

Co-production of urban climate planning: Insights from the Barcelona Climate Plan



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ABSTRACT

Climate policy co-production represents an emerging institutional arrangement promising to better and fairly involve societal actors in resilience policy-making. Little evidence exists, however, on how climate policy co-production is understood, planned and performed in cities. This article sheds light on these co-production processes through an in-depth analysis of the case study of the Barcelona Climate Plan. While traditional forms of public engagement such as face-to-face workshops served to collect most proposals from organizations, new tools such as the digital platform resulted in increased lay citizen involvement and process transparency. Participants, including organizers of the co-production process, did not share a clear understanding of what co-production was about, which can endanger the fulfilment of the goals. These findings shed light over effective and limiting procedural and conceptual aspects for co-production of urban climate policies and guide a critical discussion over the added value and the transformative potential of the co-production approach to reframe urban climate resilience planning in cities.

1. Introduction

Against the backdrop of impending climate emergency, urban climate change mitigation and adaptation strategies, and more generally, urban climate resilience planning have intensively been embraced by local and metropolitan authorities worldwide. While this shift has been widely welcomed, previous literature has identified several gaps between theory and practice of urban resilience (e.g., [Archer et al., 2014](#); [Stumpp, 2013](#)) that lead to problematic urban resilience interventions such as socially unjust outcomes ([Zier vogel et al., 2017](#)) or the prioritization of higher-income groups rather than low-income residents ([Anguelovski et al., 2016](#)). These gaps highlight the need to reframe urban climate resilience by restructuring climate governance mechanisms. In particular, people's involvement in climate governance is increasingly considered as a critical factor for effective and inclusive climate change resilience in terms of public empowerment, increased legitimacy and compliance, climate justice and social innovation ([Berenthal, 1990](#); [Castán Broto & Westman, 2020](#); [Galderisi & Colucci, 2018](#); [IPCC, 2014, 2018](#)). However, the institutional challenge of effectively involving lay citizens and other urban stakeholders differently

knowledgeable, responsible, vulnerable, and able to adapt to climate change is a pending issue often not met ([Romero-Lankao et al., 2018](#)). On the one hand, there is still institutional resistance to redistribute power among citizens in conventional planning actions ([Albrechts, 2003](#)). On the other hand, integrating expert and local knowledge and approaches in climate change planning is not an easy task and effective tools are lacking ([Roux et al., 2006](#); [Ruiz-Mallén, 2020](#)). Introducing novel approaches to deeply involve citizens in the process of development and implementation of urban climate resilience planning is a promising pathway for exploration.

In the past few years, both academics and policymakers have embraced the notion of "co-production"¹ within climate change research and policy, generating multiple and contested meanings and uses ([Bremer & Meisch, 2017](#); [Turnhout, Metze, Wyborn, Klenk, & Louder, 2020](#)). While such a myriad of perspectives on co-production in climate change has started to be acknowledged, most research has mainly focused on the science-policy interface (e.g., [Lemos & Morehouse, 2005](#)) or developed empirical case studies in rural settings (e.g., [Homsy & Warner, 2013](#)). Yet, in the urban context, empirical evidence on the co-production of climate governance is so far limited (e.g., [Göpfert et al., 2018](#)).

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¹ Here we refer to the practical/utilitarian rather than the analytical understanding of co-production (see differences in [Lövbrand, 2011](#)). While the concept of co-production gained prominence in the early 1980s to describe citizen-state interactions in US cities ([Mitlin, 2008](#)), in the past few years it has been (re)positioned as a new form of governance ([Sorrentino, Sicilia, & Howlett, 2018](#)).

2019; van de Ven et al., 2016; Wamsler, 2017). Moreover, these few exceptions use co-production as an analytical term mobilized by researchers to describe how urban adaptation plans and knowledge are produced collaboratively. In this regard, they understand co-production as an approach that presumes the involvement of both government and community participants to improve transdisciplinarity (Wamsler, 2017), or as a converging learning process including knowledge sharing and discussion of alternative adaptation measures (van de Ven et al., 2016). By contrast, little is known about how climate policy co-production is understood, planned and performed by those developing and implementing practical urban climate change actions on the ground (i.e., urban practitioners, Howarth et al., 2017).

In this article, we contribute to shed light on how the processes of co-production of climate change policies are practically applied in urban settings through the case study of climate policy-making led by the local government of Barcelona: the Barcelona Climate Plan. Barcelona is an internationally lauded² example of a city performing urban climate experiments guided by the concept of co-production with its local Climate Plan co-produced with citizens in 2017 (Barcelona, 2018a) and its board of organizations co-producing the Climate Emergency Action Plan since late 2019. Its plans and experiences will be probably used during next years to inspire other cities (see Lee & van de Meene, 2012 on transmunicipal climate policy learning) in a context in which inclusive climate action has found a place in international commitments (C40, 2018a; CoM, 2018b) and it will likely be rewarded by funding bodies (e.g., see the new priorities from the Urban Agenda of the EU, 2018). Beyond being internationally recognized as a pioneering urban plan in terms of climate change action and citizen involvement (C40, 2018a, 2018b; CoM, 2018a), we selected the case study of the Barcelona Climate Plan because it explicitly puts into practice the notion of "co-production" in the context of climate change policy planning. While we cannot generalise our findings across all cities, the Barcelona Climate Plan can serve as a paradigmatic case (Flyvbjerg, 2006) because it offers an insightful example to contrast high expectations on co-production with the developments and problems encountered in practice.

This paper aims to understand who is involved in the co-production process behind the Barcelona Climate Plan and how it is operationalized, what impact it has in the final plan, and what expectations and understandings emerge around this co-production process. This research contributes to shed light to non-resolved questions in urban climate resilience and particularly climate governance research and practice such as the reasons behind the different involvement of stakeholders in decision-making and the opportunities and limitations of the available spaces for co-producing knowledge from interaction and reflexivity (Frantzeskaki & Kabisch, 2016; Muñoz-Erickson et al., 2017; Ruiz-Mallén, 2020). Moreover, while previous research has described cases of success and failure of participatory urban climate governance (Anguelovski et al., 2016; Archer et al., 2014; Bulkeley, Carmin, Castán Broto, Edwards, & Fuller, 2013; Castán Broto, Boyd, & Ensor, 2015; Chu et al., 2018), less attention has been paid to empirically track how innovative approaches to engage citizens in climate planning develop in practice (Göpfert et al., 2019; Wamsler, 2017). All in all, our research contributes to the need to understand how the goal of public engagement in urban climate policy has been put into practice through new governance arrangements relying on co-production approaches and what challenges and limits might have emerged (Castán Broto & Westman, 2020; Coenen et al., 2019).

