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Article

Urban Greening Management Arrangements between Municipalities and Citizens for Effective Climate Adaptation Pathways: Four Case Studies from The Netherlands

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Abstract: The transition towards nature-based cities has increasingly become a central focus in political–environmental agendas and urban design practices, aiming to enhance climate adaptation, urban biodiversity, spatial equilibrium, and social well-being as part of the ongoing socio-ecological urban transition process. Climate adaptation in cities is a complex problem and one of the main collective challenges for society, but the relationships between city managers and citizens as to urban green care still face many challenges. Parks design guided by technical-expert and globalised criteria; inflexibility from bureaucratic inertia; and citizens' demands to participate in the urban green transition, sometimes without the necessary knowledge or time, are some of the challenges that require further research. In this study, we examine four long-lasting approaches to green-space management in four cities in the Netherlands, ranging from municipality-driven to community-driven management forms, and encompassing diverse spatial configurations of greenery within the urban fabric. Utilising the theoretical lens of the Social–Ecological Systems Framework, we employ a multiple-case-study approach and ethnographic fieldwork analysis to gain a comprehensive understanding of the norms, collective-choice rules, and social conventions embodied in each urban green management arrangement. The purpose of this research is applied, that is, to provide urban managers and decision-makers with a deeper understanding of drivers to promote effective collaborative management approaches, focusing on specific organisational rules that may contribute to more sustained planning and maintenance pathways for urban green spaces, regardless of changes in political leadership or significant external funding sources. The results of the investigated cases show that long-lasting collaborative management of forests and parks has established a set of collective-choice rules for resource transfer between municipalities and citizens, including non-monetary resources (such as pruning-training courses or guided tours that attract tourists and researchers). Additionally, these arrangements have been favoured by the existence of legal norms that enable co-ownership of the land, and monitoring and sanctioning mechanisms that offer a slightly different interpretation from the evidence identified so far in the scientific literature on collective resource management and organisational studies.

Keywords: green cities; urban planning; social–ecological systems; citizen engagement; collaboration

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1. Introduction

Renewed emphasis on planned greening processes in urban areas has been growing in environmental agendas and urban policy arenas since the end of the 20th century, related to the urgency for climate adaptation and expanding urban population [1–4]. The shift towards becoming a nature-based city has increasingly become a central focus in urban management literature and practices over the past century [5,6] an initiative aiming to enhance urban resilience [7,8], spatial equilibrium [9], and social well-being [10] within the

ongoing social–ecological urban transition process. In particular, recent pioneering research provides scientific evidence on the benefits of urban greenery on urban living. It enhances mental and overall human health [11–13] by, for instance, facilitating short-term recovery from stress or mental fatigue and accelerating physical recovery from illness [7,14]. It also influences perceptions of a high quality of urban life [15] and even improves performance and job satisfaction among office workers when they have views of nature [16]. Additionally, shadier neighbourhoods create meeting places, enhance social interactions [17], and foster a sense of community ownership and responsibility [10]. While evidence on air pollution reduction by urban trees is mixed, well-placed trees can reduce local pollution [18,19].

Current urban planning increasingly incorporates evidence-based guidelines to enhance the well-being of city dwellers by leveraging the positive impacts of nature. City managers and landscape designers around the world are working to introduce more nature into urban areas, motivated by environmental and political agendas, as well as by the desire to emulate other cities. For instance, guidelines such as the "3-30-300" rule suggest that every resident should be able to see at least three trees from their home, live in a neighbourhood with at least 30% tree canopy cover, and have access to a green space within 300 m [7]. Additionally, other guidelines emphasise the importance of maintaining proximity to green spaces to promote the regular use of these spaces and associated health benefits, such as the European Regional Office of the World Health Organization's recommendation for public green space within 300 m of residences [20].

However, this is not an easy task within already-established cities, and the forms of green spaces in cities often adapt to the available space, ranging from new forests or parks in new urban developments to the regeneration of depleted soils in interstitial city spaces, disused industrial land, and urban peripheries, some on a significant scale [21–27]. The need for mainstreaming urban greening and forestry into urban management structures [12,28] is becoming increasingly evident. Harmonising the expansion of green spaces within continuously growing cities requires expert ecological knowledge (plant species, fauna, soil quality, irrigation systems, landscape connectivity, etc.), along with meticulous coordination among the various municipal departments responsible for planning, environment, or mobility, as well as the maintenance companies typically engaged in managing urban green spaces [29]. Additionally, it is also necessary to harmonise the growing social demands for urban green spaces with powerful interests involved in new urban developments [28]. These factors collectively increase the complexity of urban management and the financial resources required for the upkeep of expanding green infrastructure.

In this context, to maximise scientifically proven benefits for urban residents and to accelerate the urban green transition, the collaboration between city managers and citizens is generating high expectations. By establishing effective mechanisms for citizen involvement in the care of urban greenery through diverse forms of civic engagement, these collaborations can achieve significant impacts [30–32]. Various municipal strategies are being experimented with to implement collaborative approaches for the development of a "new generation" of greening initiatives, aligning with social demands and ecological lifestyles, as demonstrated in both practitioner arenas and the scholarly literature [28,30–32]. However, while public–social collaboration and citizen engagement efforts have resulted in numerous co-design methodological toolkits, the reality is that many challenges remain [29,33,34]. One of the causes at the root of tensions is the emphasis placed by urban designers, guided by technical-expert criteria, on meeting globalised quality standards in green public spaces, which contrasts with localised communitarian uses and customs in the city space acquired over time [29,32,34,35]. Another common cause is inflexibility caused by bureaucratic inertia [34,35]. Simultaneously, due to this bureaucratic treatment and previous failed experiences, citizens feel distrustful or "disembedded" [36] towards actions initiated by public bodies. Additionally, the demands from citizens to participate in the urban green transition sometimes face their lack of necessary training and time to undertake green design and maintenance tasks that ensure adherence to public space requirements [31,32,34]. Therefore, the long-term effectiveness and acceleration of

urban greening depend on understanding and bridging these tensions and limitations, and there is a need to accumulate more empirical evidence on the collaborative urban management practices that go beyond conventional models and have been successfully implemented around the world. It is essential to translate emerging paradigms of management and socio-ecological relationships into concrete management mechanisms and protocols [37–41] as the foundation of cooperation between citizens and city managers in the care of urban green spaces. Only recently have scholars in organisational studies and public management begun to address the climatic and ecological dimensions [42–45], and thus far, sophisticated and critical applications of institutional knowledge aimed at addressing questions of climate adaptation [46,47] have been few and sporadic.

The objective of this research is to delve into specific management arrangements for urban green spaces made between city managers and citizens over several years, examining four distinct approaches, from municipality-driven to community-driven management forms, and encompassing diverse spatial configurations of greenery within the urban fabric in four cities in the Netherlands. We define "management" as a set of norms, collective-choice rules, and social conventions [37–41] that are embedded in planning and maintenance practices of urban greenery. The general research question is as follows: How have long-lasting collaborative management forms of urban green spaces been sustained over time, and what drivers have led to their effectiveness? The following specific research questions guide the exploration: (i) What are the management forms implemented (sets of norms, collective-choice rules, and social conventions)? (ii) How have diverse management forms built trust and cooperative relationships between city managers and citizens? (iii) What practical implications can be drawn and generalised for effective adaptation pathways?

The chosen analytical framework is the Social–Ecological Systems Framework [37–41] of the prominent scholar Elinor Ostrom, which has shown significant efficacy in explaining the resilience of collaborative natural resource management systems overall (forests, fisheries, pastures, and irrigation systems, among others). Such an approach could provide a valuable addition to contemporary theoretical and practitioner-oriented perspectives in the domain of sustainable greening in cities. From a methodological standpoint, the empirical basis of this research consists of four well-established case studies in the Netherlands using an ethnographic analysis method, and encompassing urban forests or parks co-managed by municipalities and civil associations. These case studies represent a diverse spectrum of co-management schemes and various urban configurations and sizes (ranging from 1 Ha to 330 Ha). The Netherlands is a country implementing robust national and local urban greening policies. Given that it is partially below sea level, the management of water in scenarios of torrential rains and the filtration in high-quality green areas have now become urgent challenges to address. This study enables a deeper understanding of the management challenges embedded in sustainable urban planning and maintenance for cities over time. Our purpose is to provide insights to urban managers and decision-makers on effective collaborative management mechanisms, as well as information as to their dependency on the urban configuration of green areas, that may contribute to more sustained planning and maintenance pathways for urban green spaces over time, regardless of changes in political leadership or external significant funding sources.

The remainder of this article is structured as follows: Section 2 describes the theoretical and conceptual framework, as well as the methodology and criteria employed in selecting case studies. Section 3 presents the four case studies, focusing on their urban configuration and management structures. Section 4 discusses the results, contrasting empirical material with theoretical references. Section 5 concludes with key findings and their practical implications for various contexts, and ideas as to future research.

2. Materials and Methods

2.1. Theoretical Framework: A Social–Ecological Systems Framework Used to Analyse Collaborative Management of Green Areas

The Social–Ecological Systems (SES) Framework created by Nobel Prize laureate Elinor Ostrom is enlightening in understanding the resilience of collaborative management forms used in the management of natural resources [37–41]. Ostrom recommends its use when ecological factors significantly influence the actions situations analysed [40]. The framework has been predominantly employed to analyse situations in which agents exchange or extract resources, or participate in maintaining common natural resources, within the context of related ecological systems and broader socio-political–economic environments [38]. The SES framework illustrates the interconnections among four key subsystems, as underlined in Figure 1: (1) resource systems, like protected parks with forests, wildlife, and water; (2) resource units, such as trees and plants; (3) governance systems and organisational management, like specific park rules and the rule-making process itself; and (4) users, representing individuals with diverse purposes like sustenance, recreation, or commercial activities in the park. The interconnections between these subsystems give rise to specific interactions and outcomes. Interactions between agents include the sharing of information, deliberative processes, conflicts, and networking activities. Outcomes are classified as social performance measures (e.g., efficiency, equity, and sustainability), ecological performance measures (e.g., resilience and biodiversity), or externalities to other SESs.

