is all the way an uncertainty connected to the actual size of the emissions, and we will only get a confirmed answer of whether we reach the 2020 target in 2022."<sup>12</sup> The municipalities were now working together with the

<sup>6</sup> Personal communication, municipal official, June 2019. The interview was recorded, transcribed, and relevant quotes translated from Norwegian to English by the author.

<sup>7</sup> Senior Oslo official at Planning a sustainable city through Carbon Budgets webinar, Covenant of Mayors, September 2018.

<sup>8</sup> Senior Oslo official, pre-recorded message for the Eurocities mobility forum, March 2019. Recording available here: <https://www.youtube.com/watch?v=BKM-G1sfhm0> (retrieved 20 June 2022).

<sup>9</sup> Breakfast webinar on climate accounting, Tekna union, May 2019.

<sup>10</sup> Ibid.

<sup>11</sup> Senior Oslo official at Planning a sustainable city through Carbon Budgets webinar, Covenant of Mayors, September 2018.

<sup>12</sup> Personal communication, municipal official, June 2019. The interview was recorded, transcribed, and relevant quotes translated from Norwegian to English by the author.

Norwegian Environment Agency to find ways to reduce the delay in the provision of municipal emissions statistics.

To partially alleviate this problem, the municipality developed a portal – known as the Climate Barometer – with supplemented the national statistics with more rapidly available indicators that the municipality could produce on its own. These indicators – which traced the trends in the sale of new cars, the distribution of different fuels sold at petrol stations, and the use of fossil heating oil – were updated three times per year. To ensure transparency, they were also publicly available at the municipality's website.<sup>13</sup> According to an official involved in Oslo's climate budgeting, these indicators provided a sense of "which direction the emissions may point" although they are not necessarily "one-to-one with the emissions."<sup>14</sup> The indicators were able to track progress, but the municipality still depended on national statistics to verify their results.

Oslo's climate mitigation efforts therefore depended on a number of practices to translate climate change from a long-term problem to a more immediate concern affecting the budget cycle at an annual basis, hence aligning the temporalities of climate action and municipal planning. However, this temporal alignment was constrained by the time intensive process of modelling potential emission reductions of proposed measures, as well as a mismatch between the rapid budget reporting cycle and the slower timelines of national statistics. In the next section, we will discuss the mechanisms and practices through which the translation of the temporalities of climate action is accomplished, and how this also leads to particular framings of climate change as the problem is selectively rendered legible for the municipality.

## 5.2. Rendering future climate change legible in the present

The climate budget worked to selectively make the often long-term temporalities of climate change legible in the present. This translation of climate change from a long-term issue to a problem of immediate relevance for the municipality depended on how the climate budget renders climate change legible for the municipality; the climate budget organises climate change in a particular way that can be comprehended and acted upon by the regular governance structures of the city. This is a complicated process which involves several different actors and which also leads to a selective picture of climate change as the scope and system boundaries are defined, a base line scenario is established, and the emission reduction potential of various measures are modelled. We will examine each of these steps in turn.

In order to make climate change governable here and now, climate budgeting reduces the inherent complexities of climate change in several ways, thereby narrowing the scope of the problem. First of all, the climate budget's status as a chapter in the larger economic budget for the city has implications for how climate change is framed and which measures to decrease emissions are included. The much-repeated aim to "count carbon dioxide the same way as we count money" provides a clear focus on greenhouse gas emissions, in other words climate mitigation. While the broader Climate Strategy (Oslo Kommune, 2020) also includes goals connected to climate adaptation and land use, these are not operationalised through the climate budget document. Also, while the climate budget both includes relatively short-term interventions with an estimated potential to reduce carbon emissions and a list of more long term measures, its main thrust is clearly placed on the former (Climate Agency, City of Oslo, 2018). Finally, we should note that the climate budget chapter only covers specific measures to cut carbon emissions, and not the potential climate impact of *all* budget decisions in

<sup>13</sup> Oslo's Climate Barometer, available at <https://www.klimaoslo.no/klimabarometer/> (retrieved March 15, 2022).