² For instance, the city has been acknowledged for leading on fair or citizen-led climate action by the C40 network (C40, 2018b). Barcelona Climate Plan also won the 2018 Covenant Cities in the Spotlight awards (CoM, 2018a).

2. Citizen involvement in climate change governance: from consultation to co-production

Advocacy for public participation in climate change policy-making has been a recurrent topic in the recommendations of the Intergovernmental Panel on Climate Change (IPCC) experts throughout their five reports, although there have been differing nuances in the way it has been approached. While in the first reports public participation involved consultation and placation, or even the recognition of local knowledge (Berenthal, 1990; IPCC, 1995; IPCC, 2001), arguably it was the fourth report the one that observed a substantial progress in terms of citizens' involvement in risk, adaptation and vulnerability assessments (IPCC, 2007). Indeed, Lemos and Morehouse (2005) notice that the fourth report suggested the idea of promoting stakeholders' interaction in climate change research through a process of co-production of knowledge so as resultant measures to be better suited to local needs and public policy credibility and acceptance increased. In the fifth IPCC report, the idea of co-production of both climate knowledge and policy gained more ground for adaptation in both rural and urban settings (IPCC, 2014). In the last special report of the IPCC, local governments are specifically targeted as key actors to ensure community engagement in both the development and implementation of mitigation and adaptation climate policies (IPCC, 2018). Active involvement of varied stakeholders – particularly lay citizens and minorities – in the discussion of urban climate planning is considered critical to ensure procedural justice, public acceptance and successful policy implementation. Moreover, the special report states that transformative changes for climate-resilient development should also include approaches enabling new ways of decision-making drawing upon diverse knowledge sources.

Co-production represents an emerging approach that tries to address the challenges mentioned before by institutionalising the need to better and fairly involve stakeholders beyond government agencies and experts in public services delivery, knowledge production, or policy-making (Voorberg et al., 2015). Joshi & Moore (2004:31) refer to institutionalised co-production as "*the provision of public services (broadly defined, to include regulation) through a regular long-term relationship between state agencies and organised groups of citizens*". Co-production is also defined as "*the intentional act of engaging extra-scientific actors in the process of scientific knowledge production*" (van der Hel, 2016:166) when those extra-scientific actors shape research directions or mobilise scientific knowledge towards social impact (ibid). Finally, when co-production is understood as a strategy to put citizens at the very center of the decision-making process (Subirats, 2016), it is operationalized on the ground through a variety of governance arrangements involving state and lay actors (Sorrentino, Sicilia, & Howlett, 2018). Although it may resemble other concepts such as collaborative governance or participatory planning, co-production puts the emphasis on citizens' involvement in the production of both knowledge and planning decisions (van Kerckhoff & Lebel, 2015).

Deepening public engagement and participation in urban climate governance through co-production efforts, however, entails an institutional change and therefore may pose several challenges to cities' government, such as the following identified in the literature: lack of coordination between national and local governments climate change agendas; lack of governmental support for grassroots adaptation and mitigation initiatives; institutional rigidity and compartmentalisation hindering the development of integrated climate actions; and lack of participatory methods and traditions to facilitate stakeholders' interactive learning, exchange and shaping of institutional knowledge (Anguelovski & Carmin, 2011; Chu et al., 2018; IPCC, 2014, 2018; Measham et al., 2010; Preston, Westaway, & Yuen, 2011). These challenges mainly highlight the need to keep looking for mechanisms that provide lay citizens with a more prominent role in climate change mitigation and adaptation decision-making at the local level.

Following calls encouraging participation, many cities, especially in

Europe, have designed processes to incorporate local stakeholders into climate planning with different degrees of intensity (Bertoldi, 2018). Some examples include Bratislava (Slovakia) (RESIN, 2016), Bologna (Italy) (Bologna, 2015), and Munich (Germany) (Wamsler, 2017). Those three cities have recently tested three distinct forms of involving stakeholders within climate policy-making ranging from consultation to co-production, though all the initiatives excluded lay citizens and the elaboration process significantly relied on civil servants' inputs. A handful of cities have started to experiment with, design and put into practice innovative forms of public engagement, including lay citizens in the climate planning processes. Illustrative cases include Durban (South Africa), Semarang (Indonesia) (Archer et al., 2014), New York City, Boston and Chicago (USA) (Chu et al., 2018), London (UK) (Siders, 2017), Paris (France) (Paris, 2018), or Barcelona (Spain), as we will show next.

3. The Barcelona climate plan

Barcelona city, north-eastern Spain, has a population of around 1.6 million and a metropolitan area of 3.2 millions (IDESCAT, 2019). As a Mediterranean city, forecasts of climate change in Barcelona anticipate a higher risk of heatwaves, floods, droughts and water scarcity, and sea-level rise by 2100 (Barcelona Regional, 2017). Climate change impacts will unevenly affect the local population, as the vulnerability to heat-related events could be shaped by age, gender, and socio-economic status (Marí-Dell'Olmo et al., 2018). In the light of these prospects, the local government has been challenged to plan a fair transition towards a decarbonised city resilient to the uneven and unavoidable impacts of climate change.

Several climate change policies have been implemented in the city of Barcelona since the mid-1990s by progressively introducing climate mitigation and adaptation into local energy plans (Table 1). In 2002, the local government passed the first comprehensive plan to promote energy efficiency and renewable energies until 2010, to reduce greenhouse emissions and air pollution (Barcelona, 2002). In 2011, a second local energy plan made further efforts to better incorporate concerns related to climate issues stimulated by international commitments, such as the 2008 European Covenant of Mayors. However, this plan was still centred on mitigation, air pollution, and energy issues, with just one out of 108 proposals dealing properly with climate adaptation (Barcelona, 2011). Therefore, the recent Climate Plan has been the first plan in Barcelona that integrates mitigation and adaptation concerns and acknowledges social inequalities behind climate change, to accomplish international commitments, particularly those derived from the 2017 Covenant of Mayors for Climate and Energy (Barcelona, 2018a).