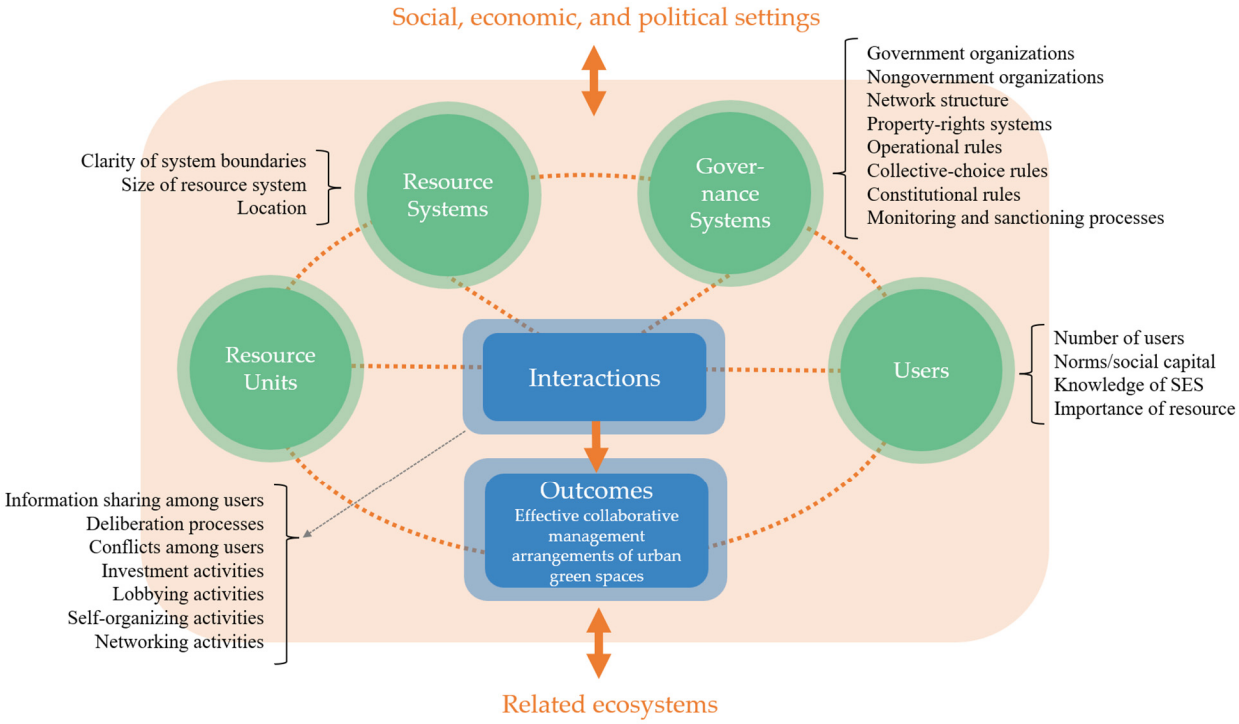


Figure 1. Social–Ecological Systems (SES) Framework. (Source: adapted from Ostrom [38]).

In this research, social performance measures describe the outcome we aim to obtain, which is specified as the effective collaborative management arrangements of urban green spaces. To achieve this, we pay special attention to all variables in the Governance subsystem, a significant portion of those in the Users subsystem, and some variables in the Resource Systems—this is to validate whether the green space's size and its urban configuration influence the management approach. The variables chosen to guide the analysis are highlighted in Figure 1.

The SES framework is based on the extensive, lifelong research conducted worldwide by Ostrom. According to Ostrom [38], the likelihood of co-organisation in the management of natural resources increases when the following dimensions emerge: (1) Moderate

territorial size is most conducive to self-organisation for land-related resource systems. (2) Users need to observe some scarcity before investing in self-organisation, i.e., abundant or exhausted resources may not motivate management, and scarcity alone is not always sufficient to trigger collective action [37]. (3) Self-organisation is facilitated when system dynamics are predictable; forests, for example, are more predictable than water systems. (4) Self-organisation is less likely with mobile resource units, and stationary units are more conducive due to the lower observation and management costs they entail. (5) As the size of the group of users increases, coordination and decision-making tasks become more complex and expensive; however, larger groups are more capable of self-organisation if the tasks to be managed are costly, so the impact depends on other variables and management tasks. (6) Entrepreneurial skills and respected local leaders increase the likelihood of self-organisation. (7) Shared moral and ethical standards among users reduce transaction costs in reaching agreements. Indeed, reciprocity norms within a group are learned and applied under rational logic, but a small group-size is necessary for their manifestation [37]. (8) Common knowledge of relevant socio-ecological system attributes lowers organising costs, and by contrast, lack of understanding can lead to resource destruction. (9) Long-lasting self-organisation is more likely when users depend on the resource for their livelihoods or attach high value to its sustainability over time. (10) Users with autonomy in crafting and enforcing their own rules face lower transaction costs and reduced defence costs against resource invasion by others.

Finally, some additional findings suggest that the incorporation of face-to-face communication relative to a planned action does not guarantee collaboration among agents [37]. Ostrom also indicates that the existence of monitoring and gradual sanction mechanisms increases the longevity and robustness of common natural resource management [37].

2.2. Concepts of Reference: "Management", "Disembedding", and "Trust" in Municipality–Citizen Relationships

Ostrom inspired us to unpack the concept of "management" in a nuanced definition as a blend of rules, norms, and social conventions. By "rules" we mean "shared practices that certain actions in particular situations must, must not, or may be undertaken and that sanctions will be taken against those who do not conform" [37]. Rules are by collective choice, and "guidelines for societal living enacted in social relationships, transcending specific situations and being transmittable and replicable" [48]. By "norms" or "constitutional rules" (in terms of Ostrom) we refer to "bureaucratically stipulated written rules often accompanied by explicitly outlined penalties or sanctions, representing objectified rules in written form" [37,48]. Finally, we specifically refer to "social conventions" since management forms (and human agency, in general terms) are built upon "shared understandings among agents arising from social learning. Conventions also have a practical status and are useful to indicate operations aimed at making forms of practice acceptable, i.e., they produce a persuasive effect on the acceptability of practices in an intersubjective space" [48]. Social conventions constitute the nature of social reality and create the frames through which meaning is made [37].

Additionally, we needed to incorporate other concepts, which are of great utility for this research in describing agreements and disagreements between city officials and citizens, such as "disembedding" and "expert systems", which were developed by the sociologist Anthony Giddens. "Disembedding" is defined as the "separation of social relationships from their interaction contexts, restructuring them in indefinite space-time intervals" [36], i.e., social relationships become more independent of their immediate environment and acquire a more abstract and detached dimension in time and space with modernization and globalisation processes, facilitated, for instance, by information and communication technologies. This is a progressive process of separation of modern forms of knowledge and action from the traditional contexts of face-to-face interaction in which they would have been generated [48]. Among the mechanisms responsible for the disembedding are the "expert systems", defined as "systems of technical accomplishments or professional

expertise that organise large areas of the material and social environment in which we live. They are specialised systems of abstract knowledge, rationalised and linked to a technoscientific division of labour" [49]. In this research, we describe municipalities as expert systems.

These concepts have spawned research worldwide that focuses specifically on modes of connection between expert systems and citizenship. At this crucial juncture, the evidence of disembedding between expert systems and individuals undermines the construction of trust. Therefore, it is also necessary to unpack the meaning or meanings of "trust". Theoretically the concept of "trust" is further dissected by distinguishing between everyday social relationships and those with formalised organisations. Anthropologist Díaz de Rada explains: "While personal commitments point towards trust as a form of connection, commitments with institutions point towards cooperation" [49]. The conceptualization of "cooperation" between expert systems and citizens has been scrutinised by various scholars. It can be identified "cooperation-suspicion when an agreement occurs [. . .], a kind of contract that must be observed throughout the interaction, and may not necessarily result from prior communication or be written, they can emerge implicitly during the interaction, being established through custom, past successful experiences, trial and error, etc." [50]. In another sense, "figurative trust is identified, constructed by expert systems to conceal the overtly instrumental and de-subjectivizing logic when dealing with subjects in a partial manner (i.e., as consumers, customers, travellers. . .) and establishing their relationship through pre-established binding rules rather than immediate dialogues" [49]. This theoretical distinction in meanings of "trust" assists us in analysing different modes of engagement in greening management processes.

2.3. Methodological Framework: Multiple-Case-Study and Ethnographic Fieldwork Analysis

This research combines the multiple-case-study approach [51,52] and the ethnographic method [53–55]. The rationale for choosing the ethnographic method lies in the nature of the object of study: social conventions, collective-choice rules, and norm development. This dimension requires an in-depth examination of individuals' articulated statements (*what people say*), professed actions (*what people say they do*), and actual behaviours (*what people actually do*) [53]. Ethnography seeks a balance between theoretical analysis and vivid fieldwork descriptions [54]. The combination with the case-study approach facilitates the exploration of specific action processes into the "boundaries" of the case in a systematic way.

The selection of the case studies in this article has been faithful to the ethnographic perspective, in that the objective is not to make statistical generalisations, but to provide an in-depth understanding of common perceptions and experiences. We have adopted an embedded multiple-case-study design, allowing us to explore multiple levels of analysis within a single context. The cases were selected using intentional, non-representative sampling, and by focusing on their accessibility to the field—crucial for ethnographic research, as it enables direct interaction with the actors involved in the study. What is sought is the representativeness of our field in relation to the problems we aim to study [55]. This process ensures theoretical replication rather than a sampling logic, aiming for contrasting and replicable results within a well-defined theoretical framework [51].

The criteria for case selection were, first and foremost, Ostrom's three fundamental criteria for examining natural resource management within her theoretical framework [37]. This implies that the cases must involve: (1) the management of natural or artificial resources (human-made), i.e., forests, irrigation systems, or fisheries; (2) resources for which it is costly, but not impossible, to exclude beneficiaries from derived benefits and to effectively prevent others from accessing the resource (e.g., fencing a forest); and (3) resources that may be subject to depletion or exploitation. Regarding the third criterion, all of the selected cases are located in the same country, the Netherlands, where soil is considered a scarce resource vulnerable to depletion due to rapid urbanisation and intensive agriculture. Cities in the Netherlands face climate impacts and imminent risks due to 25% of the country being

below sea level, and consequently putting approximately two-thirds of the country at risk of flooding during storms or river overflows caused by rain [56]. The country is densely populated, and over the past few decades, nature has been planned and introduced by urban designers and landscape architects to enhance urban quality of life and strengthen the soil for construction purposes [56]. Subsequently, we selected the cases according to these three additional criteria: (4) longstanding presence of managerial forms (excluding cases with a short lifespan); (5) ownership of green spaces by municipal bodies or citizen communities; and (6) diversity of green surface sizes and urban configurations. Regarding the last criterion, we have linked to the work of Sijmons [57], who delves into three historical urban models embodying contrast, contact, and contract between urbanisation and landscape. The Garden City, advocating relocation to nature and bringing satellites of the city, aligns with the "contrast" model. The Garden Lobe, bringing nature into the urban fabric, represents the "contact" model. Lastly, the Broad-acre City, providing families with one-acre plots for living and self-sufficiency in food production, embodies the "contract" model. These archetypal concepts offer insights into historical urban–nature relationships, guiding present-day urban planning. Finally, academic experts in landscape and urban design from the Department of Urbanism at Delft University of Technology provided suggestions of potential cases to study in which there was either prior contact or easy access to key informants for conducting ethnographic analysis.

The names of the selected cases are Maxima Park in the city of Utrecht, DakPark in the city of Rotterdam, the EVA-Lanxmeer district in the city of Culemborg, and Groene Mient in the city of The Hague. Table 1 summarises the classifications of the cases, according to the selection criteria, for convenience. A more detailed description of each case is provided in the following section. In all cases, the scale does not exceed the district level; it encompasses either a neighbourhood or the entire district. This allows for an ethnographic analysis at a human scale, enabling the examination of actions and reactions of individuals. Regarding the criterion of urban configuration, it is necessary to specify that the cases are classified as "contact" and "contract" models, but none are classified as "contrast" due to the evolving role of nature in urban development over time, transitioning from a contrasting element distinct from the city during the 20th century to an element integrated with the urban environment [57].