<sup>14</sup> Personal communication, municipal official, June 2019. The interview was recorded, transcribed, and relevant quotes translated from Norwegian to English by the author.

the city (although some of those other decisions might be included in the baseline scenario). As such, the climate budgets deliberately demarcate the sectoral and temporal scope of climate action.

Moreover, the way that the system boundaries are defined serves to further narrow the scope of the climate budget. Officials in Oslo are keen to highlight that the climate budget is a flexible tool which can be used with different system boundaries, including direct and indirect emissions. As more municipalities are experimenting with climate budgets, their implementation, including how they define their system boundaries, varies.<sup>15</sup> However, in Oslo, the climate administration strongly recommended to focus the climate budget on direct emissions (*Oslo Kommune, 2018*). This was because a solid numerical foundation was available for direct emissions while indirect emissions were more uncertain, and the municipality had more control over the former.<sup>16</sup>

The climate budgeting approach served to further delimit the problematic of climate change through the practices through which carbon dioxide was actually “counted”. This exercise involved multiple actors as emissions targets were operationalised into concrete, quantified interventions. In the preparation of climate budgets, percentage emissions targets are translated to yearly carbon budgets (*Oslo Kommune, 2019*, page 9). Measures to reduce emissions in the sectors of heating, waste and energy supply, road traffic, construction machinery, and marine traffic were then identified in relation to a baseline emissions scenario commissioned from the CICERO research institute (*Aamaas et al., 2019*). The estimated emission reduction potential for each measure was modelled, both in-house by Oslo’s Climate Agency and by external consultancies and research institutes (*Sundvor and Øvring, 2019; Multikonsult, 2018a; Multikonsult, 2018b*). Through this process, climate budgeting tended served to frame climate change as a predominantly technical problem open to calculation.

This quantified framing of climate change had implications for the type of measures that were proposed. Most of these quantified measures involved technical interventions to phase out fossil fuels and shifting to biofuels and electricity for heating, transport, and machinery (*Oslo Kommune, 2019*). There is one notable exception, which concerns the provision of bicycle lanes to partially shift private mobility from cars to bicycles, hence involving a change in mobility behaviour and practice (*Oslo Kommune, 2019*, page 12). In addition to these quantified measures, the climate budget also provides a list of non-quantified measures which are expected to lead to emission reductions by 2030. Municipal officials observed that many of the proposed measures were of a “technical” character. However, they also noted the (unquantified) potential of these technical interventions to affect other spheres of the climate transformation, e.g., social practices and the patterns of production and consumption which shape the indirect emissions of the city.<sup>17</sup>

The example of climate budgeting demonstrates how the translation of climate change into an issue of immediate relevance is a selective exercise which is shaped by prevailing logics of governance, in this case calculative approach of budgeting. Here, the definition of systems boundaries, the emissions baseline and establishment of potential emission reductions from climate interventions led to a selective rendering of climate change which focused on a subset of the issues identified in the broader climate strategy. However, in working with these calculations and estimates, urban actors needed to negotiate a shifting landscape characterised by uncertainties at multiple levels. This will be the topic of the following section.

### 5.3. Managing uncertainty

The proper management of inherent uncertainties about the future

was seen to be at the core of the legitimacy of the climate budgeting approach. When the climate budget is communicated, its close ties with the ordinary financial budget is emphasised. As Deputy Mayor for Transportation Lan Marie Berg noted: “The climate budget works like an ordinary budget, meaning that an overall maximum emission volume is set for each year. This is comparable to the maximum expenditure level in the financial budget”.<sup>18</sup> Here, the level of detail in the climate budget is also stressed. Oslo’s governing Mayor Raymond Johansen noted at the C40 Cities Summit in Copenhagen 2019 that “[i]n the future to fulfil the green shift it is important to discuss on how to govern it – the devil is in the details and the climate budget gives all the details.”<sup>19</sup> Hence, Oslo’s Climate Agency underscores the need for a solid numerical foundation in climate budgeting (and climate planning overall) as essential both for planning and for tracking results (*Oslo Kommune, 2018*).