The plan is also the first one that actively involves the local population in its production (Table 1). Indeed, local climate policies have advanced in terms of progressively implementing engagement tools and involving a variety of stakeholders since the first energy plan (2002) that restricted the participation of stakeholders to selected experts. The second energy plan (2011) already included a participatory process engaging more than 250 participants. Yet, lay citizens and NGOs were still omitted. An initial trial to include them in local climate governance came up with the joint declaration of the Barcelona's Commitment to the Climate (Barcelona, 2015), which implied co-designing and co-implementing a climate roadmap agreed between the City Council and several organizations from the *Barcelona + Sostenible* network.³ Building on this precedent, the local government opted for elaborating the Climate Plan (2018) through a process referred as "co-production", particularly relying on organizations from the *Barcelona + Sostenible* network, but kept open to lay citizens and other interested

stakeholders. All those developments have been driven by the changing political priorities regarding citizen participation from the 2015 elected local government led by "Barcelona en Comú" (see Blanco, Salazar, & Bianchi, 2019). The latter, an anti-austerity and grassroots party product of the 15 M and the anti-eviction movements, promised in its electoral programme of 2015 to "promote a shared governance that reinforces the role of direct, deliberative and binding democracy, with face-to-face and digital methodologies" (Barcelona en Comú, 2015:64). In practice, this goal materialized with a series of measures, but particularly with the new Rules of Citizen Participation which understand that "participation has different degrees, from proposal to decision, through moments and spaces for debate and co-production of actions" (Barcelona, 2018b:8). Additionally, the free open-source platform *Decidim Barcelona* was launched in February 2016 to digitally support and enhance this intensification and widening of participatory democratic governance. As we describe below, the engagement process of the Climate Plan was named and designed following the principles of these new rules and was implemented using the digital infrastructure of the platform *Decidim*.

The Barcelona Climate Plan was elaborated between 2015 and 2018 (Fig. 1a). In July 2017, the diagnosis was released and was composed of two documents. On the one hand, a commissioned report assessing the local impacts of climate change, divided into ten hazard-based chapters (e.g., heatwaves, sea-level rise, floods) which evaluated risks and vulnerabilities and also described in detail specific proposals to be included in the plan (Barcelona Regional, 2017). On the other hand, a diagnosis made by civil servants assessing the current framework, analysing the roles and powers of involved stakeholders, and suggesting ideas to be considered for defining the plan's actions. This internal diagnosis was structured around nine topics (i.e., social domain, energy, mobility and air quality, city model, health, food system, biodiversity, water, and governance), and also included the inputs from one inter-departmental workshop with 30 civil servants celebrated on May 2016.

The co-production process started in mid-July 2017, consisted of three phases and used different tools for public engagement (see Fig. 1b and Sub-section 5.1). During the first phase, proposals from participants were collected by the town council through: a) two face-to-face workshops, b) two self-organized sessions, and c) the digital platform *Decidim*. The second phase of the co-production process included the validation and initial prioritization of the proposals collected in the first phase. The municipality organized a face-to-face workshop where proposals compiled were presented and discussed. Finally, the last phase consisted of the acceptance or rejection of the proposals by the team of civil servants in charge of elaborating the plan. All proposals collected were uploaded at the digital platform.⁴

The Barcelona Climate Plan (2018–2030) launched in April 2018 and officially approved in October 2018 contains actions based on the co-produced proposals, the suggestions from the diagnoses, and the civil servants' inputs (Barcelona, 2018a). The resulting plan includes 242 actions, split into five areas (i.e., people first, starting at home, transforming communal spaces, climate economy, and building together) and 18 lines of action (e.g., no energy or water supply cuts, conserving the seafront, zero waste, or cultural action for the climate). The actions listed fall into two-time horizons (i.e., actions to be launched before 2020 and actions to be launched between 2021 and 2030) and four strategic goals (i.e., mitigation, adaptation, climate justice, and promoting citizen action).

4. Methods

We develop a case-study research combining data from interviews, observation and a focus group, as well as a content review of the digital

³ *Barcelona + Sostenible* is a network of approximately 1000 organizations (e.g., NGOs, private companies, schools, trade unions) committed to sustainability and coordinated by the Barcelona City Council.

⁴ This process at the digital platform can be found at: <https://www.decidim.barcelona/processes/placlima>.

Table 1

Evolution of climate policy planning in Barcelona. Note: PMEB is the Catalan abbreviation of the Plan of Energy Improvement of Barcelona, and PECQ is the abbreviation of the Plan of Energy, Climate Change and Air Quality.

Plans	Period	Topics covered	Process of creation
PMEB Energy Plan	2002–2010	Energy and (partially) climate change mitigation	<ul style="list-style-type: none"> ● Consultancy: 10 thematic groups were created and contracted (in total, 27 experts from public and private sectors, professional organizations, and universities) to produce the diagnosis and collect proposals for the plan. A public company (Barcelona Regional) was in charge to design and elaborate the plan, and to propose the experts to be contacted.
PECQ Energy Plan	2011–2020	Energy, air pollution, and climate change mitigation	<ul style="list-style-type: none"> ● Participatory process: the City Council organized eight thematic groups with stakeholders (253 participants from public and private sectors, professional and labour organizations, and universities) to collect suggestions and proposals for the plan. These face-to-face sessions were complemented with six web forums. ● Internal consultation process: a municipal session was organized subsequently (86 participants from neighbourhood agencies, public companies and civil servants from different municipal areas) to collect suggestions for the diagnosis and proposals at the local administration level (<i>Programa Municipal</i>). ● Consultancy: a public company (Barcelona Regional) was in charge to design and produce the diagnosis and proposals at the city level (<i>Programa Ciutat</i>). The participatory process was supported by external facilitators (Delibera). ● Collaborative agreement: 141 organizations (e.g., private sector, NGOs, schools) were involved through participatory sessions to draw up a joint commitment acquired both by the City Council and citizen organizations, so as to implement five strategic measures and seven priority projects (led by the Council) and to define and develop nine citizen-led projects (involving 135 people from 86 organizations).
Barcelona's Commitment to the Climate	2015–2017	Climate change mitigation and (partially) adaptation	
Barcelona Climate Plan	2018–2030	Climate change mitigation, adaptation and resilience, climate justice and citizen action	<ul style="list-style-type: none"> ● Co-production process: the City Council organized face-to-face workshops and put up a digital platform to collect and prioritize proposals for the plan from organizations (104 participants from public and private sectors, NGOs, schools and universities, trade unions and professional associations) and citizens (23 participants). Moreover, the organizations' self-organized sessions. ● Interdepartmental cooperation: a team from different municipal areas was created to develop, implement, monitor, and disseminate the plan. An initial face-to-face workshop was organized (30 civil servants from different areas) to collect suggestions regarding the local impacts of climate change and possible plan's proposals. Informative sessions and internal meetings with civil servants from different areas were organized to define and agree on the diagnosis and final design of the plan. ● Consultancy: the assessment of climate risks and vulnerabilities was made by a public company (Barcelona Regional). Two consulting firms supported the internal diagnosis (Lavola) and the co-production process (Espai Tres).

platform *Decidim* to gain in-depth knowledge of the engagement tools, stakeholders, and understandings behind the co-production of urban climate policies (Table 2).