Table 2 enumerates the data production techniques used during the fieldwork, encompassing in-depth interviews; visits for observation; participation in guided tours and collective pruning sessions; and desk research involving planning and project documents accessed through project agents, i.e., examining statutes, meeting minutes, plans and maps on the websites of the construction firm, and photographs taken on-site during the work (see Supplementary Materials link and Appendix A). Some of this documentation was publicly available, while other parts were formally requested from the coordinators of each project. The analysis of planning and project materials produced by the agents of each case study are fundamental pieces in this research as expressions of conventions and collective-choice rules that shape the social practice of managing urban spaces. The information obtained from these data sources has been triangulated among the sources to ensure adequate representation, to increase synchronic reliability of data, and to uncover any deeper meaning in the data [54]. Transcripts and emerging themes were categorised and (re)coded in order to seek possible patterns in the texts and assist in the interpretation of results and analysis.

Table 1. Case studies' summary: Surface size, Urban configuration, Year of start, Organisations involved, and Property rights relevant to the green resource. Source: Authors.

Name, Location, and Population	Surface Size (Hectares)	Year of Start	Urban Configuration	Governmental, Non-Governmental Organisations Involved (Legal Forms)	Property Rights Relevant to the Green Resource (% of Public, Private, and Common Land)
MaximaPark. Utrecht, Leidsche Rijn district (49,307 inhabitants)	330 Ha. Forest park	2007. Before, there was agricultural land.	Contact	Public Administration and Foundation of neighbours volunteering	Public land, 100%
DakPark. Rotterdam, Delfshaven district (76,605 inhabitants)	7 Ha. Park with vegetable gardens	2014. Before, there were railways.	Contact	Public Administration and Foundation of neighbours volunteering	Public land, 100%
EVA-Lanxmeer. Culemborg, eco-district (800 inhabitants)	56 Ha. Eco-district with 330 houses	1994. Before, there was agricultural land.	Contract at start, now contact	Owners' Association and a network of foundations, associations, cooperatives, and corporations	Private lands, 68% (each house with private garden); public lands, 9% (green area on public land owned by the City Council of Culemborg); and common lands, 23% (owned by the owners' community under the "mandeligheid" legal form)
Groene Mient. The Hague, Segbroek district (60,054 inhabitants)	0.76 Ha. Social–ecological housing with 33 houses	2013. Before, there was a school.	Contract	Owners' Association, a secondary association, and a cooperative	Private land, 44% (each house with private garden); and common lands, 56% (common gardens and roofs) under the Collective Private Ownership legal form

Table 2. Data sources: Interview, Participant observation, and Desk research of case documentation. Source: Authors.

Case Study	Data Source	Data Collection Period
Maxima Park, Utrecht. Forest park.	Three in-depth interviews: (1) Project Manager of MaximaPark, Department for Spatial Development, Utrecht City Council (2 interviews); (2) the designer of the Masterplan for the renovation of the neighbourhood where MaximaPark is located.	(1) 21 December 2023; 6 February 2024; (2) 14 December 2023
	Two non-guided visits (tours are on request. There is a suggested itinerary on the website).	November and December 2023; February 2024
	Desk research with project documents.	September 2023–April 2024

Table 2. *Cont.*

Case Study	Data Source	Data Collection Period
DakPark, Rotterdam. Park with vegetable gardens.	Two in-depth interviews: (1) volunteer group engaging in green maintenance; (2) Landscape Designer, Department of Planning, Landscape & Urban Development, Rotterdam City Council.	(1) 25 November 2023; 6 February 2024; (2) 28 December 2023
	One Guided tour and one collective pruning session with volunteers and subsequent meal (participant observation).	25 November and 2 December 2023
	Desk research with project documents.	September 2023–April 2024
EVA-Lanxmeer, Culemborg. Eco-district.	Two in-depth interviews: (1) focal point of communication in EVA-Lanxmeer; (2) a resident of the dwellings (for 3 years).	(1) 21 December 2023; (2) 14 December 2023
	One guided tour and one non-guided visit.	4 and 22 November 2023
	Desk research with project documents.	September 2023–April 2024
Groene Mient, The Hague. Social–ecological housing.	Two in-depth interviews: (1) a resident in the dwellings (for 3 years); (2) a resident in the dwellings (for 10 years).	(1) 28 October 2023; (2) 9 December 2023
	One guided tour and one non-guided visit.	October and December 2023
	Desk research with project documents.	September 2023–April 2024

3. Case Studies: Urban Green Space Configuration and Organisational Structure

We provide a description of the green spaces selected, focusing on their geospatial configuration within the urban fabric, as well as the local urban development plans related to climate change and city adaptation, contextualising each case study. Similarly, we delve into the organisational forms arising between city managers and citizens and the decision-making structures in each case, accompanied by a diagram illustrating the connections among the legal entities involved (such as associations, foundations, cooperatives, and corporations).

3.1. MaximaPark (Utrecht): Citizens' Ideas Added to the Park Landscape

MaximaPark, located in Utrecht, the Netherlands, is an extensive urban park spanning around 300 hectares in the Leidsche Rijn district (49,307 inhabitants). Originating from a traditional agricultural landscape, the park was conceived as the central element of the conversion of the area into a new residential district of the city of Utrecht. Its design was awarded by municipal tender in 1997 to the Rotterdam-based landscape and urban design firm West 8, and it has been built in stages from 2007 onwards. It was officially inaugurated by Queen Máxima in the summer of 2013, hence the name [58].

Regarding its urban configuration, the park is situated on the historical ridges of the Oude Rijn river. Its transformation into a vast green space for the new housing areas in west Utrecht, Leidsche Rijn, has divided it into inner areas with a city park and outer areas with housing, public amenities such as sports fields, and vegetable gardens (see Figure 2). Designed to accommodate various users throughout the day, the park features structural elements, including a 10 km green belt and the 6-m-high Park Pergola, providing ecological benefits and space for climbing plants (such as hops, ivy, wisteria, and honeysuckle). Historical features like the Viking Rhine and essential park components like the Lily Pond and Japanese Garden contribute to its diverse landscape [58]. This new park is part of Utrecht's urban design strategy extending to 2040 [59], aiming to create several urban centres with essential facilities, relieve the historic centre, and expand greenery within the city by up to 2 million square metres, along with 2.5 million square metres in parks on the outskirts, accommodating the 30% population increase anticipated by 2040.

(**a**) (**b**)

Figure 2. (**a**) Urban configuration of "contact" model of MaximaPark. (Source: Authors, adapted from OpenStreetMap). (**b**) Photograph taken during fieldwork. (Source: Authors).

From an organisational standpoint, the park is owned by the Utrecht municipality and managed by the Spatial Projects Management Area, in the department of Development Organisation Space (see Figure 3). Primary maintenance is carried out by maintenance staff, with occasional planting activities and construction of amenities (such as small wooden bridges) involving some volunteer residents. City managers engaged a group of local residents in decision-making regarding park activities and administration from the start. Residents, who voluntarily participate, are organised under a foundation known as the "Friends of MaximaPark" ("De Vrienden van het Máximapark" in Dutch) [60]. The City Council has established a channel for receiving proposals from citizens as to elements to be added to the park, such as leisure amenities, for instance. There are sponsorship arrangements with companies for tree planting, as evidenced by signs located within the park.

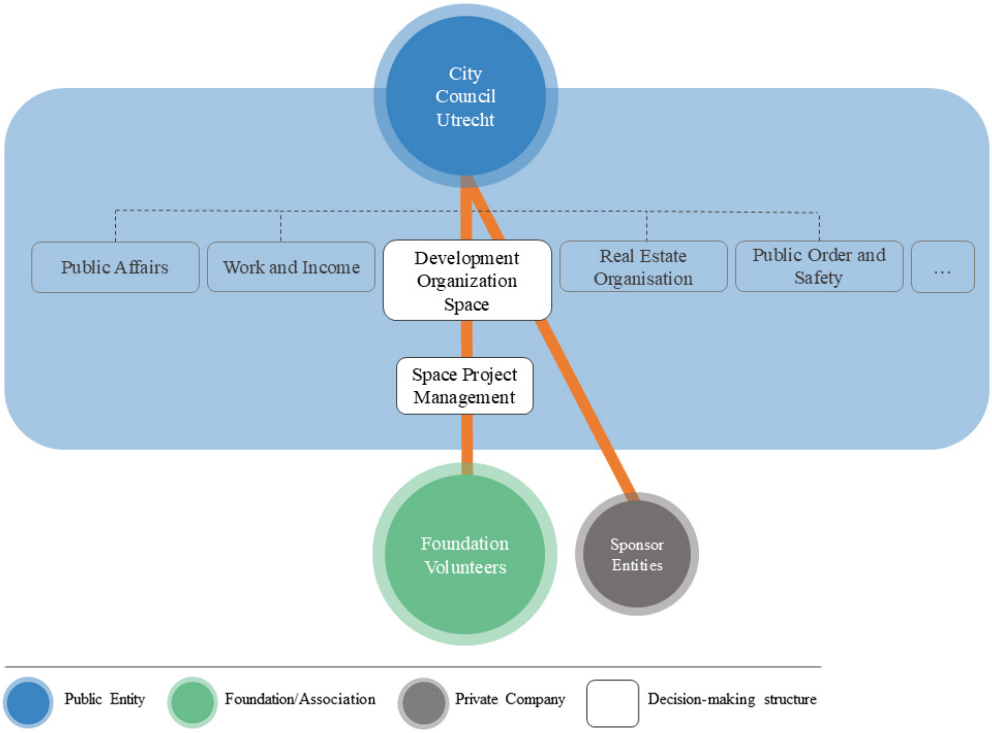


Figure 3. Organisational form of MaximaPark. (Source: Authors).

3.2. DakPark (Rotterdam): Neighbours Volunteering for Green Maintenance

DakPark is situated in the city of Rotterdam near the Merwe Vierhavens port area, in the Delfshaven district (76,605 inhabitants). It is built on top of an old railway yard which blocked the access for inhabitants to the river for decades [61]. Now, it is a sloping park on top of a shopping mall and a river levee with an area of 7 hectares (see Figure 4). Various options were considered regarding the re-lease of the rail yard. The port authority, the owner of the land, wanted to use it for economic activities, while local residents wished to turn it into a park which would also provide access to the river. Finally, the Municipality of Rotterdam commissioned the design of the park from the firm Sant en Co [62], incorporating requests gathered from residents by city managers: good connections between the park and surrounding neighbourhoods, and accessibility for disabled visitors and people with prams [61]. In the summer of 2014, the roof park was inaugurated.

(**a**) (**b**)

Figure 4. (**a**) Urban configuration of the "contact" model of DakPark. (Source: Authors, adapted from OpenStreetMap). (**b**) Photograph of volunteers pruning, taken during fieldwork. (Source: Authors).

The urban design of the park is intricately linked to the surrounding neighbourhoods (see Figure 4). The park slopes upward from an existing dike to the roof of the parking space, and there are shops beneath it. Paths with stairs provide direct access, while diagonal paths offer gentler inclines. The park is surrounded by a fence and has extended opening hours, a feature requested by residents since the park's design process commenced. The park boasts three thematic gardens and unique amenities such as a restaurant housed in a winter greenhouse and a playground. DakPark is one of many municipal initiatives within City Vision Rotterdam 2030 ("Stadsvisie Rotterdam 2030" in Dutch) [63] and the Climate Change Adaptation Strategy launched in 2019 [64]. These initiatives underscore that spatial development planning in Rotterdam must consider long-term climate change forecasts while accommodating uncertainty [65].