In other words, the analogy between the climate budget and the financial budget suggests detailed indicators and a sense of certainty with regard to the numbers and methodologies used in the budget. This has implications for how the climate budget is organised and for what is included in the budget. For instance, the uncertainties inherent in estimating the effects of interventions targeting indirect emissions was a key argument for not including these emissions in the climate budget. An official involved in the climate budget project noted that “it will be much more demanding to make a life cycle analysis for all the measures we make. So, it is a simplification to only include direct emissions, and then we try to point towards the consequences that concrete actions might have for the indirect [emissions].”<sup>20</sup> In contrast, measures targeting direct emissions were understood to be based on a solid numerical foundation from the Norwegian EPA, with a known uncertainty range. At the same time, the same official underscored that “that’s not to say that Oslo does not consider this important” and stressed that the “city has a target to reduce indirect emissions, and evaluate all budget proposals and projects on indirect effects.”<sup>21</sup>

However, in practice, the need to establish this impression of certainty contrasts with the actually existing uncertainties at the different stages of the climate budgeting process. For instance, modelling the emission reduction potential proved to be difficult even for direct emissions. In one instance, as the climate budget for 2019 was prepared, an updated estimate for road transport measures included in the “Oslopakke 3” which significantly reduced the anticipated emission reduction potential of these measures (*Multikonsult, 2018b*). In practice, this meant that the municipality suddenly had an additional gap of 60 000 tons of carbon dioxide equivalents to bridge, amounting to thirty percent of the total emission reduction potential of all quantified measures in the 2019 climate budget (*Oslo Kommune, 2019*).

Another example was the changing of the baseline year for Oslo’s climate targets from 1990 to 2009 when the Norwegian EPA developed new, detailed municipal scale emissions statistics with 2009 as a starting year. However, since Oslo’s climate goals stated in percent remained the same, the implications of these targets as they were operationalised in terms of tons of carbon dioxide equivalents changed. Furthermore, in the early years of climate budgeting, changes in statistical methods could make the mandated emission reductions stated in tons of carbon dioxide equivalents change from year to year.<sup>22</sup>

Moverover, the delay in the provision of national municipal level

<sup>18</sup> Lan Marie Berg, Vice Mayor of Environment and Transportation, Oslo, at CitiesIPCC conference, Edmonton, Canada. Session on Solutions for the Transition to Low Carbon and Climate Resilient Cities, March 6th 2018.

<sup>19</sup> Raymond Johansen, Governing Mayor of Oslo, at the C40 World Mayor’s Summit in Copenhagen, October 2019.

<sup>20</sup> Personal communication, municipal official, June 2019. The interview was recorded, transcribed, and relevant quotes translated from Norwegian by the author.

<sup>21</sup> Ibid.

<sup>22</sup> Ibid.

<sup>15</sup> Breakfast webinar on climate accounting, Tekna union, May 2019.

<sup>16</sup> Ibid.

<sup>17</sup> Ibid.

greenhouse gas emissions statistics led to difficulties in verifying the emission reductions from the implemented measures (see Section 5.1). Indeed, when the Norwegian EPA published the municipal level emissions statistics for 2018 (in June 2020), they showed a slight increase in emissions (2.9 %) from 2017 to 2018 instead of a reduction (KlimaOslo, 2020). Hence, misalignment between different time scales also generated uncertainties that were difficult to manage.

