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Virginia Pellerey & Mendel Giezen

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More green but less just? Analyzing urban green spaces, participation, and environmental justice in Amsterdam

Virginia Pellerey^a and Mendel Giezen^{b*}

^aInteruniversity Department of Regional and Urban Studies and Planning (DIST), Politecnico di Torino, Turin, Italy; ^bAmsterdam Institute for Social Science Research, University of Amsterdam, Amsterdam, the Netherlands

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Cities worldwide are taking action to increase the amount and quality of urban green spaces. However, not all efforts for the greening of cities produce just and inclusive outcomes. For more inclusive urban greening processes, scholars have proposed incentivizing residents' participation in planning and implementing green initiatives that promote creating and maintaining green spaces. However, further in-depth analysis of the connection between implementing new urban green spaces and environmental (in)justice is needed to understand how unjust outcomes might emerge due to policies aiming to promote the uptake of urban green through citizen engagement. To investigate the justice implications of policies that aim to create new urban green spaces through citizen participation, this article combines GIS analysis and qualitative analysis of 26 semi-structured interviews to evaluate the process and outcomes of the Green Agenda policy in Amsterdam. The Green Agenda (*Agenda Groen*) is a municipal policy supporting citizens' initiatives to uptake urban green. Through the analysis of this case study, the article aims to identify factors that create barriers to achieving just outcomes during the implementation of policies for urban greening. Results indicate that although the approach has successfully increased the amount of urban green in Amsterdam, the presence of barriers that impede procedural justice and lack of recognition made the urban greening process less just. The three underlying factors that create barriers in Amsterdam are the centralization of the government, the lack of support for local organizations, and the effect of socioeconomic characteristics on inclusion and participation. The article concludes by discussing the synergies and tradeoffs between identified barriers and suggesting solutions to be integrated into future policies for more successful and just greening processes.

Keywords: urban green space; environmental justice; green initiatives; citizen participation; Amsterdam

1. Introduction

The importance of urban green spaces for the well-being of cities is a well-known fact. Green spaces provide essential ecosystem services, enhance climate resilience, and offer significant health benefits to urban residents (Braubach *et al.* 2017;

*Corresponding author. Email: m.giezen@uva.nl

Mathey *et al.* 2010). Because of this, cities are trying to encourage the uptake of urban green spaces as one crucial way to achieve urban sustainability and residents' well-being. However, cities also face the challenge of environmental (in)justice in doing so. Efforts to implement new green spaces can sometimes create or even exacerbate inequality in access, distribution of resources, or involvement in the planning process (Wolch, Byrne, and Newell 2014). Therefore, understanding the link between the provision of urban green spaces and environmental (in)justice is vital if cities want to achieve growth justly. Specifically, while barriers to even accessibility and distribution of green spaces have been vastly explored, a stronger focus on justice in the urban green process is lacking.

Research suggests that including residents in the planning and implementation processes can lead to more diverse, just, and equitable results in urban development (Buijs *et al.* 2016). However, studies have shown that citizens' participation does not always automatically lead to more just outcomes and processes, and empirical research verifying the efficiency of participation in achieving environmental justice during the urban green process is scarce (Fors *et al.* 2015). Applying an environmental justice perspective to assess the efficiency of citizens' participation might provide new insights into the barriers hindering justice and inclusion in participatory urban greening processes. Furthermore, additional empirical analysis is necessary to better understand the barriers preventing just processes and outcomes in creating urban green spaces.

In this article, we explore the connection between implementing new urban green spaces and environmental (in)justice to understand how unjust outcomes might emerge due to policies that promote urban green uptake through citizen engagement. Specifically, we focus on the justice implications of policies that aim to create new urban green spaces through citizen participation. To do this, we evaluate the outcomes of the Green Agenda: a municipal policy promoting the creation of new green areas in Amsterdam (the Netherlands) through the involvement of residents in greening initiatives. Specifically, we address three important aims: (1) proposing a replicable framework for empirical analysis of urban greening policies through an environmental justice perspective, (2) discussing the justice implications of citizen participation in urban greening initiatives, and (3) identifying barriers to efficiency preventing just processes and outcomes for urban greening intervention. For this analysis, we evaluate the outcomes of the Green Agenda by identifying a set of indicators and evaluating each indicator either through spatial analysis (GIS) or qualitative analysis (interviews). The article starts by developing a theoretical framework based on the existing literature on urban green spaces, citizen involvement, and environmental justice. This is followed by a description of data collection and data analysis methods. Finally, the empirical results are presented and discussed in relation to the theoretical framework.

2. Urban green spaces and environmental justice

With Target 11.7, the Agenda 2030 (United Nations 2015) aims to "provide universal access to safe, inclusive and accessible, green and public spaces, particularly for women and children, older persons and persons with disabilities." This target encloses two important goals: to make cities greener, more inclusive, and just. While these two goals should be pursued as a single, comprehensive target, unfortunately, the creation of green spaces often clashes with the pursuit of inclusivity and justice in urban contexts (Haase *et al.* 2017). As a matter of fact, research shows that while city plans

often engage with the topics of green spaces and green infrastructure, the issue of justice is rarely explicitly discussed (Hoover *et al.* 2021). Furthermore, the lack of attention to the issue of justice might lead to unjust outcomes, such as the creation of green spaces at the expense of vulnerable residents or uneven accessibility to green areas for different groups of citizens (Kabisch and Haase 2014). Existing studies have shown the existence of barriers affecting the availability and accessibility of urban green spaces or the lack of provision of community-tailored solutions. For example, Biernacka and Kronenberg (2018) identify conflicting interests, physical barriers, lack of funds, and legal and governmental failures as the main barriers causing uneven availability and accessibility of green spaces.

Similarly, Menconi, Sipone, and Grohmann (2021) argue that a lack of attention to criteria such as attractiveness and usability in the planning process can lead to outcomes where the distribution of urban green spaces is inadequate to meet all residents' needs. Indeed, many other studies theoretically and empirically highlight the clash between the goal of making cities greener and the goal of making green spaces evenly accessible and attractive to all residents (see literature review in Wolff *et al.* [2022]).

However, a more in-depth analysis from an environmental justice perspective can reveal that the difficulties in achieving Target 11.7 of the Agenda 2030 extend beyond the distribution and accessibility of urban green spaces. In fact, while most of the existing literature still focuses on issues of distributional justice (i.e. the uneven distribution and/or accessibility to green areas), other scholars have stressed the need for a more comprehensive definition of (in)justice that also looks at inclusion, recognition, and participation during the processes leading to the creation of urban green spaces (Liotta *et al.* 2020; Nesbitt *et al.* 2018; Zuniga-Teran *et al.* 2021). For instance, Fainstein (2015) argues that the lack of awareness on issues beyond distributional justice makes us ignore issues of power unbalance and often leads to the creation or reinforcement of existing socioeconomic inequalities, inequality in access to resources and living conditions, or unequal inclusion in planning processes. Similarly, Anguelovski *et al.* (2020, 10) call for a greater focus on the “systematic and asymmetrical structures of power and domination” and thus call for green interventions to consider past experiences of exclusion of vulnerable residents and to try to represent their everyday experiences in the planning process. In other words, when planning for green cities and urban green areas, considering the distribution and access to green as planning criteria is insufficient to achieve justice, and a stronger focus on the procedures and recognition of vulnerable residents is necessary to ensure an inclusive planning process that leads to just outcomes. The existing literature has vastly discussed the need to expand the focus beyond distributional justice. However, empirical analyses of the mechanisms shaping (in)justice in the planning processes are still lacking (Calderón-Argelich *et al.* 2021).

Therefore, future academic research needs to consider the procedural and recognition aspects of environmental justice (Shi *et al.* 2016). Focusing on residents as active participants in the greening process can be a way for researchers to move beyond the assessment of distributional injustice and also to include the evaluation of procedural and recognition (in)justice appearing during the ongoing process of making cities greener and inclusive (Shi *et al.* 2016). Citizen participation is the primary response to the need to place residents at the heart of the greening process to reduce procedural and recognition injustice. Citizen participation aims to provide residents and local stakeholders with meaningful opportunities for input and collaboration during urban policy design, planning, and implementation phases (Campbell-Arvai and Lindquist 2021).

Research shows that citizen participation in urban planning can lead to “improved satisfaction with planning outcomes, greater longevity of the project, and opportunities for increased civic engagement and interest” (Campbell-Arvai and Lindquist 2021, 2). However, scholars have identified many challenges preventing citizen participation from reaching the goals of successfully increasing justice, inclusion, and recognition in the planning and implementation phases of the urban greening process. For example, Mees *et al.* (2019) notice two possible problems with citizen participation: the uncertainty over the initiatives’ long-term continuity and the potential increase of inequality between residents. The same argument is expressed by Jakobsen and Andersen (2013), who argue that citizen participation in policy might exacerbate the gap between advantaged and disadvantaged residents due to disproportionate access to the policy-making network. Similarly, Fainstein (2015) also argues that participation alone cannot guarantee that the poorer or marginalized neighborhoods will achieve just results but that direct recognition and support of the most vulnerable residents is a minimal requirement. Other factors mentioned as possible enhancers of justice are a diversity of actors, public engagement, community-based management, and process and outcome evaluations (Chu, Anguelovski, and Carmin 2016). Therefore, the question emerging from such observations is: *Citizen participation is often proposed to achieve inclusion, justice, and representation in the greening process, but does it succeed at its goal? If not, what barriers prevent citizen participation from efficiently increasing justice in the urban greening process?*

2.1. Contribution of the research

The need to provide urban green spaces is very relevant for the future development of cities. At the same time, planners and policy-makers cannot disregard the issue of justice. Applying an environmental justice perspective to analyze the processes and outcomes of urban greening efforts is an important strategy to understand the justice trade-offs of creating urban green spaces and to prevent the exacerbation of existing inequalities. Three important knowledge gaps emerge from the literature:

1. While the fact that urban greening efforts can have unintended negative consequences on justice is well discussed in existing literature, the justice implications beyond the distribution and accessibility of green spaces are often left out of the picture (Calderón-Argelich *et al.* 2021). For comprehensive results, more in-depth evaluations of procedural and recognition justice are needed.
2. Citizen participation as a means to enhance inclusion and justice in urban greening processes is still under debate as scholars have stressed both positive and negative consequences of including citizens in the planning and implementation of green initiatives (Buijs *et al.* 2019; Coffey *et al.* 2020; Mattijssen *et al.* 2019; Wamsler *et al.* 2020). Framing citizens’ participation through a procedural and recognition justice perspective might give new insights into the effectiveness of participation in enhancing justice and inclusion.
3. Different studies have proposed barriers to justice in participation in urban planning (Boulton *et al.* 2020). However, it is also argued that such barriers are not always applicable in the same way to all cases; instead, they are very context-dependent, multidimensional, and interact with each other and with external factors (Wolff *et al.* 2022). An in-depth analysis of one specific case study might

illuminate how different barriers can create synergies or trade-offs depending on the characteristics of the urban context.