The current owner of the park is the City Council of Rotterdam, and the management department is the Planning, Landscape & Urban Development. Park maintenance is carried out collaboratively between the municipal maintenance staff and a group of residents organised under the Dakpark Foundation of volunteers (see Figure 5). At present, the number of people volunteering is 40. Volunteers are organised into two groups based on the type of activity they engage in within the park: green maintenance and children's activities [66]. The City Council pays a part-time salary to the two groups' coordinators. The "green group" prunes a section of the park on Saturday mornings (7–8 people typically turn out, with a total of 15 individuals occasionally joining the effort), manages compost, keeps some hens, and conducts guided tours (see Figure 4b). Volunteers have also reached an agreement with a Dutch farm to allow a flock of sheep to graze in the park during the summer months in exchange for monetary compensation.

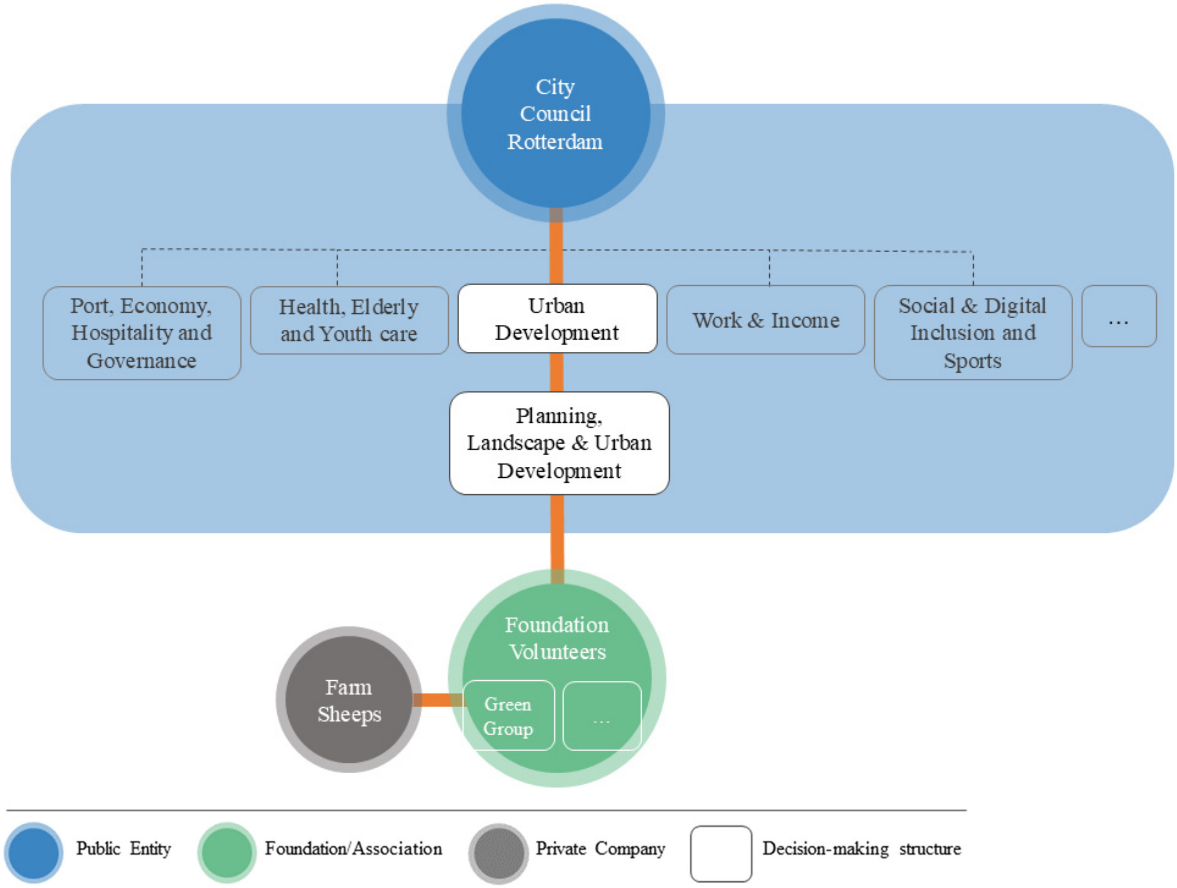


Figure 5. Organisational form of DakPark. (Source: Authors).

3.3. EVA-Lanxmeer (Culemborg): 330 Houses with Public, Private, and Common Gardens in a Self-Management Eco-District

EVA-Lanxmeer is located in the medium-sized city of Culemborg, near Utrecht, and stands as a self-management eco-district of 330 houses and more than 800 residents. It started in 1994 and today encompasses approximately 56 hectares. EVA-Lanxmeer originated from the vision of a woman named Marleen Kaptein and her aspiration to create an ecologically conscious community embracing self-management principles, inspired by previous peer initiatives that emerged in Northern Europe in the 90s. The acronym EVA means "Education, Information, and Advice" ("Educatie, Voorlichting en Advies" in Dutch) [67]. The first 80 owners formed the EVA Foundation, and the development of the initial 200 houses was carried out under the joint commission of the municipality of Culemborg and the EVA Foundation, and lasted eight years [68]. This collaboration facilitated the creation of a Special Urban Development Plan for the EVA-Lanxmeer district, based on municipal spatial models and also the ecological principles of permaculture [69]. Nowadays, this Special Plan is part of a broader Regional Adaptation Strategy 2050 [70], which the city of Culemborg has developed alongside nine other medium-sized municipalities in the region. The strategy is based on an analysis of climate stress data and aims to introduce more nature within each city, improve the runoff and water storage system, and coordinate with the Regional Water Board to monitor dikes and quays.

EVA-Lanxmeer is located on an ancient river ridge within a historic settlement area. Despite years of agricultural use, there is still potential for ecological development, particularly due to the presence of calcareous sand layers [71]. Key elements of the previous urban development plan included the restoration of a historic creek alongside the Rijksstraatweg and the river, as well as the excavation of an old riverbed to create new water structures. The design aims to establish spatial connections between the sheltered water extraction

area, surrounding buildings, and the district farm, with careful consideration given to the integration of the existing school on the southwest side (see Figure 6). The urban structure mixes residential, commercial, and communal activities.

(**a**) (**b**)

Figure 6. (**a**) Urban configuration of the "contract–contact" model of EVA-Lanxmeer. (Source: Authors, adapted from OpenStreetMap). (**b**) Photograph of interior streets. (Source: Collectif Argos Association).

From an organisational standpoint, managing the eco-district has required the creation of a network of organisations initiated by residents and coordinated by the Owners' Association (see Figure 7): a green maintenance foundation, an ecological farm foundation, an energy cooperative (supplying 66% of residents) [72], and a primary school, as well as agreements with an electric car-sharing company, a housing rental corporation, and the national government's water management company (which is located in the centre of the district). The Owners' Association convenes a general assembly twice a year (legal requirement) where decision-making processes regarding resource management and communal initiatives are shaped. To address specific tasks, residents organised several Task Forces, such as TOPLA, for monitoring EVA-Lanxmeer standards as applied to new residential developments of the City Council, and task forces for cleaning the district's streets and monitoring the level of water. The management of green areas presents some complexity, as there are green zones on municipal land; green areas that belong to privately-owned homes; and common green spaces, where residents of each neighbourhood (there are 17 neighbourhoods in the district, called "courts", and represented by a neighbourhood council) are joint owners of a plot. To become co-owners of green areas, the traditional legal concept of "mandeligheid" was used; each owner, in the deed to their home, mentions the existence of a common land (which they do not own as property, but rather have the right to use, as a percentage of the total land).

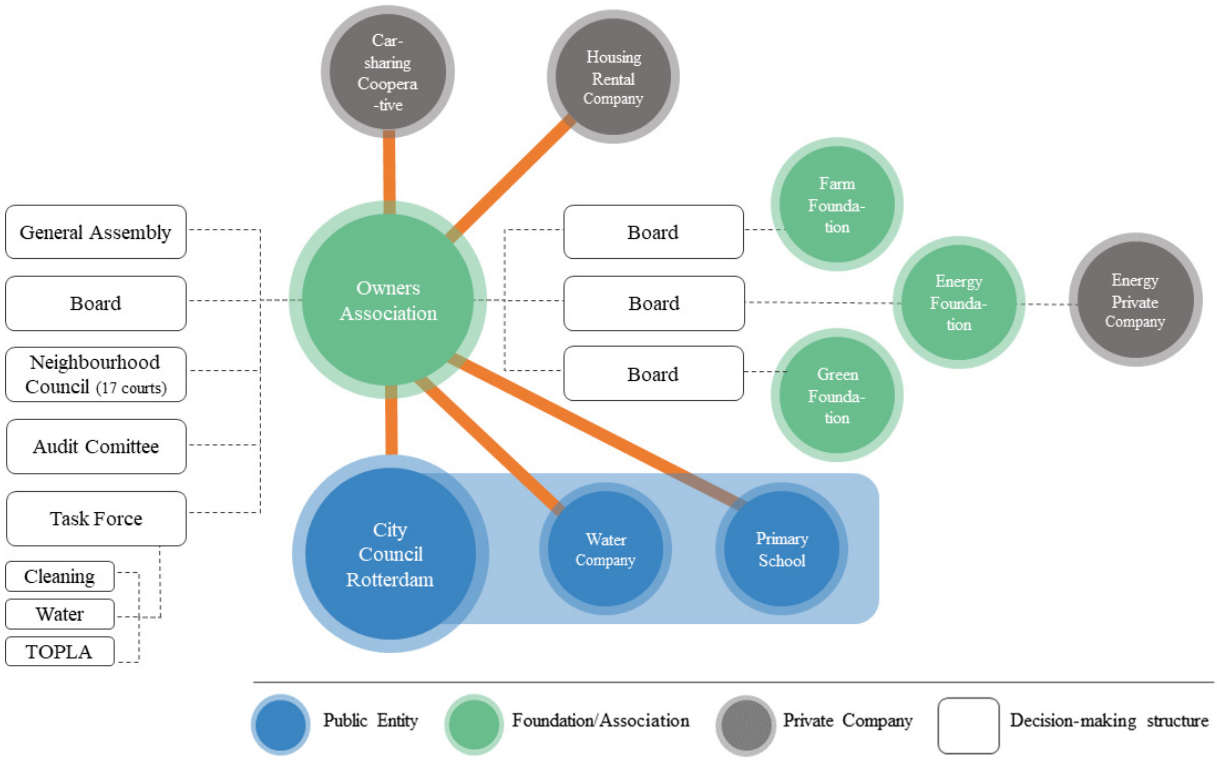
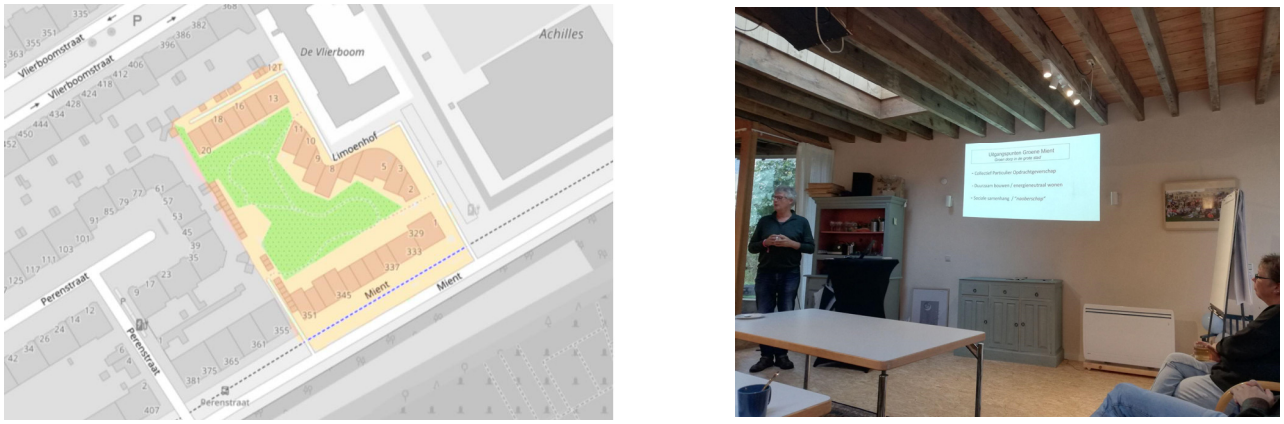


Figure 7. Organisational form of EVA-Lanxmeer. (Source: Authors).