Therefore, while measures were taken to limit the uncertainties inherent in climate planning, for instance by narrowing the scope of climate budgeting to focus on direct emissions, such uncertainties could not be avoided entirely. Municipal actors therefore had to pursue a flexible approach to deal with those uncertainties that could not be avoided. Officials noted that these uncertainties should not stand in the way for ambitious and deliberate climate action, since the goal is to get down to virtually zero emissions in any case.

## 6. Discussion and conclusions

This paper contributes to the ongoing efforts to articulate how climate change is made governable in specific times and places through particular logics of governance. Its distinct contribution is to provide a conceptual approach to assess the temporal dimensions of this work, foregrounding the (a) the alignment of multiple temporalities of climate action, (b) how future climate change is rendered legible in the present, and (c) the management of uncertainty. Hulme (2007) observes that “[c]limate change knowledge and meaning travels uncomfortably across scales and needs constant re-interpretation as it is applied in different spatial contexts.” This paper shows that this argument holds true also in terms of the temporal scales of climate change. By bringing together literatures on temporality and governmentality (e.g., Abram, 2014; Anderson, 2010; Guyer, 2007; Lövbrand and Stripple, 2013; Miller and Rose, 2008), this paper has foregrounded the technical practices involved in translating and re-interpreting climate change at different temporal scales and cycles. As such, it brings attention to the active work involved in transforming “in a highly selective way distant temporal relevances into present social ones” (Luhmann, 1976).

Drawing on the case of Oslo’s innovative climate budgets, the paper demonstrates how the accomplishment of climate governance depends on technical practices which establish the need for immediate action and integrates climate action within the overall cycles of urban governance and planning, thereby aligning the multiple temporalities of planning and climate action. As such, the key achievement of Oslo’s climate budgeting methodology might be how it establishes responsibility for climate change in the here and now. This paper sheds light on how this articulation of responsibility locally and in the present depends on active work by situated actors in translating and aligning a problem previously conceived as a distant future one into something of immediate relevance. As such, the paper adds to the literature on the temporalities of planning by demonstrating how actors relate to multiple time scales in a pragmatic and dynamic rather than static way (cf. Abram, 2014; Guyer, 2007; Hillier, 2008; Sareen et al. 2021). It also shows how the alignment of and movement between these different co-existing temporal orientations is never smooth or perfect.

It follows that efforts to move between time scales will always be partial and shaped by the prevailing logics and structures of governance, leading to a selective rendering of future climate change into the present. Approaches from the governmentality literature can here serve to articulate the rationalities and technologies of power through which this translation of climate change temporalities is accomplished (Bulkeley, 2016; Lövbrand and Stripple, 2013; Stripple and Bulkeley, 2013). The example of Oslo’s climate budget demonstrates the multitude of different actors and practices that need to be brought together in order to accomplish urban climate governance. However, it also shows how the selection of particular tools and methods in this work leads to a selective rendering of future climate change into the present. Here the budget metaphor and the ambition to “count carbon dioxide the same

way as we count money” have shaped how climate change is represented in Oslo’s efforts to govern climate change.

In these efforts, the management of uncertainty has been key. The budget metaphor brings with it a strong focus on calculation, quantification, and (un)certainty. Accordingly, the climate budget focuses on the aspects of climate change (mitigation) governance which are understood to be possible to quantify and count within reasonable degrees of certainty. As such, rendering climate change governable through the climate budget process depends on simplification and management of inherent complexities and uncertainties (cf. Scoones and Stirling, 2020; Stirling, 2008). This links to a predominant focus on reducing direct rather than indirect emissions which are regarded as less uncertain. Similarly, the measures included in the climate budget are predominantly technical interventions where the emission reduction potential can be quantified. Therefore, this paper demonstrates how practices involved in managing uncertainty significantly shape efforts to restructure the temporality of climate action and establish climate change as an immediate political concern.