To address these gaps, we propose an empirical analysis of the justice implications of an urban greening policy characterized by the participation of residents during the greening process. The Amsterdam Green Agenda is a policy implemented between 2015 and 2018 that specifically aimed to increase the amount of urban green spaces by providing funds for the residents to set up greening initiatives. This policy was selected because of its goal to incentivize residents' participation in the greening process by funding residents' projects to develop new pocket parks and improve the existing ones. By assessing all three aspects of environmental justice (distribution, procedure, and recognition) of the process and outcomes of the Green Agenda, this research offers an important insight into the barriers to justice and inclusion in cases where citizen participation is incentivized and supported. With this, the added values and contributions of this study are:

1. This study proposes and applies a replicable methodology for empirically analyzing the environmental justice implications of urban greening efforts, with attention not only to distributional outcomes but also to the processes leading to such outcomes.
2. This study evaluates the justice implications of citizens' participation in urban greening initiatives through an environmental justice perspective.
3. The results of this study allow scholars and policy-makers to identify context-dependent barriers hindering inclusive participation and justice in urban greening processes and outcomes. Moreover, synergies and trade-offs between barriers are observed, and suggestions are proposed based on the observed results.

2.2. Analytical framework

With the intent of evaluating the effects of the Green Agenda in the city of Amsterdam, we propose the use of an analytical framework that encompasses indicators used to evaluate (1) the efficiency in the creation of additional urban green spaces and (2) the justice implication of the process and outcomes of the policy, with specific focus on citizens' participation.

Therefore, we adopt the framework proposed by Tyler and Moench (2016) as references for the framework for empirical analysis encompassing both environmental justice and urban greening, as well as paying particular attention to the role of residents as important actors involved in the process and its outcomes. While this framework was initially proposed to evaluate urban climate resilience, it can also be specifically related to urban green spaces, an important measure in urban resilience strategies (Tyler and Moench 2016). Therefore, this framework was selected because it includes indicators concerning the physical urban system (including green spaces) and indicators of civic participation and agency of the urban residents. To this original framework, we therefore add:

- Three indicators specifically related to creating and sustaining new green spaces were included from the framework proposed by Wüstemann, Kalisch, and Kolbe (2017).

- One indicator of recognition is Schlosberg's (2004) argument that vulnerable residents' needs must be recognized to achieve just outcomes.
- Thus, the final framework includes different indicators related to the urban greening process and its outcomes, as well as additional indicators to account for all aspects of environmental justice.

We relate each indicator to one of the three common environmental (in)justice types: distributional, procedural, and recognition. Distributional (or distributive) justice focuses on the spatial relationship between the urban green and the urban residents, identifying possible patterns of uneven access to vegetation (Nesbitt *et al.* 2018). On the other hand, procedural justice observes the institutional framework in which the greening process is happening and the different actors' possibilities and objectives (Zuniga-Teran *et al.* 2021). Finally, recognition justice emphasizes the (lack of) attention given to various residents and their inclusion in the process (Zuniga-Teran *et al.* 2021). Table 1 summarizes all the indicators identified for the framework of analysis and the relative sources supporting the need for such indicators.

3. Methodology

3.1. Research design

This article sets out to answer the research question: *What factors impede just implementation of policies promoting the uptake of urban green spaces?* To answer the question, empirical results have been obtained from mixed-method research based on a single-case study of Amsterdam and a comparative study of two areas of this city. To evaluate the case studies' performance during the Green Agenda of Amsterdam, 27 interviews were conducted with local urban partitioners and citizens to understand planning and implementation processes. A diachronic analysis of satellite images (2016, the beginning of the Green Agenda, and 2019, the end of the Green Agenda) was used to identify changes in the built and green environment. This research approach was chosen to reach an in-depth understanding of the possible trade-offs between the urban greening process and environmental justice and the role of contextual characteristics in acting as barriers to justice and participation in the greening process. Furthermore, the comparison between the two city areas was conducted to provide further insights into the effects of different socio-economic conditions. The indicators proposed in the analytical framework were used as the starting point of the analysis to evaluate the effectiveness of the Green Agenda as an inclusive urban greening policy.

3.2. Case-study

3.2.1. Amsterdam and the Agenda Groen 2015–2018

Amsterdam has seen rapid urbanization rates in recent years (Gemeente Amsterdam 2020). The municipality has expressed its will to make the city more livable while also tackling climate change. It has promoted numerous initiatives and policies that intend to increase the urban green in the city. One of the key policies was the *Agenda Groen* (Green Agenda), which was carried out between 2015 and 2018 (Gemeente Amsterdam 2015). The Green Agenda granted 20 million euros to be invested in green

Table 1. Framework of analysis.

	Indicator	Explanation	Relevance	Source
Distributitional Justice	Redundancy	Present green spaces exceed the residents' needs	Assesses the new amounts of green spaces created, but also to what extent residents' needs are met	Tyler and Moench 2016
	Maintenance	Protection and maintenance of green spaces	Evaluates the possibility of survival of green initiatives and green spaces in the long-term	Fors <i>et al.</i> 2015
	Distance	Distance of residents from urban green spaces	Assesses the new amounts of green spaces created, but also whether green spaces are distributed evenly	Liu <i>et al.</i> 2016; McCauley and Heffron 2018; Schlosberg 2004; Wüstemann, Kallsch, and Kolbe 2017
	Total amount	Amount of urban green space compared to total surface area	Assesses the new amounts of green spaces created, but also whether green spaces are distributed evenly	Liu <i>et al.</i> 2016; McCauley and Heffron 2018; Schlosberg 2004; Wüstemann, Kallsch, and Kolbe 2017
	Amount per capita	Amount of urban green space per capita	Assesses the new amounts of green spaces created, but also to what extent residents' needs are met	Liu <i>et al.</i> 2016; McCauley and Heffron 2018; Schlosberg 2004; Wüstemann, Kallsch, and Kolbe 2017
	Resourcefulness	Technical and financial resources on the supply side; network and financial resources on the demand side	Evaluates the agency of residents in engaging in greening initiatives	Folke <i>et al.</i> 2010; Maguire and Lind 2003; Tyler and Moench 2016
Procedural Justice	Capacity to learn	Extent to which past experience is incorporated into the planning process	Evaluates the agency of residents in engaging in greening initiatives	Folke <i>et al.</i> 2010; Ikeme 2003; Leitchenko 2011; Tyler and Moench 2016
	System access	Systematic inclusion or exclusion of different communities; rights of communities and private individuals	Evaluates the agency of residents in engaging in greening initiatives, with specific focus on marginalized and vulnerable residents	Maguire and Lind 2003; Tyler and Moench 2016
Recognition Justice	Decision-making processes	Transparency and accountability of decision-making processes	Evaluates the institutional barriers to participation and inclusion in greening initiatives	Maguire and Lind 2003; Tyler and Moench 2016
	Information flow	Access to information of supply side and demand side	Evaluates the institutional barriers to participation and inclusion in greening initiatives	Maguire and Lind 2003; Tyler and Moench 2016
	Application of new knowledge	Institutional encouragement towards public and private actors to apply to knowledge and develop new initiatives	Evaluates the incentives to participation in greening initiatives	Ikeme 2003; Tyler and Moench 2016
Recognition Justice	Recognition	Institutional recognition of communities disproportionately affected and commitment to address their vulnerability	Assesses efforts to recognition of marginalized and vulnerable residents	McCauley and Heffron 2018; Schlosberg 2004

projects to increase the amount of green space, address biodiversity loss and climate change, and make urban green more accessible (Gemeente Amsterdam 2015). On the topic of green spaces, the documents focused specifically on improving existing parks and developing new pocket parks throughout the city. The fund was administered by the central city government and distributed to the districts based on the proposed projects and initiatives in each district (Gemeente Amsterdam 2015). More specifically, one of the policy's main objectives was to support residents' initiatives in creating neighborhood green (pocket parks) by "facilitating neighborhood initiatives, education, communication, and awareness" (Gemeente Amsterdam 2015). The rationale behind this was to (1) let residents do what is best for their neighborhood and (2) develop public-private cooperation for green projects that would take some of the responsibilities off the shoulders of the municipality (Gemeente Amsterdam 2015). No further information was provided on how the funds would be administered to this specific target or whether certain areas would be prioritized over others. If successfully implemented, the Green Agenda should have increased urban green in Amsterdam by funding and supporting residents in developing new green spaces. Because it aimed to increase the number of green spaces in the city through residents' involvement, this policy represents a good case study for analyzing the environmental justice impact of citizens' involvement in the process of urban greening.

3.2.2. *Oud-Zuid and Bijlmer-Oost*

Amsterdam is divided into 22 administrative areas (Gemeente Amsterdam 2020). These do not have any political or executive power, but they are part of larger boroughs with an elected district committee with small administrative power (Gemeente Amsterdam 2020). These areas are small enough to present specific socio-economic characteristics and large enough to discern differences in policy outcomes. These two areas were purposely selected for the comparative analysis due to their differences in socio-demographic characteristics and development priorities. Still, despite differences, the cases are comparable since the same policy was implemented in both areas, and they fall under the same governance structure. Therefore, it is expected that comparing two very different cases with one common variable (the implementation of the Green Agenda through the same governance system) will highlight the impact of the different characteristics of the areas on the outcomes in the two cases. Furthermore, such comparison allows for identifying barriers to inclusion, participation, and just outcomes and observing possible synergies or trade-offs between barriers in different contexts.