3.4. Groene Mient (The Hague): Housing and Green Management through Socratic Decision-Making Principles

Groene Mient, in the city of The Hague, is a project of 33 houses with private and common gardens, spanning across approximately 7.600 m^2 (less than 1 hectare) situated on the site of the former Maris School in the "Vruchtenbuurt" (old fruit neighbourhood), in the Segbroek district (60,054 inhabitants). The initiative was led by a group of citizens in 2013 under the Collective Private Ownership (CPO) [73], a Dutch legal form that enabled this group of individuals to collectively purchase land from the local government, rather than individually, and subsequently hire design and construction companies for their custom residential space. The project's inception was rooted in a commitment to create "social-ecological housing, i.e., environmentally energy neutral conscious and socially connected neighbourhood" [74]. The Groene Mient residential project adheres to a collective architectural design, yet each home varies based on individual household preferences [74]. Surrounding a communal ecological garden, the houses incorporate a communal building for social gatherings (see Figure 8). To address climate change-induced flooding and drought, Groene Mient has implemented measures to effectively integrate rainwater into the garden. Semi-permeable paving and constructed wadis (vegetated ditches) around the garden help retain rainwater in the soil, with these interconnected wadis facilitating proper drainage and being connected through pipes. The Municipality of The Hague is promoting public–private collaboration to protect urban nature in the coming years [75] through CPOs and other initiatives such as the Eco-building Points System [76], which incentivizes construction companies to incorporate green roofs or bird nesting sites in their constructions, and the distribution of trees to residents and schools for planting in their gardens (approximately 2500 trees were distributed between 2021 and 2022) [77].



(**a**) (**b**)

Figure 8. (**a**) Urban configuration of the "contract" model of Groene Mient. (Source: Authors, adapted from OpenStreetMap). (**b**) Photograph taken during a guided tour organised by the residents themselves. (Source: Authors).

From an organisational standpoint (see Figure 9), residents are grouped into an Owners' Association that functions as a CPO, collectively owning the entire space. In other words, each resident holds the right to utilise both the housing and green space as a unified entity [78]. This is reflected in the absence of fences or physical separation between private and communal green areas. The Owners' Association convenes twice a year in a general assembly (legal requirement) to make decisions on Socratic principles [79]. This means that decisions are not taken by a traditional majority, but that arguments are discussed in several rounds of dialogue until none of the residents raises a major objection. The decision-making process changed over time, and nowadays, residents have organised small groups ("clusters" in their terms) to work on and address issues related to construction, ecological maintenance, communication, finance, and legal matters. Major issues requiring a decision at the general assembly are communicated by two spokespersons from each cluster to the Board, which prepares the agenda for each assembly. Recently, a group of owners have created an energy cooperative to supply energy to Groene Mient residents and part of the district, with the aim of achieving energy self-sufficiency [80].

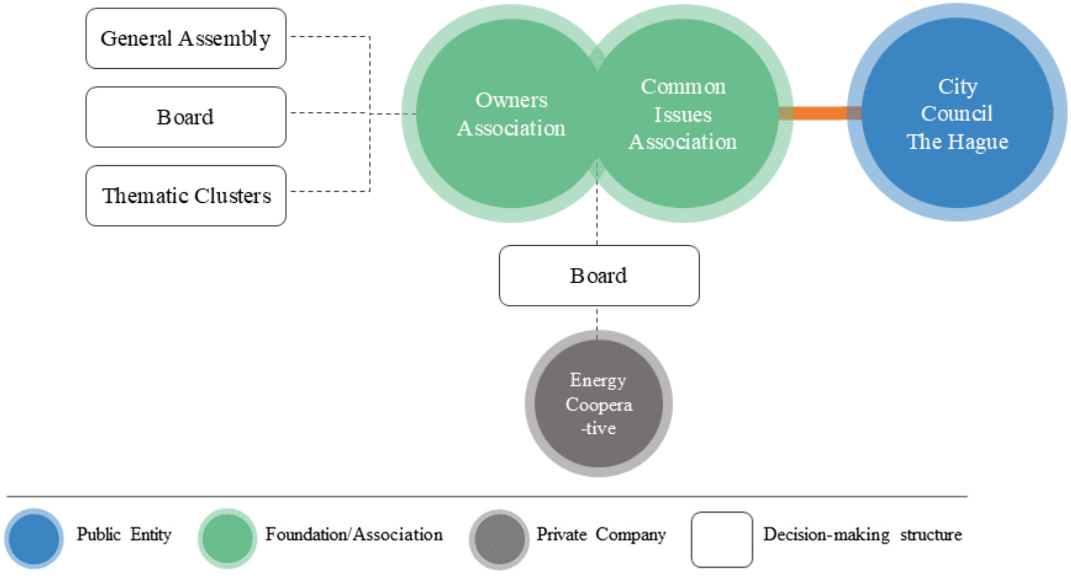


Figure 9. Organisational form of Groene Mient. (Source: Authors).

4. Results and Discussion of Case Comparison

The results of the case comparison are presented here, along with the discussion following the ethnographic analysis process, in which a dialogue is woven between the empirical material from the fieldwork, ordered and interpreted through the analysis categories of the SES framework and the theoretical references from the analytical framework, which validate or not the evidence taken as a reference [54]. The construction of an ethnographic text involves simultaneously interpreting the results and their discussion, rather than in two phases (first results, and then discussion), as occurs in non-ethnographic analysis processes.

4.1. Similarities and Differences in Organisational Structures and Legal Norms

A first observation from the analysis and diagramming of organisational and decision-making structures reveals that both self-managed initiatives and municipal ones have developed similar structures (see Figure 10). In the case of municipal parks, bureaucratic structures have been built and maintained for centuries and are very similar from one city to another (with small variations according to population size and the number of city officials working). On the other hand, self-managed initiatives share basic structures such as general assemblies, boards, and specialised task forces within the owners' association, which is the core structure. In these cases, subsequent foundations, cooperatives, and companies have been created and promoted by owners and coordinated through the owners' association. This suggests a first finding for discussion: resource managers and users require a clear organisational structure regardless of the number of individuals involved (whether the 60 residents in Groene Mient or the 800 residents in EVA-Lanxmeer), the size of the natural space (the 7 hectares of DakPark or the 330 of MaximaPark), or its configuration within the city (contact or contract).

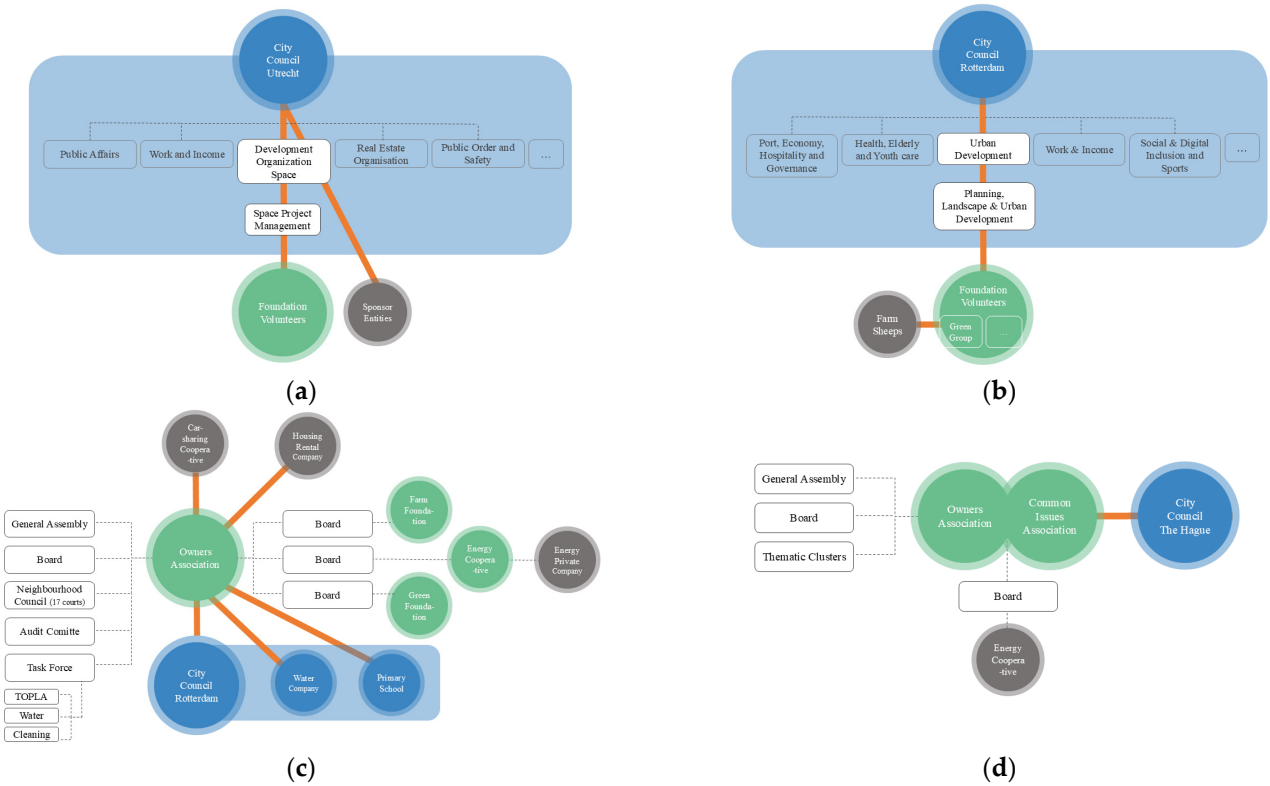


Figure 10. Comparison of organisational forms: (**a**) MaximaPark; (**b**) DakPark; (**c**) EVA-Lanxmeer; and (**d**) Groene Mient. (Source: Authors).