This paper adds a case study of local climate governance to the growing literature on climate governmentalities which has to a large degree focused on the national level and multilateral mechanisms. Examining local governance through a governmentality lens shows how accomplishing local climate action depends on the alignment of multiple actors in active efforts of rescaling climate change in both time and space. This also serves to frame climate change in particular ways that align with the extant logics of urban governance. As a result, the climate budget serves to successfully re-interpret climate change as a problematic which fits within current modes of governing the city, rather than transforming urban governance itself.

Nonetheless, the climate budgeting approach also provides a means to establish urgency in climate action that is an alternative to the fragmented temporalities of disaster management and emergency governance (McHugh et al., 2021). Here, the operationalisation of climate change as a near future concern through climate budgeting creates a space in which urgency and immediate climate action can be combined with the political deliberation of planning and local democracy. This links to broader calls to create new political arenas in which to respond to the climate challenge (Davies et al., 2021). In other words, responding to climate urgency does not by necessity have to lead to the erosion of democratic structures but can also spark off a rejuvenation of deliberative governance.

### *CRedit* authorship contribution statement

**Jakob Grandin:** Conceptualization, Methodology, Writing – review & editing.

### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Data availability

The authors do not have permission to share data.

### Acknowledgements

The author is grateful to Håvard Haarstad, Helene Nilsen and two anonymous reviewers for insightful comments that led to significant improvements of this paper. Thanks are also due to the informants for generously sharing their experience and perspectives. The article is based on research funded by the Trond Mohn Foundation (grant number BFS2016REK04).

## Appendix 1:. List of documents analysed

Title/theme	Publisher	Type	Published
Referansebane og framskrivning for Oslos klimagassutslipp mot 2030	CICERO and Insititute for Transportation Research	Technical report	2019
Climate Budget 2018: Preliminaries/Climate budget 2018/Technical report	Climate Agency, City of Oslo	Plan and technical report	2018
Manual for climate budgets as a governance tool	Climate Agency, City of Oslo	Technical report	2021
Nye beregninger viser økte utslipp i 2018	KlimaOslo	News report	2020
Effekt av nye virkemidler for å redusere utslipp av klimagasser fra vare- og nyttetransporten i Oslo kommune	Multikonsult	Technical report	2018
Reduserte klimagassutslipp som følge av revidert Oslopakke 3	Multikonsult	Technical report	2018
Bilfritt byliv: styringsdokument	Multikonsult	Steering document	2016
Kunnskapsgrunnlag for satsingsområder: Klimastrategi 2030	City of Oslo	Technical report	2018
Klimabudsjett 2020: Kapittel 2 i Byrådets forslag til budsjett 2020 med vedlegg	City of Oslo	Plan	2019
Klimastrategi for Oslo mot 2030	City of Oslo	Plan	2020
Utslipp fra lastebiler knyttet til bygg- og anleggsvirksomhet i Oslo	Insititute for Transportation Research	Technical report	2019

## Appendix 2:. List of conferences, seminars, and webinars analysed

Title/theme	Organiser	Type	Place	Date
How to create car-free and attractive city centres	ICLEI and City of Oslo	Seminar	Brussels	May 2017
Cities of the future	Litteraturhuset	Seminar	Bergen	Aug 2017
Climate budgets for municipalities	Norwegian Environment Agency	Webinar	Virtual	Mar 2018
CitiesIPCC Cities and Climate Change Science Conference	IPCC	Conference	Edmonton/ streamed	Mar 2018
A better climate for cities	European Commission	Webinar	Brussels	May 2018
Oslo's Climate Budget [Part I]: The Mayor's voice	C40	Webinar	Virtual	May 2018
Oslo's Climate Budget [Part II]: Technical drill	C40	Webinar	Virtual	Jun 2018
Planning a sustainable city through Carbon Budgets	Covenant of Mayors	Webinar	Virtual	Sep 2018
Eurocities mobility forum	Eurocities	Conference	Virtual	Mar 2019
Breakfast seminar on climate accounting	Tekna union	Webinar	Virtual	May 2019
Count with CO2	Climate Agency, City of Oslo	Seminar	Arendal	Aug 2019
C40 World Mayor's Summit	C40	Conference	Copenhagen/streamed	Oct 2019
Municipal Climate Budgets	Tekna union	Webinar	Virtual	Sep 2020
The road to climate budgets	City of Oslo	Webinar	Virtual	Jan 2021