Between November 2017 and March 2018 we conducted ten semi-structured interviews with key stakeholders: a) the organizers, including two civil servants from the Barcelona City Council and one external facilitator of the Climate Plan co-production process; and b) the participants, including five representatives of involved organizations (e.g., grassroots social movements, public entities, or private companies) and two lay citizens (see Table S.1 in Supplementary Data). Interview questions tackled their role along the co-production process, their perception of what the success of this process would be, or their understanding of what co-production means, among other aspects. Interviews also included an additional set of questions to value in a rating scale from 0 to 5 aspects of the co-production process, such as the degree of participation of the citizens or the techniques of deliberation used in the workshops. Moreover, during the three co-production workshops, we took observation notes, focusing on the interaction among participants and on how the co-production process was explained by the municipality.

Transcribed interviews and observation notes were analysed qualitatively by using content analysis with pre-defined and emerging codes (Bernard, 2006). The codification process was designed following the research objectives and was supported by the software Atlas.ti. The main categories of analysis included: 1) engagement tools employed, 2) stakeholders involved, 3) understandings of co-production, and 4) opportunities and challenges (see the coding scheme developed in Table S.2 in Supplementary Data).

The opportunities and challenges for co-production were further examined, rated and discussed during a focus group we conducted in April 2018. We invited all interested stakeholders of the Climate Plan co-production process to share, validate and refine preliminary results. Ten members of organizations, three civil servants or facilitators, and one citizen were voluntarily involved. Focus group participants also reflected on proposals for improving co-production of urban climate policies.

The digital platform *Decidim* was a key data source to follow up the co-production process and to capture the role of new digital co-production tools. We reviewed the Climate Plan proposals uploaded in the platform from July 2017 till October 2017 and its associated metadata (e.g., author, date, proposal's description, number of comments and supports). We also exported data on visits regarding this process (i.e., visits over time, total visitors, average visit duration, and number of page views). To assess the impact of the co-production in the plan, we classified all accepted proposals uploaded in the platform in four categories: i) identical, i.e., the proposal was perfectly included in the plan; ii) partially transformed, i.e., the proposal was included slightly modifying some punctual aspects; iii) highly transformed, i.e., one or more relevant aspects of the proposal were excluded or significantly modified once converted into plan's actions; and iv) non-included, i.e., the proposal was not present in any action of the plan.

In addition, to triangulate and complement our findings, we reviewed secondary documents, including local plans, policies and reports, the Climate Plan accompanying materials, and international reports.

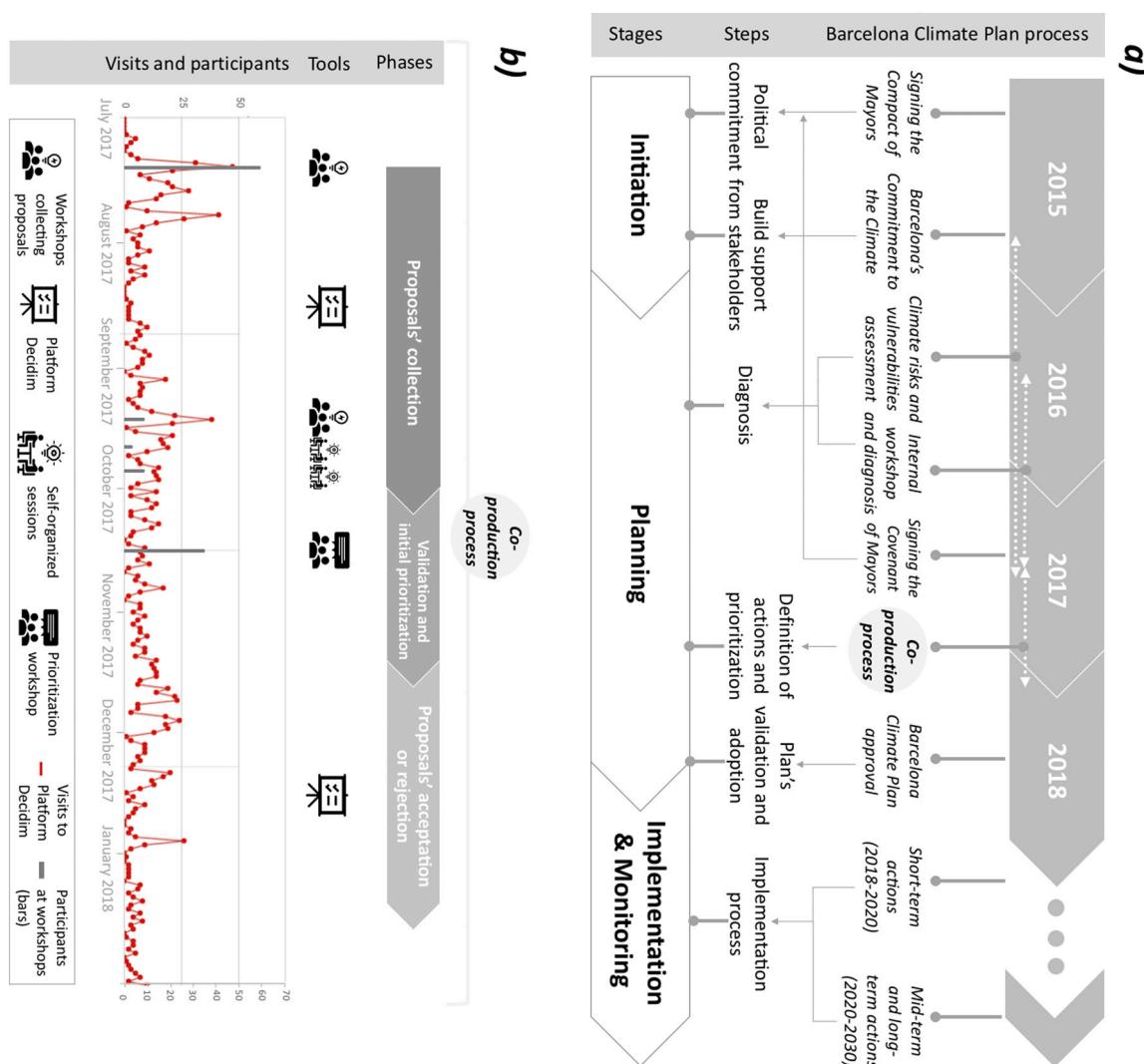


Fig. 1. Timeline of the Barcelona Climate Plan (a) and particularly the co-production process (b).