This process of organisational isomorphism occurs through mimetic imitation among peer initiatives, not only in pursuit of social legitimacy, as highlighted in the institutional

literature [81–83], but also to achieve self-sufficiency in essential urban services. This need for self-sufficiency drives self-managed initiatives to acquire expertise (EVA-Lanxmeer and Groene Mient). In fact, this occurs through a dual process: through peer-to-peer learning of agro-forestry and energy production, and formalisation through legal entities like associations and cooperatives. "Expertisation" and institutionalisation are the two resulting processes. These initiatives reappropriate knowledge, once socially acquired and now often relegated to expert systems, driven by a collective sense of ownership over basic resources. This evolution reflects a virtuous cycle of institutional strengthening, facilitating social learning and collective decision-making, and leading to resilient and adaptable communities, as also concluded by Fleischman et al. [84] in their study on disturbances in self-organised forested communities in Indiana (USA). Similarly, as Ostrom highlights, shared knowledge about the socio-ecological system among users significantly reduces organisational costs and fosters effective resource co-management [38].

In both self-managed cases, the expert knowledge has been gained over time, 30 years and 10 years, respectively. This gradual learning process has facilitated the understanding of the carrying capacity of the resource; otherwise, the community might fail to organise and could destroy the resource [38]. A resident from Groene Mient mentioned this during their interview:

> "Now I know everything about energy systems and I knew nothing about this. Also, in 2013, the possibility of having gas in the houses was raised. I remember someone said to me: but do you want to depend on Putin's gas? I had never thought about this. Never. And now I say… yes. The truth is you don't want to be dependent on him… I wasn't interested in Putin or gas, in fact, I didn't even know where the gas we used came from".

Gaining knowledge about a system's productivity, growth or replacement rate, and economic value [38] has been crucial for enabling the co-management of resources among community members, leading to the creation of business models. Initially, residents sought insights by visiting similar initiatives across the country and sharing experiences during informal meetings. In fact, interviewees in The Hague (Groene Mient) were well-aware of the case of the eco-district EVA-Lanxmeer. Web repositories listing Dutch eco-villages and eco-districts also provided valuable resources [85,86]. We cannot speak of a complete "commodification" of self-managed communitarian initiatives, but rather of the gestation of profitable business models seeking self-provision of basic services for the resident community, and also for the surrounding districts. In the EVA-Lanxmeer eco-district, inhabitants can buy agro-ecological fruits and vegetables from the farm, and utilise renewable energy generated by the cooperative established by community members. However, the usage of these services is not obligatory. In fact, this case exemplifies the highly intricate organisational structure, which is characterised by a sophisticated network of foundations, cooperatives, and corporations, through which the expert technical knowledge acquired over 30 years is formalised to sustain their ecological lifestyle. Following these steps, in the case of Groene Mient, in 2020 several residents also established an energy cooperative with the goal of providing solar energy not only to the 33 houses but also to the western part of The Hague, and nowadays they are in negotiations with another local cooperative to expand renewable-energy production sources [87].

Another observation derived from the decision-making structures is the existence of specific legal forms that allow shared ownership of a green resource in some cases, or its sale by public administrations to collective–private entities. Figure 11 illustrates who holds the ownership of green spaces in each case and what percentage of the green space is maintained through shared and ongoing efforts in each case. As observed, there are two cases (Figure 11b) DakPark and (Figure 11c) EVA-Lanxmeer where the maintenance of green spaces on public land is partly carried out by entities other than the City Council (the owner of the public land). This diversity of co-management forms is possible due to agreements between municipal managers and volunteers or residents, as well as specific

legal frameworks that allow these degrees of co-ownership within the legal system, which are detailed below.

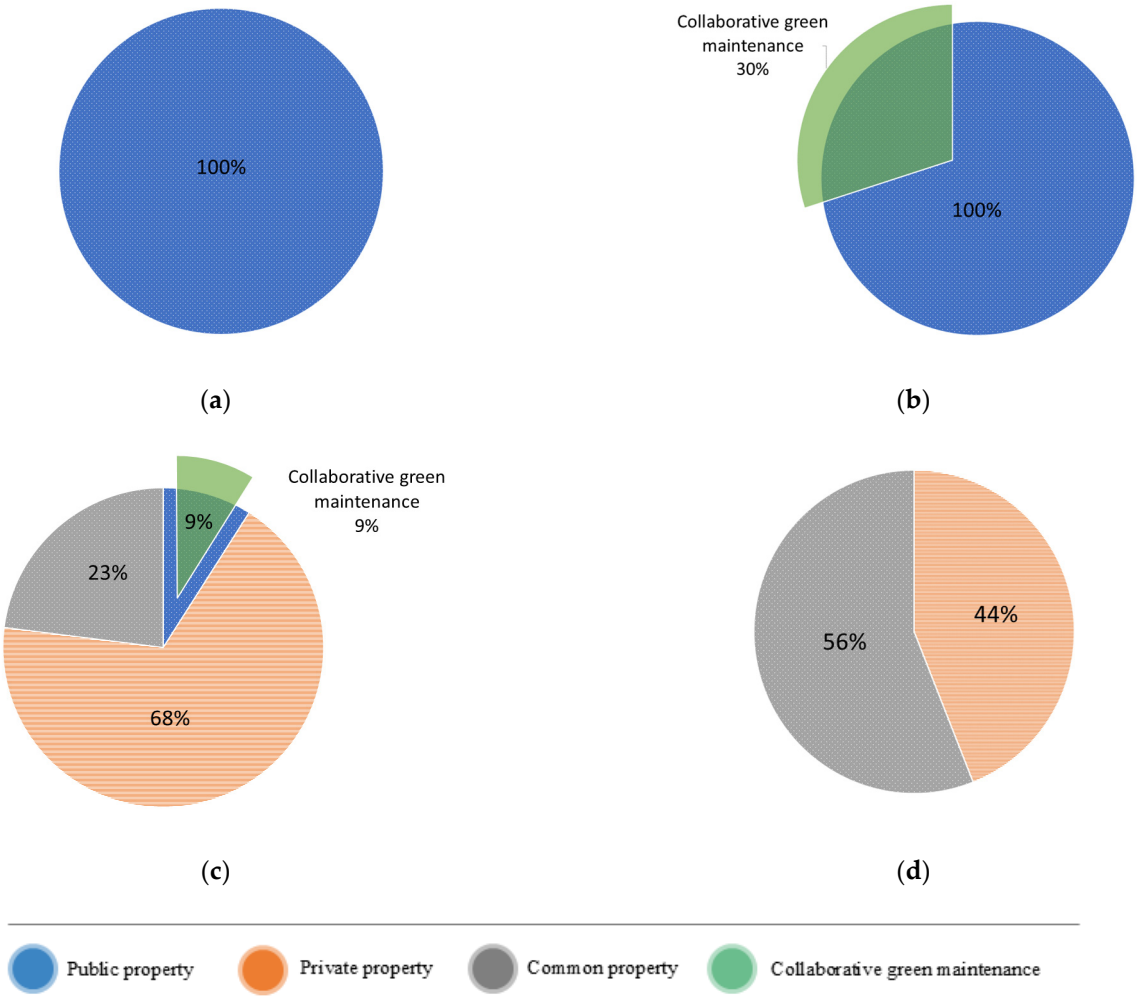


Figure 11. Comparison of property-rights and maintenance forms: (**a**) MaximaPark; (**b**) DakPark; (**c**) EVA-Lanxmeer; and (**d**) Groene Mient. (Source: Authors).

It is noteworthy that the Netherlands has a tradition of multi-stakeholder resource management, particularly in water-related entities, and a historical tradition of legal co-ownership norms, similar to other Northern European regions such as Germany or Denmark, and as opposed to Southern Europe [88]. Contemporary literature on Civil Law provides accumulated evidence on the influence of the law developed by the Roman Empire (from the 1st century B.C. until its fall in the 5th century A.D.) in Southern European countries, which was more pronounced than in Northern European countries, because the customs and practices of the Germanic peoples, which were more rooted in resources of communal utilisation, were retained rather than lost within a fully assimilated Roman law [88,89]. This reveals that the legal forms for co-ownership of natural resources, such as the 'mandeligheid' seen in the case of EVA-Lanxmeer, are indeed very ancient and persist in contemporary legal frameworks alongside more recent figures like the Collective Private Ownership (CPO) used by residents in Groene Mient to act collectively. According to the Germanic custom present in the current country of the Netherlands, it is possible that "ownership of the goods belongs to the group of individuals as a whole (*Gesamthand* or 'in common hand'), based on a collectivist conception of the world" [89]. However, in the Roman tradition, co-management figures were more limited because the legal system was conducive to the expanded market economy promoted by the Empire (covering a

significant part of Europe, parts of Eurasia, and Northern Africa, at its peak) [88]. The mentioned evidence may explain the abundance of co-ownership practices in pastures, forests, or springs in the Netherlands and other Northern European countries, compared to their scarcity in Southern European countries. Throughout her extended research career, Ostrom emphasises the significant role of institutional frameworks in sustaining collective governance of natural resources. She provides examples such as the irrigation systems in Spain and the Swiss Alpine pastures, where the existence of clear, enforceable rules since the 15th century was crucial for long-term maintenance [39]. In fact, other studies have shown how the management of common natural resources for environmental protection in different parts of the world has been made possible by the existence of well-defined property rights which impact the effectiveness of environmental policies by clearly delineating the rights and responsibilities of owners and users over natural resources, thus creating incentives to protect their resources [90].

4.2. Building Trust and Cooperative Relationships through Face-to-Face Interactions and Resource Transactions

The ways organisations are structured and decisions are made depend on the rules agreed upon by the people involved and the shared social conventions learned by a group of individuals. The social behavioural fabric alternates processes of trust construction, in a variety of senses, and forms of disembedding [36], as we have observed occurring between municipal agents and resident agents in their negotiations for co-management during the fieldwork. Collective-choice rules "can improve reciprocity by clarifying and making evident mutual commitments, and alternatively, they may grant authority for action, distributing benefits and costs unequally, thus destroying trust in positive norms" [38].

In several cases analysed, rules are collectively established between city officials and neighbours (owners or volunteers) to jointly manage the green resource, resulting in various face-to-face interaction dynamics. In Rotterdam's DakPark, a fluctuating process has marked the relationship between city officials and volunteers, even in the years preceding the park's construction in 1997. Initially, residents requested a park on the former train tracks, which the City Council accommodated alongside a car park for employees from nearby workplaces. After negotiations, the park was built above the car park and a shopping centre constructed. For some years thereafter, and after going back and forth several times, a group of city officials and residents engaged in six face-to-face co-design workshops called "DakPark world cafe". According to the city official interviewed:

> "First, they didn't believe it. They thought, oh, it will never be a nice park. I think the first three, four years, we tried to get the neighbours. . . but the last five years, they thought, ok, it could be nice".

Nowadays, collaboration is a reality and, indeed, the municipal government financially supports volunteer groups assisting with the green maintenance and organising children's activities, support which constitutes 5% of the total budget of the park maintenance:

> "[The money] it's not for the labour, it's for the things they have to buy for it. . . tools, seeds. . . They are mainly amateurs, so how much money do you pay for an amateur? And what they can do and how reliable they are? expressed a municipal official.