## References

- Aamaas, B., Korsbakken, J.I., Madslie, A., 2019. Referansebane og framskrivning for Oslos klimagassutslipp mot 2030. CICERO & TØI, Oslo.
- Abram, S., 2014. The time it takes: temporalities of planning. *J. Roy. Anthropol. Inst.* 20, 129–147.
- Adam, B., Groves, C., 2007. *Future Matters: Action, Knowledge, Ethics*. Brill, Leiden.
- Adey, P., Anderson, B., 2011. Event and anticipation: UK civil contingencies and the space—times of decision. *Environ. Plan. A* 43 (12), 2878–2899.
- Amundsen, H., Hovelsrud, G.K., Aall, C., Karlsson, M., Westskog, H., 2018. Local governments as drivers for societal transformation: towards the 1.5. *Curr. Opin. Environ. Sust.* 31, 23–29.
- Anderson, B., 2010. Preemption, precaution, preparedness: anticipatory action and future geographies. *Prog. Human Geogr.* 34 (6), 777–798.
- Anderson, B., 2015. Governing emergencies: the politics of delay and the logic of response. *Trans. Inst. Brit. Geogr.* 41 (1), 14–26.
- Bäckstrand, K., Lövbrand, E., 2006. Planting trees to mitigate climate change: contested discourses of ecological modernization, green governmentality and civic environmentalism. *Glob. Environ. Polit.* 6 (1), 50–75.
- Beck, U., Levy, D., 2013. Cosmopolitanized nations: re-imagining collectivity in world risk society. *Theory Cult. Soc.* 30 (2), 3–31.
- Bulkeley, H., 2005. Reconfiguring environmental governance: Towards a politics of scales and networks. *Polit. Geogr.* 24 (8), 875–902.
- Bulkeley, H. (Ed.), 2016. *Accomplishing Climate Governance*. Cambridge University Press.
- Climate Agency, City of Oslo, 2018. *Climate Budget 2018: Preliminaries / Climate budget 2018 / Technical report*. Climate Agency, Oslo.
- Climate Agency, City of Oslo, 2021. *Manual for climate budgets as a governance tool*. Oslo.
- Cooper, M., 2016. Pre-empting emergence. *Theory Cult. Soc.* 23 (4), 113–135.
- Davies, A., Castán Broto, V., Hügel, S., 2021. Editorial: is there a new climate politics? *Polit. Govern.* 9 (2), 1–7.
- Emmerling, J., Drouet, L., Wijst, K.-I., Vuuren, D.V., Bosetti, V., Tavoni, M., 2019. The role of the discount rate for emission pathways and negative emissions. *Environ. Res. Lett.* 14 (10), 104008.
- Guyer, J.I., 2007. Prophecy and the near future: thoughts on macroeconomic, evangelical, and punctuated time. *Am. Ethnol.* 34 (3), 409–421.
- Haarstad, H., 2016. Where are urban energy transitions governed? Conceptualizing the complex governance arrangements for low-carbon mobility in Europe. *Cities* 54 (C), 4–10.
- Haarstad, H., Grandin, J., Kjærås, K., Johnson, E. (Eds.), 2023. *Haste: The slow politics of climate urgency*. UCL Press, London.
- Hansson, S.O., Lilieqvist, K., Björnberg, K.E., Johansson, M.V., 2016. Time horizons and discount rates in Swedish environmental policy: who decides and on what grounds? *Futures* 76, 55–66.
- Head, L., Gibson, C., 2012. Becoming differently modern: Geographic contributions to a generative climate politics. *Prog. Human Geogr.* 36 (6), 699–714.
- Hillier, J., 2008. Plan(e) speaking: a multiplanar theory of spatial planning. *Plan. Theory* 7 (1), 24–50.
- Hu, C., 2018. 'A jungle that is continually encroaching': the time of disaster management. *Environ. Plan. D: Soc. Space* 36 (1).
- Hulme, M., 2007. Geographical work at the boundaries of climate change. *Trans. Inst. Brit. Geogr.* 33 (1), 5–11.
- Jameson, F., 2002. *A Singular Modernity: Essay on the Ontology of the Present*. Verso, London.
- Juhola, S., Kesitalo, E.C.H., Westerhoff, L., 2011. Understanding the framings of climate change adaptation across multiple scales of governance in Europe. *Environ. Polit.* 20 (4), 445–463.
- KlimaOslo, 2020. *Nye beregninger viser økte utslipp i 2018*. KlimaOslo.no. <<https://www.klimaoslo.no/2020/04/23/klimagassutslipp-i-2018-oslo/>>.
- Lamb, W.F., Mattioli, G., Levi, S., Roberts, J.T., Capstick, S., Creutzig, F., Minx, J.C., Müller-Hansen, F., Culhane, T., Steinberger, J.K., 2020. Discourses of climate delay. *Glob. Sust.* 3 e17.
- Lemke, T., 2002. Foucault, governmentality, and critique. *Rethin. Marxism* 14 (3), 49–64.