Figure 1 shows the location of the two study areas within Amsterdam. Oud-Zuid is an area where only 15% of the inhabitants have a non-western background, and the personal income is the highest (70,400 € average yearly income per person) compared to the rest of the city (43,400 €) (Gemeente Amsterdam 2020). On the other hand, 68% of the residents of the Bijlmer-Oost area have a non-western background, and their average income is the lowest (33,000 €) of all other city areas (Gemeente Amsterdam 2020). The Dutch Statistical Bureau defines residents with non-western backgrounds as residents with a migration background from Africa, South America, Asia, and Turkey and residents with a Western background as residents with a migration background from Europe (excluding Turkey), North America, and Oceania (Gemeente Amsterdam 2020). With this classification, the Dutch government also identifies residents with more integrated socioeconomic and cultural positions

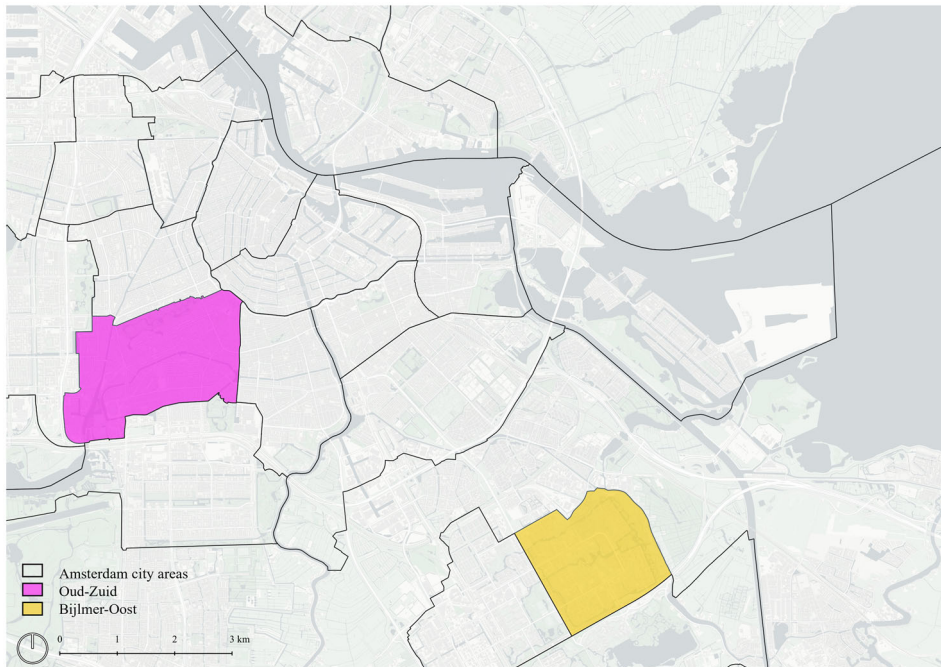


Figure 1. Study area. Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the authors.

Table 2. Socio-economic characteristics of Oud-Zuid, Bijlmer-Oost, and Amsterdam.

	Amsterdam	Oud-Zuid	Bijlmer-Oost
Population	918,194	54,493	30,102
Population density	5,333.0	11,039.0	8,064.0
Migratory background – non-western	41.9%	25.2%	70.9%
Personal income (average)	43,400.0	70,400.00	33,000.0
Unemployment	4%	4%	5%
Education level – university degree	40%	53%	19%
House ownership	29.2%	45%	14.5%
Age – 66+	11.6%	13.9%	10.9%

(western) and residents with worse socioeconomic and cultural positions (non-western). While this classification is not comprehensive of all cases (as there can be western residents with low socioeconomic status or non-western residents with well-integrated cultural positions), it is representative of the socio-demographic characteristics of the city of Amsterdam¹. Given this information, it is possible to argue that residents of the two areas have significantly different socioeconomic backgrounds because the residents of Bijlmer-Oost have generally lower incomes and non-western backgrounds, which are typically associated with socioeconomic distress and lack of cultural integration (Mohai, Pellow, and Timmons Roberts 2009). Apart from this main aspect, the areas also present other socio-economic differences such as the number of renters compared to home-owners, education level of the residents, and employment level. All socio-economic differences between Oud-Zuid and Bijlmer-Oost are reported in Table 2.

Moreover, the two areas also have different development priorities (Gemeente Amsterdam 2017). Being a central and historical area, the vision for Oud-Zuid is to become more attractive to tourists, thus increasing the number of green spaces, public amenities, and recreation areas. On the other hand, the vision for Bijlmer-Oost is to enhance the provision of housing and increase the neighborhood's well-being. Even if these two visions are significantly different, they both greatly benefit from creating green spaces, and therefore, the relevance of the Green Agenda is comparable in both areas.

3.3. Data collection

Two methods are employed to explore the connection between urban greening and environmental (in)justice in Amsterdam and evaluate the outcomes of the Agenda Groen: (1) qualitative analysis, using in-depth interviews and policy documents, and (2) GIS analysis, using satellite imagery.

Data for the qualitative analysis has been collected through interviews with relevant stakeholders involved in creating urban green or implementing green initiatives in Amsterdam. Participants for the interviews were selected following a snowball selection, where each person interviewed was asked to suggest new possible participants. The contacts for the first few participants were found on the municipality's or local organizations' websites. To minimize bias, we tried to interview diverse participants, including residents, civil servants, and local organizations. Still, because most of the respondents are project personnel or professionals, the results might be biased toward their point of view. However, many residents were also part of the respondents, so points of view from the residents are also taken into consideration.

The semi-structured interviews lasted around one hour. A total of 26 interviews were conducted, one per participant. All interviews included the same set of open-ended questions developed to address the indicators in the analysis framework (Appendix 1 [online supplemental material]). However, specific questions were asked to each participant regarding their involvement in the greening process. Most of the interviews were conducted on Zoom due to the local restrictions imposed by the COVID-19 pandemic. See Appendix 2 (online supplemental material) for a complete list of the participants.

The use of remote sensing and satellite images has been identified as an important tool to monitor changes in the urban landscape over time and to assess the amount, density, and distance of green urban areas (Giezen, Balikci, and Arundel 2018). For this reason, two satellite images from 2016 (the beginning of the Green Agenda) and 2019 (the end of the Green Agenda) have been chosen to analyze changes in urban green space in Amsterdam. The images have been provided for research purposes by Esri Nederland, but the photos were initially developed by Beeldmateriaal Nederland and covered most of the city of Amsterdam (Beeldmateriaal Nederland 2021). Both images (2016 and 2019) were taken in the summer months when the vegetation is more visible and has a resolution of 25 cm. The images were provided in two formats: a 3-band normal aerial photo and a 3-band color infrared (CIR) in which the NIR and Red band are combined into one data analysis method.

3.4. Data analysis

Most of the indicators have been examined qualitatively. Data from the interviews and the policy documents were analyzed through a thematic coding technique (Williams

and Moser 2019). Answers were classified according to the indicators presented in the analysis framework, and results were extracted for each theme. Results reported in the following sections present an extract of quotes representing observations of the participants and an analysis of the common themes identified.

Five of the indicators were analyzed using GIS. The aerial photos were classified using three training classes: water, urban (all built infrastructure), and green (any surface with visible vegetation), with 20 training samples each. Unfortunately, it was not possible to distinguish between urban parks and gardens and other types of vegetated places; however, the definition of green spaces includes multiple types of spaces besides public parks and gardens, as all types of spaces with vegetation can provide important benefits for the urban climate and the residents' well-being. Therefore, this limitation was deemed minor compared to the results achieved. After creating the training samples, pixel-based classification with a maximum likelihood classifier was chosen over object-based classification in light of previous studies that argue that the pixel-based technique is a better option when looking at temporal land-use changes in densely built areas (Goldblatt *et al.* 2016). The same procedure was repeated three times, one for the 3-band normal aerial photo, one for the 3-band color infrared (CIR) photo, and a final one with the CIR photo, but only with two training classes (merging the water and urban classes). Once the images were classified, a majority filter analysis was applied to remove singular pixels or small clusters surrounded by pixels of a different class (Giezen, Balikci, and Arundel 2018). A boundary cleaning was performed to smooth the boundaries of larger areas. Finally, accuracy assessments revealed that the most accurate classification is achieved using the CIR images and merging the urban and water classes (Kappa coefficient = 0.975). See Appendix 3 (online supplemental material) for all the accuracy assessments. The classification results were then used to assess each of the five GIS indicators according to previously proposed and tested methodologies in existing studies (studies were selected based on the precision of the methods and information provided on each specific indicator). The methodologies for each indicator and the related sources are collected in Table 3.

4. Results

The following sections report the results of the data analysis. Results are presented first for the whole city of Amsterdam and then for the comparison of Oud-Zuid and Bijlmer-Oost. The indicators identified in the analysis framework and used as themes for coding the results are highlighted in the paragraphs. In addition, quotes from the interviews are reported and cited by identifying the respondents who provided the information with R1, R2, etc. (refer to Appendix 2 [online supplemental material] for the list of respondents and a summary of their responses). The same notation has been used when summarizing common themes from one or more respondents.

4.1. City-wide results

4.1.1. Distributional justice

Overall, land-use change between 2016 and 2019 shows that there has been an increase in the amount of urban green in Amsterdam. Figures 2, 3, and 4 show the changes in the amount of green between 2016 and 2019. The *total amount* (+4.5%), *redundancy* (+0.93 km²), and *amount per capita* (+1.24 m² per capita) variables

Table 3. Method of data analysis for each indicator of the framework.