Table 2
Synthesis of methods applied.

Methods	Description
Interviews	Ten semi-structured interviews to organizers and participants of the Climate Plan co-production
Participant observation	Participation and observation of the Climate Plan related workshops and events
Focus group	Focus group with participants of the Climate Plan co-production
Analysis of the digital platform	Follow up the platform <i>Decidim Barcelona</i> used in this process. <i>Decidim</i> is a free open-source digital platform used by the Barcelona City Council for citizen participation, particularly by providing support to participatory processes (from planning to budgeting), multi-stakeholder boards, citizen consultations, and public accountability.
Review of secondary data	Review of municipal plans, policies and reports, Climate Plan accompanying materials, newspaper articles, and international reports

5. Results

The results of this paper are organized revolving around the understanding of: 1) the operationalization of the co-production process in terms of engagement tools and who were the stakeholders engaged; 2) the impact of the co-production process in the final plan; and 3) how involved stakeholders understand climate policy co-production and what were their expectations with the process.

5.1. Stakeholders and engagement tools for co-production

The co-production process of the Barcelona Climate Plan used analogical and digital tools for public engagement and involved four

groups of stakeholders who played different roles in the process design and implementation (Table 3). Civil servants were in charge of designing the entire co-production process. Facilitators, i.e., a consulting firm specialised in public participation in environmental issues hired by the municipality, also contributed to its design and guidance. The member organizations of the *Barcelona + Sostenible* network were involved as participants to both suggest and value proposals for the Climate Plan. Most of them belonged to the private sector (42%), followed by public entities (20%), NGOs or foundations (13%), universities (8%), major trade unions (6%), semi-private primary schools (6%), and associations of technical professionals (4%). Five of these organizations were also partially involved in the design of the co-production process through a Follow-up Committee, which was also composed of one

Table 3
Description of the tools, participants and proposals from the co-production process (as shown in Fig. 1.b). Source: lists of attendees and platform *Decidim*.

Phases of the co-production process	Public engagement tools	Calendar		Number of participants		Proposals collected		Proposals accepted	
		Events	Organizations	Members of organizations	Lay citizens	Total collected	% over the total collected	Total accepted	% over the collected per tool
Proposals' collection	Kick-off workshop Workshop "Make yourself be heard for climate"	13 July 2017 14 September 2017	39 4	58 4	0 4	37 27	34% 25%	34 23	92% 85%
	Self-organized Sessions Platform Decidim	21 and 27 September 2017 From 13 July to 30 September 2017 17 October 2017	2 2 24	11 n.d. (≥ 2) 31	0 16 3	9 37	8% 34%	8 33	89% 89%
Proposals' validation and initial prioritization	Prioritization workshop					—	—	—	—
Total			71	104	23	110	100%	98	

municipal political party, two external facilitators, and several civil servants. Finally, lay citizens and people from the organizations that were not members of the network were also engaged in the process, but could not access to the Follow-up Committee neither call for self-organized sessions.

In the proposals' collection phase, the two workshops (13 July and 14 September 2017) consisted of classical face-to-face sessions of guided deliberation by civil servants from different areas but mainly from the Urban Ecology area, and facilitators with invited participants. While the first workshop (the kick-off) was oriented to organizations, the second workshop ("Make yourself be heard for climate") was addressed to lay citizens. Overall, 66 people were involved, but only four citizens, and 64 proposals out of a total of 110 were collected. Both workshops were structured into four activities. First, civil servants (first workshop) or the facilitator (second workshop) introduced the climate change concept and the Climate Plan strategic aims (i.e., mitigation, adaptation and resilience, climate justice, and promotion of citizen action). Participants then filled an individual reflection sheet with their proposals for each strategic aim and shared them to the group while briefly discussing on their appropriateness and feasibility. As a result of such discussions, participants collectively expanded, nuanced, or outlined proposals. Facilitators then summarized and published them in the digital platform, where users could still comment and value them until November 2017. As shown in our interviews, the limited time available, the wide range of topics covered and the high technical level required for discussion deterred participants from delving into the proposals discussed. For instance, some participants wanted to debate the proposal to increase urban green areas to better adapt to heatwaves and other climate impacts by discussing which type of green areas or gardening techniques should be promoted. Yet, due to limited time for deliberation and consensus, the proposal published was simply adding various of their demands (e.g., reduce pesticides, promote rainwater irrigation or favour permacultural management techniques). Thus, although the facilitators' role and the techniques to guide and support participation in the workshops were positively valued by our interviewees, and especially by non-expert citizens, the depth and effectiveness of these discussions were less acknowledged.

The self-organized sessions also consisted of face-to-face meetings, but voluntarily convened and facilitated by the involved organizations themselves. For this reason, a facilitator defined them as "*do-it-yourself participation*" (interview#3). To prepare these sessions, the facilitators offered a resource kit that included, among others, a collection of actions from Barcelona Council to tackle climate change and the reflection sheets to write the proposals arising from the session. The interviewees valued the resource kit very positively as supporting material. Nevertheless, only two organizations convened self-organized sessions. Both were companies but from different economic sectors, scope of action, and size, that addressed it to their employees during working hours. While one session was exclusively attended by the workers from the area of sustainability, the other company involved a third of its staff. As a result, nine proposals were produced, which only represented 8% of the total compiled during the co-production process (Table 3). Indeed, this engagement tool facilitated the inclusion of proposals oriented to the actions of businesses such as promoting sustainable mobility plans for companies (action #10.15) or highlighting the commitments, actions and good practices of various stakeholders (action #16.3). During the interviews, the innovative component of these self-organized workshops and the possibility of being replicated in other processes of citizen involvement were positively valued by these two organizations and by the civil servants and facilitators in charge of the co-production process.