- Lidskog, R., Uggla, Y., Soneryd, L., 2011. Making transboundary risks governable: reducing complexity, constructing spatial identity, and ascribing capabilities. *AMBIO: J. Human Environ.* 40 (2), 111–120.
- Lövbrand, E., Stripple, J., 2011. Making climate change governable: accounting for carbon as sinks, credits and personal budgets. *Crit. Policy Stud.* 5 (2), 187–200.
- Lövbrand, E., Stripple, J., 2012. Disrupting the public-private distinction: excavating the government of carbon markets post-copenhagen. *Environ. Plan. C: Govern. Policy* 30 (4), 658–674.
- Lövbrand, E., Stripple, J., 2013. In: *Governing the Climate: New Approaches to Rationality, Power and Politics*. Cambridge University Press, pp. 27–41.
- Lövbrand, E., Stripple, J., Wiman, B., 2009. Earth system governmentality. *Glob. Environ. Change* 19 (1), 7–13.
- Luhmann, N., 1976. The future cannot begin: temporal structures in modern society. *Soc. Res.* 43 (1), 130–152.
- MacKenzie, D., 2009. Making things the same: Gases, emission rights and the politics of carbon markets. *Account. Organ. Soc.* 34 (3–4), 440–455.
- Markusson, N., McLaren, D., Tyfield, D., 2018. Towards a cultural political economy of mitigation deterrence by negative emissions technologies (NETs). *Global Sust.* 1 e10.
- Massey, D., 2004. Geographies of responsibility. *Geograf. Ann. Ser. B. Human Geogr.* 86 (1), 5–18.
- Massey, D., 2007. *World city*. Polity, Cambridge.
- McCann, E., 2023. 'Right here, right now': immediacy, space and publicness in the politics of climate crisis. In: Haarstad, H., Grandin, J., Kjærås, K., Johnson, E. (Eds.), *Haste: The slow politics of climate urgency*. UCL Press, pp. 73–82.
- McHugh, L.H., Lemos, M.C., Morrison, T.H., 2021. Risk? Crisis? Emergency? Implications of the new climate emergency framing for governance and policy. *Wiley Interdiscipl. Rev.: Clim. Change* 12 (6), e736.
- McLaren, D., 2020. Quantifying the potential scale of mitigation deterrence from greenhouse gas removal techniques. *Clim. Change* 162 (4), 2411–2428.
- McLaren, D., Markusson, N., 2020. The co-evolution of technological promises, modelling, policies and climate change targets. *Nat. Clim. Change* 10 (5), 392–397.
- Methmann, C., 2013. The sky is the limit: Global warming as global governmentality. *Euro. J. Int. Relat.* 19 (1), 69–91.
- Methmann, C., Oels, A., 2015. From 'fearing' to 'empowering' climate refugees: governing climate-induced migration in the name of resilience. *Secur. Dialog.* 46 (1), 51–68.
- Miller, P., Rose, N.S., 2008. *Governing the present : administering economic, social and personal life*. Polity, Cambridge.