	Variable/ indicator	Method of data analysis	Methodology	Notes	Sources
Distributinal Justice	Redundancy and modularity	GIS	Total green area - (9*population amount)	Research points to at least 9m ² of green space per individual	Russo and Cirella 2018
	Maintenance	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information		Williams and Moser 2019
	Distance	GIS	50m buffer around all green areas larger than 300m ²	The use of buffer areas instead of network analysis was chosen as it also accounts for ecosystem services of green areas rather than solely accessibility to the area	Aram <i>et al.</i> 2019
Procedural justice	Total amount	GIS	Total green area/total surface area		Maimaitiyming <i>et al.</i> 2014
	Amount per capita	GIS	Total green area/population amount		Maimaitiyming <i>et al.</i> 2014
	Resourcefulness	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information		Williams and Moser 2019
	Capacity to learn	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information		Williams and Moser 2019
	System access	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information		Williams and Moser 2019
	Decision-making processes	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information		Williams and Moser 2019

Information flow	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information	–	Williams and Moser 2019
Application of new knowledge	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information	–	Williams and Moser 2019
Recognition justice	Thematic coding	1. Interview to participants 2. Coding of the responses 3. Extraction of information	–	Williams and Moser 2019

*Population data is from the open data portal of the city of Amsterdam (Gemeente Amsterdam 2020).

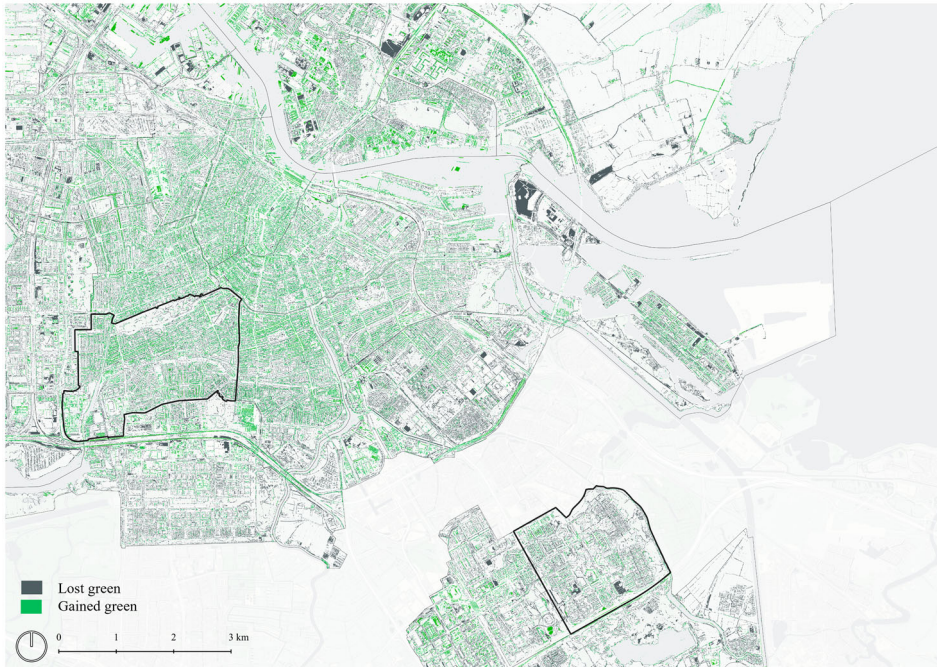


Figure 2. Changes in total urban green in Amsterdam between 2016 and 2019. Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the authors.

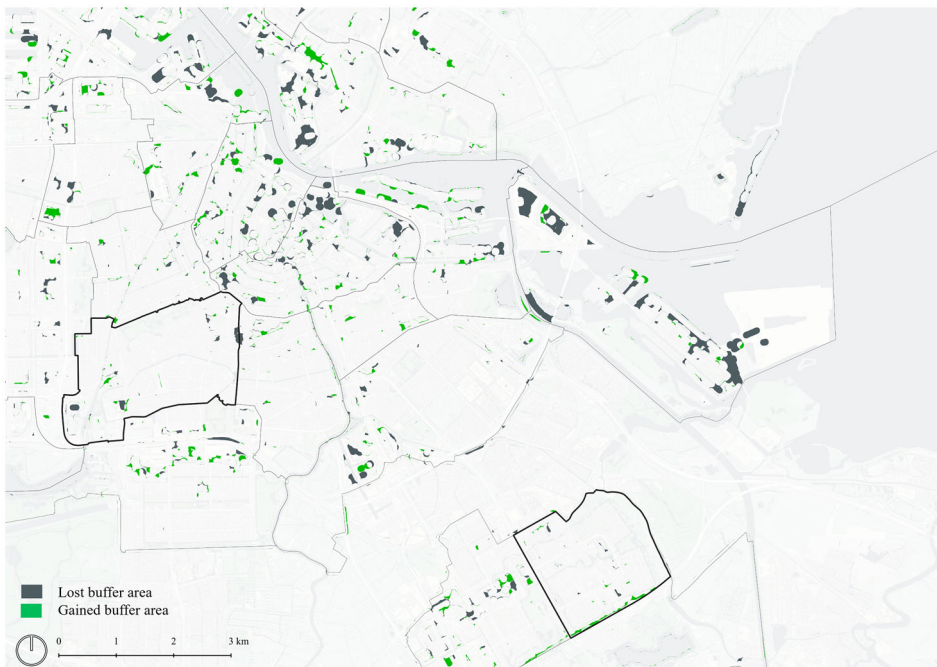


Figure 3. Changes in distance from green spaces in Amsterdam - the difference in buffer area (50 m) around green spaces larger than 300 m². Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the authors.

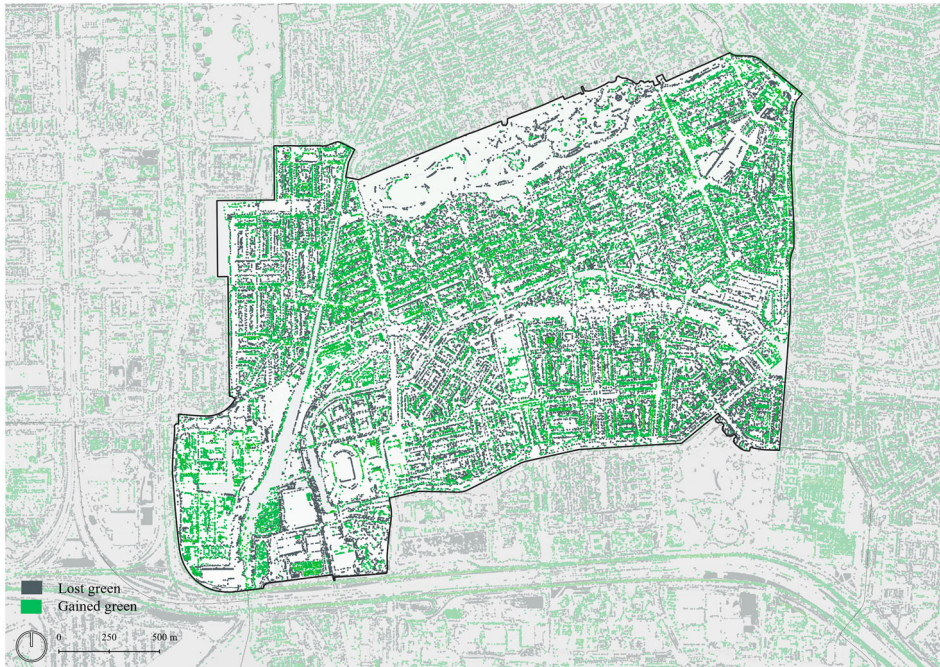


Figure 4. Changes in total urban green in Oud-Zuid between 2016 and 2019. Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the authors.

indicate a slight increase, thus confirming that the Green Agenda did succeed in its goal of developing new green areas in the city. These results differ from previous studies, which had identified a loss in green spaces in the years before 2016 (Giezen, Balikci, and Arundel 2018). Therefore, the identified increase in green spaces could be, at least in part, explained by the implementation of the Green Agenda as the first municipal policy promoting the uptake of urban green (no other similar initiatives or policies had been implemented in the same timeframe). In addition, Figure 5 shows the changes in *distance* from green spaces: the grey areas used to be less than 50 m away from large green spaces but now are farther than 50 m from green spaces. Thus, distance from green space has increased in most areas of the city. Most of these areas coincide with newly developed neighborhoods. Therefore, this confirms previous studies that identified a tension between densification and greenification policies (Giezen, Balikci, and Arundel 2018). Still, the slight increase in the total amount of urban green is a successful result for the city, as long as the newly gained green spaces are not used for development in the future.

Nonetheless, interviews reveal that the *maintenance* of green areas is a common problem shared throughout the city. The Green Agenda states, “The responsibility for the funding and implementation of the maintenance of green spaces lies with the district committee,” which can decide how to assign funds (Gemeente Amsterdam 2015). However, different factors cause problems with the maintenance of green spaces. First, residents who initiated projects with the Green Agenda funds complain that “you do not get money for maintenance, you only get money to make things” (R9), meaning that when the municipality provides funds for residents to develop new green spaces, it does not contribute to the successive maintenance, but only to the initial costs. The