In discussions with one of the volunteers co-maintaining the park, she expressed the sentiment that the pruning training course offered by the City Council was of high quality, but "the two activities coordinators are paid only for 40 h a week between the two of them, and they do a lot of work for what they are paid." Over time, volunteers conduct guided tours of the park, charging EUR 10 per person for large, organised groups. They have also reached an agreement with a farm to allow a flock of sheep to graze in the park during the summer months in exchange for payment. To receive payments (from the City Council, visitors, and farmers), residents organise themselves under the structure of a foundation as a legal entity. Relatedly, a volunteer mentioned that "creating the DakPark Foundation

[where all volunteers are grouped] was somewhat imposed by the municipality". Similarly, in the EVA-Lanxmeer eco-district, tensions have arisen between residents and the municipal government, with residents feeling that the municipality lacked genuine support for the ecological district.

> *"First, because the designers, urban planners, and the architect who designed the district came from outside, they were not locals. Second, because the people who initially settled in EVA-Lanxmeer were also all from outside; individuals from all over the country were interested in this place, but they were considered peculiar. Third, because it is well-located land next to the station, and many people from Culemborg would have liked to live here" (Resident interviewed).*

Furthermore, it was noted that unlike other eco-districts in Dutch cities, EVA-Lanxmeer lacks any signage which would indicate how to reach the district. However, the city council decisively supported the creation of the eco-district in its beginnings. Notably, the City Council funded the trips of a renowned German architect, Joachim Eble, who designed and oversaw the district's construction, every two weeks for seven years in the 1990s. More recently, the City Council reached an agreement with Terra Bella, a foundation established by district residents, to maintain green areas in street public spaces (in adherence to municipal criteria and the permaculture principles of EVA-Lanxmeer) and providing an annual payment of EUR 15,000.

In the two cases mentioned above (Rotterdam's DakPark and the EVA-Lanxmeer eco-district) there are agreements between city officials and residents, materialised in flows of public money to pay for tools, seeds, park-activities-coordinator positions, green maintenance training courses for volunteers, and green maintenance labour itself (to the EVA-Lanxmeer foundation Terra Bella). These payments frame a cooperation–suspicion arena [50] arising between officials' and residents' perspectives. While there is a mutual agreement to collaborate in the management of the green area, this cooperative process is often viewed with suspicion and contested by the different parties involved. In the case of MaximaPark, there is no transfer of funds to volunteer groups. The city management team has established several channels of citizen participation, such as a mailbox for receiving citizen ideas to add to the park, occasional planting events on weekends, and the use of a municipal building located in the park for volunteer meetings and coffee or tea gatherings. Instead of collective-choice rules, volunteer neighbours operate through one-way channels established by the city. When some volunteers disagree with certain decisions, "they openly express their complaints on social media, which are read by political representatives, causing discomfort among us [urban managers]", as indicated by an official during the interview. Therefore, a relationship of cooperation–suspicion is nurtured, along with a figurative trust established through pre-established binding rules rather than immediate dialogues [50]. The self-managed case in The Hague (Groene Mient) is notably different because there is neither a transfer of funds nor an allocation of resources from the City Council to the owners' community. This may be the reason why their relationship, in the 10 years of the project's existence, has been harmonious so far. This case can be classified as a "contract" model based on its urban configuration because a purchase–sale agreement was established between the City Council and the neighbourhood Association (later evolving into the Owners' Association) in 2014, after which the City Council disengaged from the management of the city land, which is now collectively owned private property (under the legal form of Collective Private Ownership). In fact, the signing day of the purchase agreement is depicted on the Groene Mient website with a photo [59] featuring the housing councillor of The Hague and the representative of the neighbourhood Association. The clarity in the property-transfer norms establishing responsibility for the land is aided by the size of the resource, which, being moderate, is most conducive to self-organisation [38]. Similarly, the small size of the owners' group may be suitable for "learning reciprocity norms [37]. Although the City Council does not offer direct financial support to Groene Mient residents, it recently offered to the Owners' Association the use of a small adjacent public land which is currently unused, meaning that the original "contract" established

may begin to become more complex with annexations of land ceded in mixed ownership regimes. Table 3 summarizes the transfer of resources between agents.

Table 3. Resource transfers in the investigated case studies between municipal and community agents, ordered from highest to lowest exchange flow. Source: Authors.

Case Study	Type of Resource Exchanged	Responsible Agent
EVA-Lanxmeer, Culemborg.	Salary and air travel for the eco-district architect for 7 months at the start of the project;	Municipality
	Monthly salary for the three resident owners maintaining the green spaces in the public district area (Terra Bella Foundation);	Municipality
	Cleaning of interior streets;	Owners' Association
	Permaculture criteria added to the city's green maintenance protocol;	Owners' Association
	Guided tours for researchers to learn about the eco-district (not for tourists).	Owners' Association
DakPark, Rotterdam.	Training courses in pruning;	Municipality
	Part-time salary for two park activity coordinators and funding for purchasing tools and seeds;	Municipality
	Labour for the green pruning of one-third of the park;	Volunteers' Foundation
	Guided tours in the park for tourists and researchers (paid and free, respectively);	Volunteers' Foundation
	Sheep grazing and chicken breeding for ecological composting.	Volunteers' Foundation
Groene Mient, The Hague.	Sale of public land for housing;	Municipality
	Allocation of adjacent unused public land;	Municipality
	Free guided tours for tourists and researchers.	Owners' Association
MaximaPark, Utrecht.	Provision of tools and storage for volunteers on an *ad-hoc* basis;	Municipality
	Participation in occasional planting events.	Volunteers' Foundation

It is worth noting that clear rules for resource transactions, whether through direct payments or resource allocations, play a role in reinforcing trust—in the sense of cooperation–suspicion—and the sustainability of co-management processes over time, even if this exercise in rapprochement continues to provoke friction. In all the cases studied, resource allocation agreements between entities and individuals involved legal personification for the individuals involved by means of Associations or Foundations, becoming "normative engagement" with municipalities, from one formalised legal structure to another one. In the words of Giddens, it is characteristic of modernity that "no one can interact with abstract systems without mastering some of the rudiments of the principles on which they are based" [36]. Finally, in the natural spaces promoted by the City Councils (Rotterdam's DakPark and Utrecht's MaximPark), the mismatch between two different management rationalities is apparent. The practices of "quality compliance" in public spaces clash with neighbourhood proposals that do not specifically pursue an aesthetic and functional quality characteristic of techno-expert visions of green spaces. "In the city parks, people expect a higher standard, that everything is 100%, and that's very hard with volunteers" said a city official interviewed, and then continued: "The park is for thousands of people, not for the 50 people volunteering, and that's challenging, I think". Improving usability and ensuring the functional quality of public spaces is a pivotal aspect of urban planning, aiming to make green areas accessible and user-friendly for individuals of all ages and mobility skills. This concern about space usability and adherence to professional standards resonates with urban managers worldwide. In fact, during an interview, a municipal manager revealed the following: "There are still a lot of other cities asking for information about how they can copy the concept of co-creation and co-maintenance, and they always have the same

question: How can you maintain the quality?". This fact leads to reflection on the existing tension that emerges between the standardised aesthetic standards followed in public green spaces and those more culturally localised visions.

4.3. Considerations as to Monitoring and Sanctioning Rules

One dimension that Ostrom considers influential in increasing the likelihood of co-maintaining green resources over time is the existence of monitoring and sanctioning mechanisms. Ostrom emphasised that "most robust and long-lasting common-pool regimes involve clear mechanisms for monitoring rule conformance and graduated sanctions for enforcing compliance" [37]. Throughout her research, she emphasised that sanctions have to be applied gradually to individuals who do not comply, starting with minor penalties and increasing their severity if individuals continue to fail to comply over time. Interestingly, in our research, only one of the studied cases currently implements specific rules that penalise individuals who do not adhere to the established rules for municipal green-space maintenance. In this case, the penalty involves the non-acceptance of citizens' ideas to include new elements in the park, citing a lack of coherence with the aesthetic quality of the landscape. This limits citizen participation and the possibilities for collective decision-making because a directed and normative aesthetic of the park landscape is prioritised. In the words of the park manager during an interview:

> *"There are citizen initiatives that aren't that promising, you want to say goodbye, and people want to know it at a certain stage. He [the outsourced architecture designer of the park] does lots of quality control on the different initiatives when it's something new, cause when you add something to the park, you add something to his own responsibility there to his design".*

In the smallest self-managed case, Groene Mient, penalties were applied only during the design phase of the 33 housing units. Decision-making through collective assemblies inspired by Socratic dialogue required unanimous agreement.

"If someone after several assemblies still did not agree, they had to abandon the project, because everyone had to agree on what was important. There were people who wanted to use gas in their home, for example, and that was something that we could not allow because it was stated in the statutes", explained a resident during an interview.

In summary, in cases where sanctions were applied, the focus was on maintaining specific values, either those related to the park's normative landscape aesthetics or those linked to the shared ownership and division of tasks for maintaining the common green areas.

In the remaining cases, as we have observed, there is currently no sanctioning mechanism in place; however, all cases do exhibit monitoring mechanisms for green co-management practices between city officials and residents, as well as within the resident community itself. These include attending weekly or monthly maintenance routines, participating in annual apple-picking days, and contributing payments for tools and seeds. The lack of evidence for Ostrom's assertion can be explained by the replacement of sanctioning mechanisms with conflict resolution strategies or social sanctions [91,92]. This approach is feasible when the group's size is small or medium. When the group of owners is small, social conventions can effectively maintain compliance among non-compliers (e.g., through non-verbal cues such as looks or gestures). This is evident in the smaller self-managed case, Groene Mient in The Hague—comprising 33 homes over 0.76 hectares— where resistance to communal garden maintenance from only five individuals is tolerated by the majority of residents "because we have to find a way to live together," as stated by one resident during the interview. Conversely, when the group size is larger, as in the EVA-Lanxmeer eco-district (800 people), social sanctions and monitoring become less practical. After 30 years, signs of non-compliance with collective green maintenance rules are becoming apparent. According to an EVA-Lanxmeer resident: "the last time the Terra Bella foundation called for a collective pruning of the common gardens, we were only 10 people... the weather was bad, ok... but we are attending less and less". Similar findings have been noted by other scholars, such as Fleischman, who was unable to verify the existence of sanctioning rules in large-scale self-organised forested communities [93],

and the absence of formal sanctions creates an opportunity cost that leads to disturbances. The decreasing attendance levels at co-maintenance activities may also be due to another factor: the initial group of property owners has changed over recent years, and houses, along with their share of common green property, have been sold to new tenants without monitoring whether they share the original permaculture-based and ecological principles. Property transactions in EVA-Lanxmeer have recently been subcontracted to a real estate agency in the city that "keeps to their own criteria for assigning house seekers to available units in their housing stock". This means that "1/5 of the dwellings is rented, with tenants not necessarily adhering to the ecological principles", as stipulated in the internal statutes. New tenants are mostly young working-age individuals, many with small children, and they often express reluctance to engage in lengthy assemblies or to commit to participating in communal activities one morning a week. Additionally, they are delegating more tasks to the green maintenance foundation (Terra Bella) and the national government water management company located in the eco-district, as recorded during interviews.