- Multikonsult, 2018a. Effekt av nye virkemidler for å redusere utslipp av klimagasser fra vare- og nyttetransporten i Oslo kommune. Multikonsult, Oslo.
- Multikonsult, 2018b. Reduserte klimagassutslipp som følge av revidert Oslopakke 3. Multikonsult, Oslo.
- Oels, A., 2005. Rendering climate change governable: from biopower to advanced liberal government? *J. Environ. Policy Plan.* 7 (3), 185–207.
- Oels, A., 2013. Rendering climate change governable by risk: From probability to contingency. *Geoforum* 45 (C), 17–29.
- Opitz, S., Tellmann, U., 2015. Future emergencies: temporal politics in law and economy. *Theory Cult. Soc.* 32 (2), 107–129.
- Oseland, S.E., Haarstad, H., 2022. Displacing conflicting goals in planning for sustainability? Insights from three Norwegian cities. *Plan. Theory Pract.* 23 (2), 233–247.
- Oslo Kommune, 2016. *Bilfritt byliv: styringsdokument*. Oslo.
- Oslo Kommune, 2018. *Kunnskapsgrunnlag for satsingsområder: Klimastrategi 2030*. Oslo kommune, Oslo.
- Oslo Kommune, 2019. *Klimabudsjett 2020: Kapittel 2 i Byrådets forslag til budsjett 2020 med vedlegg*. Oslo kommune, Oslo.
- Oslo Kommune, 2020. *Klimastrategi for Oslo mot 2030*. Oslo kommune, Oslo.
- Park, S., 2022. The politics of 21st century environmental disasters. *Environ. Polit.* 31 (1), 1–7.
- Sandover, R., Moseley, A., Devine-Wright, P., 2021. Contrasting views of citizens' assemblies: stake-holder perceptions of public deliberation on climate change. *Polit. Govern.* 9 (2), 76–86.
- Sareen, S., Remme, D., Wågsæther, K., Haarstad, H., 2021. A matter of time: explicating temporality in science and technology studies and Bergen's car-free zone development. *Energy Res. Soc. Sci.* 78, 102128.
- Scoones, I., Stirling, A., 2020. *The Politics of Uncertainty: Challenges of Transformation*. Routledge, Abingdon.
- Steffen, A., 2017. *The real politics of the planetary crisis. The Nearly Now*, <https://thenearlynow.com/the-real-politics-of-the-planetary-crisis-216229324deb>.
- Stirling, A., 2008. 'Opening Up' and 'Closing Down': power, participation, and pluralism in the social appraisal of technology. *Sci. Technol. Human Values* 33 (2), 262–294.
- Stripple, J., Bulkeley, H., 2013. *Governing the climate : new approaches to rationality, power and politics*. Cambridge University Press, New York.
- Sundvor, I., Øvring, T., 2019. *Utslipp fra lastebiler knyttet til bygg- og anleggsvirksomhet i Oslo*. Transportøkonomisk institutt, Oslo.
- Squires, V., 2023. Thematic Analysis. In: Okoko, J.M., Tunison, S., Walker, K.D. (Eds.), *Varieties of Qualitative Research Methods*. Springer, Cham. [https://doi.org/10.1007/978-3-031-04394-9\\_72](https://doi.org/10.1007/978-3-031-04394-9_72).