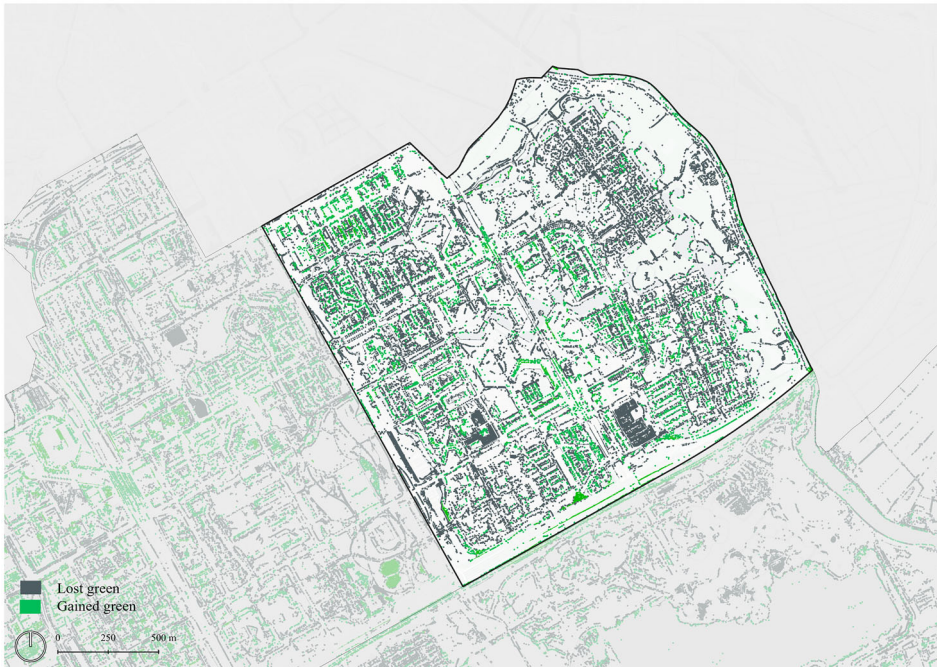


Figure 5. Changes in total urban green in Bijlmer-Oost between 2016 and 2019. Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the authors.

municipality’s rationale is that the maintenance costs will be reduced by allowing residents to take care of their green spaces (Gemeente Amsterdam 2015). However, this often causes projects to be abandoned because of the lack of funds for maintenance (R9; R11; R15). As pointed out by R15, the ultimate result is that “lots of money is sometimes wasted because there is not enough or not at all maintenance.” The second problem emerges when the district committees decide to hire private contractors for the maintenance of the whole district. In this case, project initiators and volunteers notice a lack of communication with the private companies, often resulting in companies cutting off plants and flowers planted by the residents (R8; R12; R25). One of the targets mentioned in the Green Agenda is to “set up a framework based on public-private method collaborations” for the initiation and upkeep of green projects (Gemeente Amsterdam 2015). However, such collaborations are still to be improved, given the negative feedback of the residents on their experiences with the private companies.

4.1.2. Procedural justice

Awareness about the importance of green spaces has increased in Amsterdam, and so has the number of residents’ initiatives related to urban green (R7; R19; R23). This is not solely an achievement of the Green Agenda, but it is an important factor affecting the resilience-building process. Thus, it is worth keeping in consideration. However, only a tiny circle of residents is directly involved in the urban greening process by developing and maintaining green projects (R12). Factors that may affect residents’

participation are lack of time, lack of money for an initial investment, lack of education, or lack of awareness (R3; R4; R5; R8; R11; R14; R18; R20). For instance, “people who have less money to spend and less leisure time, they do not have the luxury, either in time or money, to be busy with green” (R14). Also, “all of these people [participants in green initiatives] have something in common: they all come from rather stable backgrounds” (R7). Therefore, the most active residents are older residents with stable incomes and lives. While the involvement of these people is fundamental, projects often rely solely on the effort of one or a few residents, undermining the initiative’s long-term success (R21; R9; R22).

Resourcefulness is one of the variables most directly affected by the Green Agenda, as this policy directly provided financial resources to the residents. Moreover, each district was free to decide how to organize the provision of funds by either giving the entire budget to local organizations (the number of organizations per district varies as there is one organization per area) who would then share it with the residents or letting the local civil servant (an employee of the municipality who administers the area/district) take care of it (Gemeente Amsterdam 2015). While civil servants support residents’ initiatives by providing funds when a project is proposed, they do not help residents prepare the proposal. Furthermore, the support that proposals for green projects receive is very dependent on the individual civil servant and their preferences (R17; R21). On the other hand, the green coaches who work at the local organizations help residents ideate their projects, prepare the proposal to receive funds, and implement it (R2). With their work, local organizations act as intermediaries between the residents and the government as they provide residents with easily accessible information on the government’s policies; furthermore, because of their experience, they can facilitate residents in the process of developing plans and applying for funds, which would otherwise be very complex procedures (R16). Unfortunately, it was not possible to obtain precise information concerning the exact funds received by the organizations in each area; however, all of the coaches interviewed agreed on identifying the organizations in the Oud-Zuid district as the ones receiving the most funds as these organizations exist for a longer time, so they, have already built up more robust network than Groene PlatVorm [organization in Bijlmer-Oost]” (R12; R1; R2; R3; R5) Therefore, in the districts where the local organizations were given a large share of the budget, these organizations had a greater capacity to support and help residents who wanted to start new projects, while in those districts where the organizations had lower funds they were not able to provide the same support (R12; R1; R2; R3; R5).

The most important problem concerning the institutional process is the complexity of starting an initiative. To obtain funds for a new project, residents must go through a lengthy bureaucratic process that sometimes makes them discouraged and abandon the project (R1; R2; R11; R15). The *information flow* and *decision-making process* are also complex. Although there is transparency and the information is all publicly available, the residents feel very detached from the central municipal government. Thus, they need help accessing the information they need (R6; R7; R9).

Furthermore, respondents from the municipality and local projects or organizations agree that residents with migratory backgrounds (especially residents with African or Asian backgrounds) are more challenging to reach and to be involved in green initiatives (R6; R8; R18). This is why local organizations have the fundamental role of acting as intermediaries between the residents and the government (R12; R20). R20 explains the importance of local organizations acting as intermediaries: “I think if you

are just a citizen starting up a project on your own without help from an organization, it is pretty hard, depending on how used you are, to get what you want. [...] We [organizations] really function as a translator, I would say, between citizen and the municipality, because we know their procedures and we know how to help.”

Overall, *system access*, or initiating and taking part in green projects and initiatives, is much easier for residents with a good education, time, and Dutch background (R7; R15; R17). While this is not always the case, especially regarding taking part in already-initiated projects (R25), and it is more common to see different demographic groups taking part in projects, the initiators of projects, according to several respondents, are usually higher educated residents with a Dutch or European background (R3; R6; R9; R11). This is due to the difficulty and complexity of starting an initiative. As described by Respondent 3: “Once projects are underway and they’re sort of established, I’ll see also people from those communities [non-Dutch] taking part. So, it is more of a joining in later but not putting in the initial effort. This may have to do with the procedure at the beginning, which is quite a challenge”. Most respondents agree with this statement.

Another important problem is the *application of new knowledge* since there is a lack of encouragement and support for bottom-up initiatives from the municipality. While the Green Agenda aims to promote residents’ initiatives to make neighborhoods greener, “many residents are not aware of the problems, possibilities, and concessions from the municipality” (R16), meaning that the availability of funds is not promoted enough. Furthermore, respondents have reported occasions in which funds were denied to the residents and instead used to hire private companies or civil servants to do the same job that the residents would have done because the residents’ proposal was deemed unfeasible or too complex (R1; R2; R8; R26). Some respondents, both residents and coordinators from local organizations, reported occasions when this happened, either because the initiatives proposed by the locals had not received enough support, because the proposition was deemed too challenging to organize and support over time, or because no initiatives had been proposed for a particular space. This reveals a sort of contradiction in the intentions of the municipality, which sets off with the call for bottom-up initiatives but then tends not to trust residents with their propositions or not to support them in the proposition of new initiatives. Still, not all participants reported experiences of this, but only a limited number of them.

4.1.3. *Recognition*

Recognition is an important issue wholly overlooked in the Green Agenda. What is mentioned in the policy is that “neighborhoods with low income and education are expected to gain the most from green,” but what is not said is how to support the most vulnerable residents taking part in the greening process, nor how to include their visions and needs in the planning process (Gemeente Amsterdam 2015). Therefore, the policy lacks recognition justice as it does not include any effort to characterize the needs and expectations of residents nor to consider that vulnerable residents might have different requirements for the types of green spaces they need, access to green spaces, or inclusion in the planning process. Residents and coordinators or local organizations agree that there is little effort on behalf of the municipality to address the most vulnerable communities, exchange information on their needs, and include them in the planning process (R10; R18; R23). Civil servants also agree that it is

particularly difficult to include residents (especially the most vulnerable and isolated ones) in the planning process and that this has resulted in a lack of recognition of their needs, expectations, and difficulties (R13; R26). The most evident proof is that “neither local organizations nor citizens were contacted when writing the Agenda Green” (R7). In addition, the responsibility for including and communicating with vulnerable residents is passed to the local organizations, which sometimes try to prioritize initiatives for more vulnerable residents but often struggle to include them in their activities (R1; R13; R17).

4.2. Comparison of Oud-Zuid and Bijlmer-Oost

This section presents the results of the comparison between Oud-Zuid and Bijlmer-Oost to highlight the differences in outcomes between the two areas. Table 4 summarizes all results for the city-wide and comparative analyses.

4.2.1. Distributional justice

While outcomes on the city scale are positive in terms of the increase of green space, comparing the areas of Bijlmer-Oost and Oud-Zuid reveals some intra-city differences. The variables total amount, amount per capita, and redundancy have increased in Oud-Zuid (+1.13% in total amount of green, +1.07 m² of green per capita, +0.06 km² of redundant green spaces). At the same time, they decreased in Bijlmer-Oost (−0.21% in the total amount of green, −0.29 m² of green per capita, −0.01 km² of redundant green spaces). None of the two areas have been significantly affected in terms of distance from green. An additional difference between the two neighborhoods is maintenance. While residents in both areas engage in maintenance activities for their green spaces, the maintenance provided by residents is insufficient for the long-term preservation of all green spaces in the city, so external companies are hired to maintain urban green spaces in Amsterdam. However, some respondents have highlighted that maintenance of green areas in the Bijlmer area is worse compared to the areas closer to the city center: green spaces are damaged by cars and not fixed, the maintenance company spends less time in the area, and some spots are hardly ever maintained. This is because, until 2015, the city was subdivided into different sections, A, B, or C, each of which had assigned a level of maintenance; Oud-Zuid was assigned to level A (the highest) and Bijlmer-Oost to level C (the lowest) (R8). Maintenance should now be carried out equally throughout the city, but the difference is still evident as residents in the Bijlmer area still complain about the lack of attention from the maintenance companies (R8; R4).