The digital platform *Decidim* Barcelona was also used in the proposal's collection, being active during two and a half months. In this period, the platform gathered almost 1000 visits and over 1600 page-views. The peaks of visitors coincided with the two workshops held (see Fig. 1.b). Thirty-seven proposals were directly posted in the platform, 8

of them created by two organizations and 29 by 16 citizens (Table 3). Thus, the platform channelled a large part of lay citizens participation. Yet, involvement in the platform was often non-exclusive to the participation through other channels; some citizens and organizations who made proposals through the platform had also attended the workshops, as explained by a participant: “*in fact it was before the workshops that I first went [to the platform] to see these initiatives, and I put in a few and I also voted for those that I liked (...) and then I went to the workshop and I think that after the first or the second workshop I returned [to the platform]*” (interview#8).

The *Decidim* platform assembled the 110 compiled proposals by including the proposals directly uploaded and those collected from the face-to-face sessions. All of them could be commented and voted on the same platform by users. In total, 22% of the proposals received between one and three comments (the other 78% got no comments), while 81% received at least one vote (data exported from *Decidim*). The most voted proposals (> 10 votes) revolved around the promotion of urban greening (e.g., participatory green corridors, transformation of empty plots into green areas or increasing green surface in climate vulnerable neighbourhoods), sustainable and public mobility (e.g., limiting significantly car traffic, promoting bicycle mobility or improving public transport in socially vulnerable neighbourhoods) and renewable energy self-sufficiency (e.g., promoting energy self-generation and self-consumption), but also the need to control and limit the emissions generated by the Port of Barcelona.

Finally, in the validation and initial prioritization phase, 24 organizations and three citizens attended the face-to-face workshop organized by the municipality. The workshop aimed to present and discuss the 110 compiled proposals while amending those previously classified by the team of civil servants. Participants were organized in five thematic groups according to the action lines of the plan. Shared opinions were used to re-write the statements, merge proposals, detect overlaps, and agree on the prioritization of proposals. Moreover, acronyms and technicalities that could hinder the communication of the plan were identified by some workshop participants, who also suggested expanding the type of actors considered to design or implement the proposed actions. For instance, the water group proposed to consider other actors in the design and implementation of sustainable drainage systems such as neighbourhood associations. The suggestions of each group were presented to the rest of the participants. Civil servants' presence was highly appreciated by participant companies, as reflected by this interviewee: “*For me, it's worth considering the fact of being with civil servants [in these workshops]. It's like doing everything closer. Or it's thinking that somehow, as they [civil servants] are working together with you, it is easier to materialise the plan*” (interview#6). Moreover, some of these private companies considered that civil servants' involvement in workshops “*also served to know how they think and what they do [...]. The City Council is our client. Being in the workshops is also a way to learn*” (interview#10). Civil servants' participation was also valued because they acted as neutral arbiters and guaranteed public interest on the outcomes of the process. By contrast, other participants highlighted the challenge of holding extensive knowledge of municipal plans, government measures and public subsidies to be able to contribute to discussions. Indeed, the technical knowledge held by civil servants about the city functioning and governance often overwhelmed participants, hindering equal interactions among them. As one participant noted: “*I remember that workshop in October, I think I was at the mobility group, and of course, there were many things that were proposing that I did not have any knowledge. I wanted to say my opinion, but I did not know anything! Then, I was just listening and learning*” (interview#7). The expertise required to get actively involved was also discussed during the focus group: while some viewed unequal knowledge as a barrier for the interaction among participants and the effective involvement of all participants, others perceived that pluralism of knowledge as an opportunity to join different expertise and experiences to enrich the outcomes of the process.

5.2. From co-production to policy-making

To turn co-produced proposals into plan's actions, the team of civil servants in charge of elaborating the Climate Plan accepted or rejected the proposals collected. Only 12 of the 110 validated proposals were rejected (see Table 3). The evaluation, including the justification of why a proposal was accepted or rejected, was posted on the *Decidim* platform. Main reasons for rejection were: i) lack of municipal jurisdiction (e.g., proposals to regulate the Port of Barcelona or to foster citizen control over water and energy supply); ii) inappropriate geographical scale (e.g., those assessing the ecological footprint of the city); iii) issues already addressed or being addressed now by the City Council (e.g., proposals to create neighbourhood emergency plans); and iv) proposals not aligned with the local governments' spirit (e.g., those aiming to build offshore wind farms). Interestingly, rejected proposals were often related to citizen action and mitigation (5 and 4 versus 2 and 1 in climate justice and adaptation categories, see the details in Table S.3).

Yet, 7% of accepted co-produced proposals were not included in the final version of the Climate Plan for different reasons. For instance, although accepted on paper, the ban of outdoor stoves in bars and restaurants was finally not included arguing that it was under the jurisdiction of each Barcelona district and in process of being regulated through another normative specifically dealing with terraces. Similarly, the proposal made by a union to train workers vulnerable to heatwaves on thermal stress and heat hazards was finally not included in the plan probably due to the lack of municipal jurisdiction on occupational safety and health.

Furthermore, and according to our assessment, only 26% of accepted co-produced proposals were identically introduced in the plan as they were formulated in the co-production process. This was the case for many proposals addressing non-controversial issues such as the creation of energy banks for vulnerable people (action #2.9), the expansion of shade in public spaces (action #3.6), or the encouragement of climate solidarity (action #17.4). However, 45% of the proposals were partially transformed, i.e., slightly modifying some punctual aspects. For instance, the proposal to increase the social recognition of local trade and second-hand shops by creating specific labels was included through actions #12.5 (adapt *Barcelona Activa*⁵ to promote the green local economy), #14.1 (foster exchange and marketing of second-hand products), #15.5 (promote the consumption of locally-produced ecological food products among the general public) and #16.6 (conduct campaigns on climate change and widely publicise options and habits that help to combat it). None of these actions specifically mentioned the idea of creating a local label to support such trade. Finally, 22% of accepted proposals included in the plan were highly transformed. In other words, one or more relevant aspects of the proposal were excluded or significantly modified once converted into the plan's actions. For instance, the one to make a campaign on energy transition adapted to different audiences was limited to informative and generic actions such as undertaking communication and publicity activities to encourage energy savings in buildings (action #4.3). It is important to notice that some of these highly transformed proposals dealt with vexed questions. For instance, the proposals to remunicipalise the supply of water and energy, were just included in the plan when referring to the creation of a municipal energy operator (actions #2.4, #2.5, #4.1, #4.6, #5.3, #9.1, #9.2 and #18.11).