4.2.2. Procedural justice

The two areas are quite different in terms of *resourcefulness*. First of all, while the policy was developed on the city level, each of the seven city districts received a different budget for green: The Zuid district (where Oud-Zuid is) received 8 million € between 2010 and 2020, while the Zuid-Oost district (where Bijlmer-Oost is) received 2 million € in the same period (Gemeente Amsterdam 2017). This is because the city’s structural plan (a 30-year planning vision) identified different development goals in the two districts: the priority for Zuid (where the Oud-Zuid area is) is to

Table 4. Summary of results of city-wide and comparative analysis.

	Variable	Results in amsterdam	Results in Oud-Zuid	Results in Bijlmer-Oost
Distributional justice	Redundancy	Gained 0.93km ² of redundant green space	Gained 0.06km ² of redundant green space	Lost 0.00km ² of redundant green space
	Maintenance	-Miscommunication /lack of communication between the company and citizens sometimes leads to projects being ruined -Funding for projects does not include maintenance, so projects are often abandoned due to lack of funding for long-term maintenance See Figure 3 -City areas that have recently been densified have also lost some of their proximity to green spaces Gained 0.45% of total amount of green	-	-Maintenance in the Bijlmer district still receives less attention compared to more central districts
	Distance	See Figure 3 -City areas that have recently been densified have also lost some of their proximity to green spaces Gained 0.45% of total amount of green	See Figure 6	See Figure 7
	Total amount	Gained 0.45% of total amount of green	Gained 1.13% of total amount of green	Lost 0.21% of total amount of green
	Amount per capita	Gained 1.24m ² of green per person	Gained 1.07m ² of green per person	Lost 0.29m ² of green per person
Procedural justice	Resourcefulness	-Each district has different organizations and receives different funds based on the priorities defined by the city's structural plan -Experts are both on city and district level: very fragmented knowledge -Civil servants provide the funds once the proposal for a project is submitted, but they do not help with the writing of the proposal, while local organizations also support citizens during the proposal-writing phase -Local organizations are always struggling to get budget	-Received more funds (8 million € between 2010 and 2020) because the priority defined was to increase the amount of green spaces to make the area more attractive to visitors and citizens -Organizations are older thus have better network and capabilities to ask for more budget -All budget went to the two local organizations who support citizens in applying for funds	-Received less funds (2 million € between 2010 and 2020) because the priority defined was the re-development of the existing housing structures -Organizations are very recent and have less network and capabilities to ask for budget -Part of the budget given to the local organization, part given to the district coordinator who gives it to projects directly

Capacity to learn	<ul style="list-style-type: none"> -Following document (GroeneVisie) is a lot more comprehensive and was developed with the suggestions of local organizations -The city has shared guidelines that need to be followed to make sure that new green spaces are climate resilient -Only people with good education (and good understanding of Dutch) can start an initiative because of the complex bureaucratic process -Time is an important factor that prevents people from participating -Exclusion also depends on lack of motivation -Citizens with lower economic capabilities cannot make their private garden more green or rent a private green space 	<ul style="list-style-type: none"> -Organizations are older and have more experience in supporting new projects 	<ul style="list-style-type: none"> -
Rights and entitlements linked to system access	<ul style="list-style-type: none"> -Need for better clarification of responsibilities, it is not always clear who does what -Decision making process is transparent, but very complex -Transparency depends a lot on local civil servants -Information is available, but difficult to find (especially if you don't speak Dutch) -Organizations are the connection between citizens and the government -Communication between the different actors is difficult -Not much encouragement to start new initiatives: funds are available but not advertised -The municipality tends to use a top- 	<ul style="list-style-type: none"> -People with Dutch background in Oud-Zuid are better at finding support from the municipality -Most citizens have a stable background so they are more likely to be involved 	<ul style="list-style-type: none"> -Poorer communities are more excluded because of lack of time -Less organization in demanding things to the government
Decision-making processes	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> -
Information flow	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> -Citizens with non-western backgrounds are less connected to the municipal information stream -Citizens with non-western backgrounds are more difficult to reach for local organizations
Application of new knowledge	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> - 	<ul style="list-style-type: none"> -

(Continued)

Table 4. (Continued).

Variable	Results in amsterdam	Results in Oud-Zuid	Results in Bijlmer-Oost
Recognition justice	<p>down approach by hiring private contractors, while the local organizations try to encourage bottom-up initiatives by engaging with the citizens</p> <p>—</p>	—	<p>-There is no clear plan to prioritize the most vulnerable areas</p>

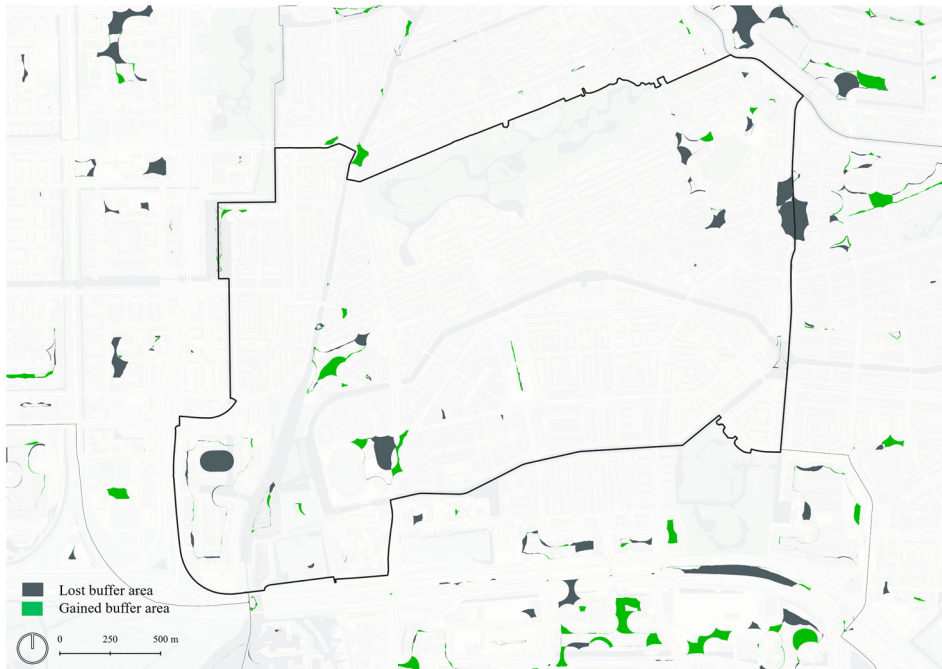


Figure 6. Changes in distance from green spaces in Oud-Zuid - difference in buffer area (50 m) around green spaces larger than 300 m². Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the authors.

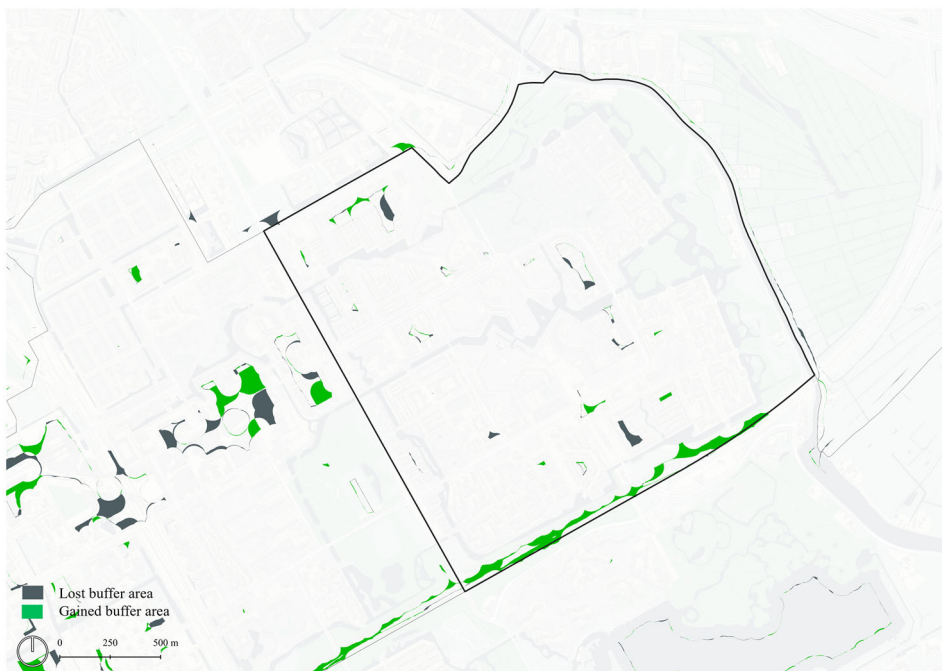


Figure 7. Changes in distance from green spaces in Bijlmer-Oost - difference in buffer area (50 m) around green spaces larger than 300 m². Sources: Esri Living Atlas, Beeldmateriaal Nederland. Design and calculations made by the author.

become the international heart of the city and increase the number of green spaces, while the priority in Zuid-Oost (where the Bijlmer-Oost area is) is the re-development of housing (Gemeente Amsterdam 2017; R26). The consequence of this is visible not only in the difference in green space between 2016 and 2019 but also in the number of green initiatives in each area (buurtgroen020 2021).

Another important difference is that, in Oud-Zuid, all the funds provided by the Green Agenda were given to the local organization, which helped residents through the process of requesting money to initiate a project (R2; R10). On the other hand, in Bijlmer-Oost, only a minor part of the budget was given to the local organization, while the majority was kept by the civil servants, who simply accepted or rejected the residents' project proposals, but did not provide any support through the proposal-writing phases (R2; R10). Therefore, the local organization in Oud-Zuid was able to provide better support to the residents of their area compared to the organization in Bijlmer-Oost.

The area of Oud-Zuid has a long tradition of residents taking care of the green spaces in the neighborhoods, and this is reflected by the fact that the local organization GroeneBuurten is one of the oldest in the city (R8; R12). This long tradition means that residents are more responsive and generally also better organized; thus, they have a better *capacity to learn*. Furthermore, residents of Oud-Zuid perceive a greater need to develop new green spaces as their area is overall less green than Bijlmer-Oost (R2). Still, that is not the main reason why the residents of Bijlmer-Oost are less responsive. The main reason is the different demographic characteristics of the population. Many respondents have identified these characteristics as factors that reduce the likelihood of residents initiating or participating in a green project (R4; R11; R21; R14). This is because: "People don't have the luxury, either in time or money, to be busy with green; so it seems like a luxury" (R14) and because "They're not connected to the municipal information streams to say it that way, but also maybe they don't have the time or the energy or the knowledge" (R4). Specifically, the factors acting as barriers in the city of Amsterdam (already mentioned in Section 4.1.2) and thus creating diverging outcomes between the two city areas are:

- Personal income: Residents of Bijlmer-Oost have significantly lower personal income (on average). The lack of money is not an obstacle per se. However, it implies reduced time availability as residents have to struggle with other priorities (multiple low-paid jobs or job hunting) before committing to greening initiatives. (R8; R10; R23)
- Migratory background: Bijlmer-Oost is one of the city areas with the highest percentage of citizens with a non-western migratory background. These residents are generally at a disadvantage in taking part in institutional activities or initiating new projects due to (1) the language barrier, as the majority of available information is solely in Dutch, and (2) the lack of engagement or trust in the institutional structure due to the complexity of bureaucratic processes (R1; R3; R10; R17).
- Education level: Respondents have expressed their observations on how residents with higher educational levels are more likely to start or engage with green initiatives as they have a greater capacity to navigate the bureaucratic processes for demanding funds and support from the municipality. Therefore, residents of Zuid-Oost have an initial advantage in demanding funds and support in their area (R20).

- Age: Residents of Zuid-Oost are, on average, older than in the rest of the city. Thus, more people could be retired and thus have more time to engage in community initiatives (R22; R24; R21).
- Homeownership: Owning rather than renting a house has been indicated by some respondents as a possible reason for having a greater interest in greening and improving the area of residence, as residents might have a more long-term vision for the neighborhood's future. Therefore, residents of Bijlmer-Oost, who are for the majority renters, have lower incentives to engage with greening their area as they might not see themselves living there in the long-term (R8; R15).

4.2.3. Recognition justice

While the Green Agenda mentions that results are expected to provide significant benefits to low-income and low-education neighborhoods, it fails to define strategies targeting the inclusion and *recognition* of vulnerable residents. Clearly, in areas where residents are more vulnerable and require greater institutional support, the role of the organizations in reaching vulnerable residents is more relevant. However, these areas are often where local organizations receive the least amount of funds. This means that even if indirectly, residents with higher education and accessibility to the bureaucratic procedures had a higher possibility of having their visions and needs heard during the planning and implementation processes.

5. Discussion

Was the Green Agenda successful in its goal of increasing the amount of urban green and including residents in the process? Partially. Results show that while it achieved a slight increase in the overall amount of green in Amsterdam, it did not create an inclusive participation process for all residents. Regarding distributional justice, the uneven distribution of funds seems to be an important factor causing unjust outcomes. However, funds were distributed according to the priorities identified by the municipality in each district (for instance, in Bijlmer-Oost, more funds were devoted to the renewal of housing structures); thus, the uneven distribution of funds for green is justified (Giezen, Balikci, and Arundel 2018).

Furthermore, the overall green increase benefits all residents across Amsterdam. The differences revealed by the GIS results are insufficient to lay strong claims of uneven distribution of outcomes. On the other hand, it is easy to diagnose recognition injustice given the lack of recognition and support for vulnerable residents. Concerning procedural justice, it is clear that not all residents have the same opportunities to participate because of institutional barriers or their socio-economic status. These results highlight the importance of analyzing the uptake of urban green spaces by not only focusing on distributional outcomes but also on issues of procedural and recognition justice.

5.1. The Green Agenda: results and residents' participation

One of the Green Agenda's main goals was to incentivize residents' participation in the greening process by funding residents' projects to develop new pocket parks and improve the existing ones. However, the Green Agenda document was unclear on how funds would be distributed or whether certain areas would be prioritized. Our interviews

showed that funds were distributed to the districts based on the central government's priorities and the number of projects proposed in each district. This led to an uneven distribution of funds. Still, this was not the main problem identified by our respondents, who expressed more concerns about the procedural aspect of the Green Agenda. All respondents agreed on the complexity of the process: from accessing information to submitting a proposal for a project and finally to initiating and maintaining the project. The Green Agenda does not provide clear information on each of these steps, but rather it says that it all needs to be administered by each district individually (Gemeente Amsterdam 2015). It has to be noted that not all respondents identified this as a central problem because, in their experience, the procedures were not as complicated as for other participants. However, such contrasting responses already highlight some procedural justice inequality. Therefore, considering that the primary goal of Agenda Green was to "support residents' initiatives in creating neighborhood green by facilitating neighborhood initiatives, education, communication, and awareness," the results and analysis of the interviews lead us to argue that the policy was a successful means to provide residents with more funds, and to incentivize bottom-up initiatives. However, it was not successful in facilitating communication and awareness, as it did not provide a city-wide strategy to do so.

The participants' experiences with the Agenda Green show us that public participation in the process of urban greening can indeed be successful, but it can also lead to enlarging existing inequalities if the more vulnerable residents are not recognized and supported (Fainstein 2015). This confirms Mees *et al.* (2019) worry about the possibility of exacerbating existing inequalities through public participation. Furthermore, our results support Jakobsen and Andersen's (2013) call for a redefinition of the role of the local government as a facilitator for residents' initiatives and its importance in trying to reduce inequality in residents' participation, as well as Buijs' (2016) argument for the necessity of governmental support in the provision of funds, maintenance of existing projects, dissemination of information, and recognition of the most vulnerable residents. Finally, focusing on the inclusion and participation of citizens in the planning process allowed us to gain in-depth knowledge of the barriers to procedural justice, as well as the lack of recognition and support for marginalized communities.

Therefore, the results of our study show that residents' participation in the urban greening of Amsterdam did not automatically lead to more just outcomes and processes. However, it did represent an important step forward in achieving environmental justice. For instance, the provision of financial support from the municipality allowed residents to access the greening process regardless of their economic status, and the support from local organizations facilitated communications and citizens' involvement. However, results also highlighted that residents' participation alone is not sufficient to achieve justice as lack of recognition, uneven access to resources, and barriers to inclusive participation are still important factors hindering environmental justice, even in cases where residents' participation is incentivized by monetary funds. As a matter of fact, the excessive reliance on voluntary labor has been reported to lead to uneven outcomes as citizens' participation is not necessarily incentivized for justice concerns, but rather for economic benefits (Perkins 2010). For this reason, scholars are now stressing the need to design policies and plans with a clear focus on justice and equity, with specific attention to participation and recognition of the most vulnerable residents (Grabowski, McPhearson, and Pickett 2023; Grant *et al.* 2022).

5.2. Barriers to environmental justice

The analysis of the process and outcomes of the Green Agenda revealed three factors acting as important barriers to justice in the implementation of the policy: bureaucratic complexity and uneven distribution of funds, lack of support to local organizations, and lack of recognition of how socio-economic characteristics of the residents affect their participation in the resilience-building process. The following points discuss the main identified factors that hindered Amsterdam's achievement of a just urban greening process.

5.2.1. Role of the government and centralization

Scholars have stressed the role of the government in supporting and incentivizing residents' initiatives in creating urban spaces (Bakker *et al.* 2012). The case of Amsterdam also shows that the local government plays an important part not only because it can create policies like the Green Agenda but also because the governmental structure can directly affect the urban greening process. For instance, Amsterdam's government centralization (as of 2014, the executive of Environment and Health operates at the city-scale, while before it used to have elected representatives in each district) had both positive and negative effects on the Green Agenda's outcomes (Gemeente Amsterdam 2022). On the positive side, it favored the development and implementation of a city-wide policy on green (previously non-existent) as an attempt to achieve comparable results in all city districts. However, there are two disadvantages of such centralization. First, it creates bureaucratic complexity, thus making it difficult for residents to find information and apply for funds. Second, although the policy was meant for the whole city, districts received different amounts and used the funds in different ways, which means that residents' possibilities to initiate green projects were very dependent on the amount of funds received by the district and the local civil servant or local organization in charge of distributing such funds.

While scholars stress the important role of local governments as facilitators of residents' initiatives, the results of this article show that specific government characteristics can also hinder residents' participation (Bakker *et al.* 2012). Bisschops and Beunen (2019) argued that governments' inflexibility tends to impede changes and add procedural complexity, as shown in Amsterdam's results. Furthermore, the uneven distribution of funds directly affects the outcomes, even though such distribution is decided according to seemingly fair principles (Fainstein 2015).

5.2.2. Role of local organizations

Results revealed that important actors in the urban greening process are local organizations or foundations. Given the difficulty that residents find in initiating projects, local organizations have the vital role of supporting them throughout the process and acting as translators between the residents and the municipality. Furthermore, local organizations support the government's aim to promote bottom-up initiatives by acting as the main point of contact between the residents and the central government, as well as trying to spread awareness of the funds provided by policies like the Green Agenda. However, all respondents working or volunteering in local organizations stress the instability of their financial situation. The funding is not only too little for the great responsibility that they have but also not secure in the long-term as it needs to be renewed every year, and additional funding from local residents is often required.

This undermines the results they can achieve and, more importantly, the amount of support they can provide to residents, especially in areas where their help is needed the most.

Other authors also highlight the role of intermediaries like these local organizations. Hawkins and Wang (2012) identify organizations as a vital support network for residents and an important intermediary between residents and institutions. Similarly, Warbroek *et al.* (2018) point to these “intermediaries” as a solution to alleviate institutional barriers and increase interest and awareness in sustainable initiatives. Other than intermediaries, local organizations could also be seen as enablers since they enable residents to demand funds and start new initiatives. On the other hand, while civil servants also provide funds for new projects and help develop projects once they are funded, they act more as gatekeepers since they only approve or reject proposed projects. Still, they do not help residents in the process of preparing the proposal.