In sum, while an overwhelming majority of the collected proposals during the co-production process were officially accepted (98/110; 89%), only less than two thirds of these proposals (69/110; 63%) were included identically or slightly transformed in the final Climate Plan. As a result, some of the disputed topics emerged during the co-production process such as the regulation of the Barcelona Port emissions, the

⁵ *Barcelona Activa* is a municipal agency promoting local employment and entrepreneurship and offering support to Barcelona companies.

limitation of outdoor stoves in private terraces, or the remunicipalization of the water supply were either initially rejected or discarded during the writing process and therefore excluded in the final plan.

5.3. Co-production understandings and expectations

According to the official definition of the Barcelona municipality, co-production is a “joint and shared way of working between the City Council and the social actors, regarding a specific action or policy of public interest and under municipal jurisdiction” (Barcelona, 2018b:16). Some of the designers of the co-production process, however, did not show a complete understanding of what this broad official definition of co-production meant. For instance, an organizer of the process expressed his doubts: “The definition of co-production, I do not know... I mean, I do not have the definition completely clear, I have to admit it. And I'm not sure that all [members of] the City Council have a shared understanding of the concept” (interview#3). In fact, not only some of the organizers but also other involved stakeholders acknowledged that they did not always perceive the distinction between co-production and other forms of participation. Along these lines a lay citizen and a civil servant respectively reported: “For me co-production... it means the same as participation, right?” (interview#2); “I come from the field of community work and I have the impression that I have been co-producing or trying to get it in the last ten years. But now we name it as co-production” (interview#5).

Among the involved stakeholders two contradictory visions emerged on what co-production meant. On the one hand, co-production was viewed as a more pragmatic and feasible engagement mechanism. As another civil servant noticed co-production processes could be shorter and cheaper than conventional (massive) participatory processes. Thus, co-production fit the purposes of the Climate Plan because it guaranteed to meet a specific (and close) international deadline: “*I do not think anyone [in the City Council] was against making a participatory process. However, if you wanted to go to Bonn [at COP23] with the document done, there was a limited time and besides, you have limited resources. Therefore, it was much easier to make a process of co-production with organizations that are already motivated in which you launch the call and they participate*” (interview#4). In other words, while participation required involving (and representing) the general public, co-production was viewed as engaging with (climate concerned and motivated) stakeholders. This interviewee also argued that co-production and participatory processes had different aims: “*in this case, it was not a participatory process, but a process of involvement [...] organized to develop shared projects with common objectives*” (interview#4). On the other hand, some interviewees and particularly those representing private companies defined co-production by highlighting public-private collaboration throughout the process: “*participation sounds like you ask me what I think of something, while in co-production we are working together [...]. In participation, the institution that convenes is the motor, while in co-production we are all required to make an effort*” (interview#6). They also argued that co-production had a binding character while participation was consultative and more rigid: “*in participation, the proposals are already defined and you have to choose among the options established, while in co-production it means attending boards and debates where you make the proposals*” (interview#10).

Such a plurality of views of the meaning of co-production was also reflected in the different ways in which the involved stakeholders framed their expectations regarding its outcomes and success. Besides meeting the international deadline of COP23, organizers linked success to procedural indicators achieved, such as the number and diversity of participants, or the number of proposals collected. A civil servant also noticed some qualitative procedural aspects as success indicators, such as the satisfaction of participants or how the plan was improved thanks to the proposals formulated through the co-production tools (interview#4). By contrast, an activist claimed that co-production processes should “*not end with final objectives [such as COP23], but be planned at longer timescales*” (focus group observation).

In this regard, two organizations referred to long-term outcomes of the plan linked to the implementation of designed actions such as air quality improvement and reduction of mobility emissions (interviews#6#7). Similarly, two other organizations understood co-production success more in terms of transforming the interactions and roles among participants in climate policy planning and governance. For instance, a grassroots organization expected co-production to reach a long-term degree of co-responsibility, tending towards a public-communitarian governance model in which climate decision-making would be permanently shared between public governments and community organizations (interview#1). In turn, a private company referred to success as reaching a maximum consensus and the integration of different points of view (and interests) in the Climate Plan (interview#10).

Furthermore, the plurality of understandings about co-production also led to confusion over who should be engaged. Interviewed organizers reported that openness to the citizens was not initially considered by the team in charge of elaborating the plan and was only promoted by the requirement of the municipality's area of Participation to include in the co-production process more agents, beyond the organizations of the *Barcelona + Sostenible* network (interviews#4#5). Thus, no dissemination campaign was prepared to involve them; instead they get to know about the co-production process by chance, through the internet or because one workshop was part of the municipal program of environmental education (interviews#1#2#8). This explains why only twenty lay citizens were engaged. Other interviewees explained that the low number of lay citizens engaged was related to the limited time citizens have to volunteer in this kind of activities, as well as the challenge of work-life balance, as reported by a grassroots activist: “[With co-production] we are talking about putting ourselves at the same level as the public administration, but we are volunteers. This is also a bit of a situation of inequality” (interview#1). The unsuitable design of the calendar and the political context (i.e., October 1 Referendum in Catalonia) were also perceived as hindering broader citizen participation, which was the worst valued item by our interviewees.

6. Discussion and conclusions

Reflecting on the learnings and challenges emerging from the case of Barcelona, we aim to contribute to recent debates questioning the transformative potential of co-production (Turnhout et al., 2020), which are particularly relevant in the fields of urban climate governance and resilience (Castán Broto & Westman, 2020; Coenen et al., 2019). In what follows we discuss the added practical value of the co-production approach in urban climate governance guided by three questions. Can co-production be an opportunity to foster more inclusive and plural urban climate governance? Can co-production be an opportunity to create and share both urban climate planning decisions and knowledge? Can co-production be an opportunity to empower community organizations providing renewed expectations?

First, it has been argued that co-production could serve to boost the active inclusion of diverse stakeholders – particularly citizens and traditionally excluded social groups – into urban climate policy development (IPCC, 2014, 2018). Yet, as the case of Barcelona shows political will from local leaders to consider lay citizens as central stakeholders of co-production can be constrained by reluctances of civil servants and organizers. Previous research on participatory climate governance has already pointed that groups already collaborating with the authorities are more often invited to participate than unorganized citizens or less well-known groups (Burch, 2010; Wamsler, 2017). Moreover, the time allocated in the process development is crucial to reach out diverse stakeholders (Frantzeskaki & Rok, 2018). In the case of Barcelona, the willingness to show this climate planning experiment as a best practice of citizen-inclusiveness at international forums sped up the co-production process to meet the Bonn COP23, which paradoxically limited the time to be devoted for citizen engagement. Although co-production

approaches to building urban resilience open up new avenues for inclusive and citizen-driven urban climate governance, in practice their feasibility is constrained by gaps such as institutional reluctance and time dedicated, which may undermine its transformative potential.