5.2.3. *Impact of socio-economic characteristics of residents*

The Green Agenda was meant to support residents in their green initiatives, but it failed to include all residents evenly because it did not address important barriers of entry in the urban greening process. The difficulties faced by residents’ participation are well-known in research. Socio-economic characteristics of the residents, especially on the city or neighborhood scale, have often been identified as barriers to inclusive participation (Ghose 2005; Ravensbergen and VanderPlaat 2010). The results of this study highlighted important socio-economic barriers that affect residents’ possibility of participation, and thus justice and inclusion in the outcomes of greening policies like the Green Agenda. First is the economic requirements of owning and greening a private garden, as well as the need for economic stability and home ownership as incentives to engage in greening initiatives. A second, more indirect, barrier is the time-consuming and complex process of initiating a new project: only residents with enough education and time on their hands have the capacity to go through the process of demanding and implementing a green initiative. Therefore, migratory background, education level, and age are three important factors affecting participation. This is especially relevant in the Bijlmer-Oost area, where the local organization is less institutionally embedded and only receives a small amount of the funds provided by the Green Agenda. Finally, information flow is a barrier for all the communities that the municipality or the local organization less easily reaches: these residents are often “left out of the loop”; thus, they are unaware of the possibilities to receive funds and support. While this might be mistaken for residents being “unresponsive,” it is actually the symptom of a deeper problem concerning the lack of access to information for residents with non-western migratory backgrounds.

These are not the only barriers to residents’ initiatives identified by previous literature. For instance, lack of risk awareness, cultural values, and lack of trust in the proposed solutions are also commonly identified barriers (Thaler *et al.* 2019). However, none of these barriers was identified as particularly relevant by the respondents in Amsterdam, primarily because awareness about the importance of green spaces has grown significantly in the past few years. Therefore, the results of this study show that while a large variety of socio-economic barriers to participation can be identified, contextualizing research on a specific city might highlight some barriers and shadow others, thus providing more precise guidelines for policy-makers.

5.3. *Barriers synergies and trade-offs*

The results of this study highlight three important barriers that hindered inclusive participation and just outcomes in implementing the Green Agenda in Amsterdam. While most of these findings confirm existing literature which had previously discussed possible barriers to participation and justice, the presented results confirm that civic participation does not automatically lead to just outcomes, especially when looking beyond distributional justice and focusing on procedures and recognition during the design, planning, and implementation processes of policies like the Green Agenda. Moreover, our empirical, in-depth, and comparative investigation of the case study allows us to assess the contextual identity of such barriers (which, as discussed, are strongly dependent on the governance structure and the socio-economic characteristics of the populations) as well as observe synergies and trade-offs between them. This final observation is highly relevant as it has been mostly overlooked in existing studies, which present barriers without evaluating their placement in a complex and interconnected urban system (Haase *et al.* 2017). Through our research, we identify two synergies and two trade-offs between the presented barriers to participation and justice:

Synergies:

- The centralization of the government and the implementation of a city-wide policy have a strong role in providing legitimacy to supporting the up-scaling of residents' initiatives. Specifically, the municipal government's commitment to a city-wide vision of green transformation and inclusive participation is seen as an important path to increasing environmental awareness, incentivizing participation, and progressing towards a more sustainable society. Finally, the city-wide application of the policy aims at reducing existing differences between city areas and providing fair support to areas that had been left behind in the past.
- Local organizations are an important bridge between residents and government, and with their role, they can help residents overcome access barriers to initiating or joining green initiatives (Fung 2015). For example, local organizations can provide support in navigating the bureaucratic complexity of demanding funds, or they can find new ways to find residents who are not engaged with their local community.

Trade-offs:

- While the benefits that local organizations can provide are very relevant, especially in neighborhoods where residents are more vulnerable and marginalized, their agency is (in the case of Amsterdam) limited due to the lack of stable and long-term institutional support. Even if the central government defined a city-wide vision for a greener and more just city, it failed at defining a robust institutional embedding and a long-term funding strategy for local organizations, whose work was undermined by lack of funding and instability.
- Finally, the socio-economic characteristics of the residents are often mentioned as one of the main barriers to participation and justice. However, our study reveals that this barrier is further strengthened by the centralization of the government, which increases the complexity of bureaucratic procedures, hinders information flows, and limits the provision of funds to local organizations.

5.4. Value of the results for academic knowledge and urban planning process

The results of the presented study have important value for academic knowledge but also for the integration of findings for future urban planning processes. In terms of academic knowledge, this research addresses important research gaps. First, it provides an empirical and contextualized analysis of the environmental justice implications of civic participation in the context of the provision of urban green spaces; this is relevant as empirical evidence on the impacts of local policies on environmental justice beyond distributional injustice is still lacking and necessitate for more in-depth analyses of the processes and institutions preventing the achievement of just and inclusive outcomes. As shown by Calderón-Argelich *et al.* (2021), a limited number of studies currently observe procedural and recognition justice empirically, and our results highlight the importance of considering these two aspects. The case of Amsterdam shows that while injustice might not be visible in terms of distribution and accessibility, it can still be present throughout the urban greening process. Specifically, the risk of enduring these types of injustices is reinforcing the existing power imbalance and further marginalizing vulnerable residents who are already excluded from the planning processes (Fainstein 2015). Second, the analysis and comparison between case studies allows us not only to confirm previous arguments on the existence of barriers to participation and justice but also to highlight how such barriers can create synergies and/or trade-offs based on the context of the case. While previous studies had discussed barriers to urban greening and just implementation of green initiatives, our research touched two important aspects mostly overlooked. First, it focuses specifically on the barriers to participation or barriers hindering just participation. Articles by Biernacka and Kronenberg (2018), Boulton *et al.* (2020), and Kronenberg (2015) propose comprehensive lists of barriers to inclusive greenspace provision, but lack focus on barriers to participation. Thus, our results trigger existing knowledge by showing that the list of barriers is longer if processes and procedures are considered as integral parts of greenspace provision. Second, while most existing studies list barriers to justice and/or greening as separated entities, we add value by embedding our analysis in an existing case study by showing the complex systemic interactions between barriers (Wolff *et al.* 2022).

Besides the academic value of the results, this study sheds light on (some of) the factors currently perpetuating environmental injustice in cities, despite the growing efforts to transition towards more inclusive, just, and fair planning processes. Therefore, the lessons from the findings of this research can and should be purposely integrated into the planning process of the city of Amsterdam, but also possibly adapted to other urban centers with similar governance or social characteristics as Amsterdam. In a nutshell, results show that city-wide provision of funds for incentivizing participation is not a sufficient measure to ensure inclusivity and recognition of marginalized citizens, which applies to most urban contexts (Kronenberg 2015).

Yet, possible solutions emerging in contrast to this problem and applicable to future urban planning processes are:

- The reduction of bureaucratic complexity to simply access for all residents, including those with limited time availability or language barriers. This can be done, for example, by creating centralized online platforms in multiple

languages, providing support and information, or organizing local meetings in each neighborhood.

- The provision of stable institutional and financial support to local organizations or similar entities which can support citizens in finding information and applying for funds or simply trying to involve marginalized residents in community initiatives.
- Collecting residents' opinions through questionnaires, workshops, or interviews can be an important way to increase recognition in the planning process and thus plan for outcomes that align with the current needs and values of all residents.

6. Conclusion

This article investigated urban green spaces and environmental justice in Amsterdam. This was done by evaluating the implementation and outcomes of the Green Agenda, a municipal policy promoting the creation of green space and green initiatives in Amsterdam through residents' involvement. Results show that although urban green generally increased in the city, important barriers still make the urban greening process less just. First, the Green Agenda offered no recognition or additional support for the most vulnerable residents. Second, the presence of important entry barriers prevents residents with low education levels and low economic stability from taking part in the process. Third, the procedural injustice is further enhanced by the uneven provision of support by the local organizations. Specifically, the main barriers to justice identified from the results are bureaucratic complexity and uneven distribution of funds, lack of support to local organizations, and lack of recognition of how the socioeconomic characteristics of the residents affect their participation in the resilience-building process.

While this article only focused on the city of Amsterdam, the results and the methodology employed are generalizable to other contexts. Using a framework that includes indicators related to both environmental justice and the urban greening process allowed us to identify important factors affecting participation and recognition justice, two elements of the urban greening process that are often ignored. Furthermore, focusing on the residents and their role in the process was a valuable way to shift the focus towards a justice perspective. While this study might reveal different results when conducted in a different context, the focus on the role of the residents and the use of the framework of analysis can easily be applied to other cases. To test this empirically, a suggestion for future research would be to use the analytical framework proposed in this article to analyze the urban greening process in other cities in both the Global North and Global South. A larger-n comparison would increase the robustness and validity of the results.

Still, these results can already provide important policy takeaways as they show that current policies like the Green Agenda are not enough to increase the uptake of urban green in a just manner. According to the results of this study, important policy solutions could be the reduction of bureaucratic complexity, the provision of stable financial support to local institutions, and the integration of residents' needs and visions in the policy-design phase. Finally, results also enhanced academic knowledge by addressing three important research gaps: (1) providing in-depth empirical knowledge on processes shaping procedural and recognition justice, (2) assessing citizen participation through an environmental justice perspective, and (3) identifying synergies and trade-offs between the barriers hindering the achievement of just greening

processes and outcomes. Through an empirical analysis and comparison of case studies, this study confirms the existence of important barriers hindering not only distributional justice but also inclusion and recognition in the planning process. Besides confirming some existing knowledge, this study also provides new outlooks on the synergies and tradeoffs between barriers to participation in the greening process, as well as factors preventing urban greening policies from achieving successful outcomes.

Note

1. The authors understand that this definition can raise objections, yet it was used following the official terminology of the Dutch administrative bodies. While highly relevant, it goes beyond the scope of this paper to discuss this definition in more depth.

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No potential conflict of interest was reported by the author(s).

Supplemental data

Supplemental data for this article can be accessed [here](#).

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