The use of the digital platform as a co-production tool in the case of Barcelona resulted in increased –but still limited– lay citizen engagement. Nevertheless, it is relevant to discuss why these ICT-mediated co-production tools still failed to substantially increase the involvement of Barcelona citizens. Operationalising co-production as a combination of traditional, innovative, in-depth and massive engagement tools could further improve qualitatively and quantitatively public involvement in climate policy-making. For instance, the Paris Climate Plan combined face-to-face stakeholder workshops, a citizen conference and a digital platform (Paris, 2018). In this case, the digital platform also hosted a Referendum to approve or invalidate (digitally or in-person) the resulting climate plan with considerable participation, i.e., 15.040 citizens out of 73.765 voters registered as climate volunteers. Although the performance of digital co-production tools in engaging lay citizens should be further assessed by what Lember (2018) argues balancing expectations (e.g., digital technologies will lead towards more representative or inclusive co-production) with limits (e.g., accessibility to digital technologies is unevenly distributed), both experiences in Barcelona and Paris can inspire future avenues for ICT-enabled co-production and, more broadly, public engagement in climate policy-making leading to more inclusive and legitimate urban resilience interventions.

Second, co-production could result as an opportunity to emphasize citizens' involvement in the production of both urban climate knowledge and planning decisions (van Kerkhoff & Lebel, 2015). The case study of Barcelona shows that unequal expertise and the range of topics covered by the Climate Plan (including mitigation, adaptation, climate justice and citizen climate action) challenged knowledge sharing and effective engagement, particularly in the context of face-to-face discussions. Moreover, excluding from the co-production process the initial assessment of climate vulnerabilities (see Fig. 1a), limited the options for sharing plural sources of knowledge before making decisions on specific solutions (i.e., proposals of climate actions). In fact, involving participants too late (Ayers, 2011), not sharing the problem-definition (Preston et al., 2013), or reproducing the technocratic bias (Castán Broto, 2014), are common implementation challenges widely recognized by climate policy participation literature (IPCC, 2018:352). Nonetheless, in the case of climate policy co-production, considering previous experience on co-creating knowledge in the context of science-policy collaboration could also inspire the design of spaces able to generate both knowledge and decisions. For instance, learning from the “knowledge co-production operating space” defined by Frantzeskaki and Kabisch (2016) could spur into the need to use knowledge from different actors to define the socio-ecological context or to identify popular (i.e., enjoying policy attention) and marginalized places and issues before developing actionable decisions.

Third, co-production can regenerate public expectations to meaningfully shape climate governance and lead to community empowerment (Turnhout et al., 2020). Previous research has noted that urban climate governance through experimentation has the potential to improve the access to political processes by civic groups and activists and to legitimate alternative narratives for building climate resilience in practice (Cloutier et al., 2018). But those experiments may also perpetuate power dynamics (Evans & Karvonen, 2014) due to constraints such as political inertia, limited resources and mismatching jurisdictional boundaries (Chu et al., 2018). Urban climate experiments specifically relying on co-production approaches envision high levels of social empowerment. However, the case of Barcelona shows that while proposals confronting powerful city stakeholders - such as the Port, the water and energy supply companies, or the lobby of private terraces - emerged during the co-production process, many of them were finally excluded from the Climate Plan throughout the policy-making.

Moreover, co-production itself is a contested term. While the multiplicity of meanings and expectations on co-production is well acknowledged across disciplines (Miller & Wyborn, 2018), countries (McMullin, 2019) and policy sectors (Pestoff, 2009), we argue that the plural views that hold urban practitioners themselves are less considered (see a recent contribution in health co-production in Crompton, 2019). In fact, many of the stakeholders involved in the case of Barcelona held ambiguous meanings and contrasting expectations on what climate policy co-production meant. On the one hand, those who viewed co-production as an opportunity to further influence decision-making and to effectively achieve ambitious climate targets such as drastic emission reductions by partnering together with public authorities. On the other hand, those who understood co-production as an efficient mean to collaboratively create climate policies in a timely manner with already motivated and experienced stakeholders. In the context of climate change, which is already a complex and intangible concept, putting into practice an innovative approach such as co-production without trying to share or align expectations and roles, and common principles and rules, could endanger the fulfilment of the empowerment promised by this “novel” form of urban climate governance.

By exploring the case of the Barcelona Climate Plan, this article has shed light over political, social and cultural factors shaping different potential outcomes of co-production such as increasing citizen involvement, generating informed decision-making, and empowering urban communities (Turnhout et al., 2020; Voorberg et al., 2015). Such insights, although context-specific, can illuminate the path towards more inclusive climate governance approaches in other cities worldwide. We are fully convinced that the adoption of a co-produced perspective in the urban climate resilience context may have a lot of transformative potential for moving towards more democratic, better informed, and community-oriented arrangements. However, this potential, we argue, is still untapped in the case of urban climate governance. The peculiarity of tackling climate change from cities is that social groups living close to each other will be diverse and uneven on their framings, experiences, vulnerabilities and responses to this challenge. While co-production might offer a promising approach to confront such (unequal) pluralities, this article demonstrates that there is still a long way to go.

CRediT authorship contribution statement

Mar Satorras: Conceptualization, Methodology, Formal analysis, Investigation, Writing- Original draft preparation. **Isabel Ruiz-Mallén:** Conceptualization, Methodology, Funding acquisition, Writing - Review & Editing. **Arnau Monterde:** Conceptualization, Data curation. **Hug March:** Conceptualization, Methodology, Funding acquisition, Writing - Review & Editing.

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Declaration of competing interest

M. Satorras, I. Ruiz-Mallén and H. March declare that they have no conflict of interest.

A. Monterde reports that he is currently working in the Barcelona City Council, as coordinator of the *Decidim* project and Democratic Innovation. However, he contributed to this article as a researcher during the phases of data collection and analysis, for this reason his affiliation is kept as IN3 (UOC). He was not involved in either the design or the implementation of the process studied in this article.

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Appendix A. Supplementary data: Table S.1, Table S.2, and Table S.3

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