In summary, in both self-managed cases, the prevailing decision not to sanction non-compliance seems to be more closely aligned with shared ecological, moral, and ethical standards [38] than with rational reasoning. As observed, the size of the resident group influences the effectiveness of monitoring practices, whether they are explicitly collectively agreed-upon or conventionally incorporated. We also note that group cohesion, in terms of shared values, in self-managed cases, is closely linked to property management, which appears to be a crucial factor influencing community compliance rules. For this reason, the owners in Groene Mient (a small group) have decided against renting out houses, whereas, in the EVA-Lanxmeer eco-district, they do allow it. Despite Ostrom's indication that "larger groups are more able to mobilise necessary labour and other resources when managing a resource [...] is very costly" [38], our observations suggest that property management decisions seem to define the resilience of collective-choice rules in the resilience of common green resources management.

5. Conclusions and Practical Implications

5.1. Drivers for Long-Term Effective Collaborative Management of Urban Green Spaces

A crucial factor for ensuring the effectiveness of collaborative urban green-space management lies in the presence of a supportive legal framework in the Netherlands. This framework enables the emergence of shared management practices through legal forms such as "mandeligheid" and Collective Private Ownership. Some of these legal structures trace their origins back over centuries, to the tradition of the communal customs of the Germanic peoples in Northern Europe, resisting the more rigid Roman law that expanded throughout the rest of Central and Southern Europe. Across all analysed cases, a direct and ongoing interaction between expert systems and citizens has been evident, not only during the inception of initiatives but also in subsequent maintenance efforts. Through face-to-face dialogue, various exchanges have been established between these groups, sustaining relationships despite occasional criticisms. Municipalities allocate resources to citizens in various forms: public lands sold to communities of residents to build houses with private and communal gardens, provision of small adjacent public lands to the housing area to expand the green space, training courses in pruning and funding for purchasing tools and seeds, or payments to individuals to carry out maintenance tasks or coordinate activities organised in the park on an open basis and free of charge. Conversely, a series of services are provided by the owner associations or volunteer foundations, such as free guided tours of the park or eco-district to showcase the history of the initiative and its current public–social collaboration scheme, cleaning of interior streets of the eco-district and aesthetic maintenance of common areas, and assistance to tourists and researchers wishing to delve into the initiatives from the perspective of their eco-social urban management (see Table 3).

Delving further into this phenomenon, we observe specific commonalities among residents and volunteers in their efforts to sustain their involvement and ownership over time. This entails acquiring expertise in green maintenance on one hand, and gradually

formalising the group into legal entities, such as associations, foundations, cooperatives, or companies, on the other. "Expertisation" and institutionalisation are the two resulting processes. The institutionalisation process facilitates the transfer of resources from the municipality to the residents. Technical knowledge acquisition in self-managed cases (especially in agroforestry, energy, and regulation) occurs independently of the size of the managed resource (ranging from 8 hectares to 330 hectares) or the size of the ownership group (ranging from 60 to 800 residents), with communities learning from peer initiatives and consulting experts, and engaging in mimetic learning, specifically during the uncertain early stages. In contrast, volunteer groups in municipally owned parks are organised into foundations to receive training courses from experts funded by the municipality and have access to workspaces equipped with tools for the common use of volunteers and municipal managers. This setup facilitates the transfer of expert knowledge to volunteer residents. For city managers, green management knowledge is embedded within the organisation, ensuring that collectively agreed-upon rules for resource maintenance are maintained over time, regardless of the specific manager in charge.

As a final conclusion, while municipalities and citizens have established various types of monitoring mechanisms, the absence of sufficient sanction mechanisms poses a notable challenge, particularly considering their role in fostering prolonged collaboration among those managing green spaces, as noted in the literature reviewed. Monitoring practices have been observed across all cases, with some explicitly agreed-upon collectively and others emerging implicitly through social learning. It is worth noting that informal social monitoring practices often occur among small groups of owners or volunteers, facilitated by mutual and informal adjustments, particularly in cases with moderate-sized resource management. The lack of explicit sanctions in these smaller-scale initiatives can be attributed to shared moral and ethical conventions fostering interpersonal trust. However, in larger groups, where moral and ethical standards may be less commonly shared, there is a clear need for gradual sanction mechanisms. Interestingly, in the case with the highest number of agents involved, there have been no penalties for non-compliance with the agreed rules over its 30-year existence. However, signs of weakening in communal activities have recently been observed, which constitutes a non-validation of the evidence provided by Ostrom. This may be due to the fact that the group of founding owners of the eco-district deeply shared ecological values of permaculture and had a collective goal of building a socio-ecological living space. Over time, and with the arrival of new tenants, the robustness of these shared values and the goal of creating an eco-district from scratch has weakened, accelerated by the subcontracting of the process of selecting new owners to a housing rental company, without the requirement of verifying the new owners' affinity to permaculture and eco-friendly lifestyles. This underscores the critical role of ownership forms and property management in maintaining compliance with rules over time. Any changes in property management should be carefully assessed for potential unintended consequences. Explicit monitoring mechanisms and fluid communication among the community of owners could serve as an early warning system for future weaknesses.

A final concluding reflection relates to the identification, during the analysis, of a clear connection between the trust-building process and the distinct visions and purposes associated with urban greenery that each agent incorporates. The emphasis placed on "quality compliance" and "achieving a specific degree of quality" in public spaces, as evidenced in the practices of city officials, reflects an aesthetic and technoscientific perspective that often clashes with the community-driven management of green areas. While communities of residents and volunteers have garnered substantial technical knowledge, their interpretation of "quality" tends to be less normative, prioritising a more collective and organic approach, diverging from the technical-expert and professionalised visions of green spaces. This disparity becomes particularly pronounced in cases where interactions between city managers and residents for green maintenance are frequent. Consequently, these differences perpetuate two distinct green management paradigms in the city, underscoring the need for establishing clear collective-choice rules and mechanisms for resource transfer

between urban managers and residents through face-to-face dialogues. Trust-building between expert systems and citizens is more about constructing cooperative relationships than achieving "interpersonal trust", which is typical among friends and acquaintances, because trust-building hinges on the nature of the agents interacting. Instead, we observe alternative forms of trust, such as "cooperation–suspicion" and "figurative trust". In three of the cases where management rules have been agreed upon between city officials and residents to mitigate the asymmetry regarding ownership and decision-making, we observe "cooperation–suspicion". In other words, agents collaborate by adhering to collective-choice rules (such as in exchanges of money; or allocation of resources, like new hectares of land; or training courses in park pruning), but the relationship remains under mutual scrutiny. "Figurative trust" is less common and arises when park management rules are unilaterally established through pre-established binding rules, rather than immediate dialogues.

These other meanings of trust are predominant in globalised societies, largely due to the temporal and spatial distance between decision-makers in resource management and the users of those resources, from the second half of the 20th century to the present day. Therefore, the effort by expert systems to (re)connect with citizens is not merely an aesthetic task; it continues to face significant challenges in countering the bureaucratic and "blind" functioning of governmental institutions. As we conclude in this research, it is crucial to mutually establish a set of communication rules and resource transfer mechanisms, based on face-to-face encounters and non-monetary resources, which imbue the cooperative relationship with a meaning beyond that of a purely contractual one. The collective management of urban natural spaces can exponentially increase the co-benefits that nature provides to society, such as by enhancing biodiversity in neighbourhoods and districts, preserving urban nature, fostering social cohesion among residents, ensuring public safety (as illustrated by the transformation of abandoned industrial spaces into public parks that attract tourists and researchers), improving perceptions of urban quality of life, and achieving territorial balance in the distribution of green spaces across different areas of the city.

5.2. Practical Implications Potentially Generalisable for Effective Adaptation Pathways and Further Research

Based on the results obtained, practical implications can be drawn for urban managers and decision-makers currently involved in the management of urban green spaces. These findings apply to both public city officials and professional organisations (architecture and landscape firms, cooperatives, and NGOs, among others) engaged in the design and maintenance of urban green spaces.

Firstly, it is essential to formalise citizen collectives that wish to participate in urban green management into legal entities (associations, foundations, or companies), enabling the exchange of resources, whether in the form of money, land ownership, training sessions, or participation in decision-making processes, as evidenced in the four cases analysed, and as Ostrom observed in long-standing cases that have persisted for centuries.

Secondly, the process of rapprochement and dialogue between municipal managers and citizens could be accelerated by simplifying the techno-bureaucratic language used and the technical requirements sometimes demanded in order to initiate conversations and first actions. We have observed in all the studied cases the ability of citizen communities to "acquire expertise" and learn peer-to-peer technological expert knowledge, but this is a slow and gradual self-learning process. A qualitative leap could be achieved by expanding face-to-face contact spaces, which could be facilitated by officials working in districts or units specialising in citizen engagement and mediation processes. As Ostrom demonstrated, face-to-face communication does not guarantee collaboration among agents but creates an interaction space without which none of the analysed cases would have been possible. While more widespread forms of citizen consultation through digital platforms or standardised participation toolkits have proven to be innovative tools, they generally do

not facilitate sustained dialogue over time and, therefore, do not succeed in building trust and cooperation with citizens.

Thirdly, the construction of collective-choice rules for resource management or stewardship will be vital, provided that explicit and periodic monitoring spaces are included. Monitoring is essential and is often neglected once the joint initiative is launched. This is problematic because, as Ostrom emphasised, the existence of only a set of collective-choice rules does not ensure reciprocity and mutual commitment and can even legitimise the unequal distribution of benefits and costs. It is necessary to monitor cooperative agreements. In fact, as we have observed in some cases, the lack of periodic face-to-face dialogue over time has led to volunteer dissent or even complaints on social media, causing alarm among political representatives who have blamed the city officials "on the ground". However, as we have also found in our analysis, the gradual sanction mechanisms that, according to Ostrom, can increase the chances of collaboration among a group of users over time may not be as effective when the resource is not owned by all the agents involved. Therefore, it would be necessary to carefully consider whether applying a penalty system to a municipally owned green space would bring citizens closer or push them away. Agreeing on an initial set of shared management rules and monitoring them over time through face-to-face meetings and making necessary adjustments seems to be the most effective strategy, especially at the outset. It should be kept in mind that frictions and complaints will always be present in a relationship between municipalities (established expert systems) and citizens (communities that "acquire expertise") due to the nature of each group. What is crucial is to renegotiate the rules until legitimate practices are established which potentially will be more resilient to changes in political agents or external funding needs.

Fourthly, a notable observation is that the long-term resilience involved in co-managing a green infrastructure with volunteer neighbours, even if they receive money to pay for water, seeds, and tools required for green maintenance (as we have observed and summarised in Table 3), is limited if based solely on volunteering. Opportunities for green employment in urban green spaces are an emerging area where modalities of local work can be configured, potentially generating income within the neighbourhood and strengthening ties between expert systems and citizens. In fact, empirical evidence reminds us that when the natural resource is vital for the subsistence of its users, the chances of effective co-management over time increase considerably, that is, the more directly the livelihood of users depends on the natural resource, the more resilient the processes for its collective management will be.

As a concluding remark, it is important to consider the limitations of this research and the potential avenues for further investigation that could address these limitations and continue building evidence on collaborative management practices for urban natural spaces. A key limitation is the focus on specific case studies centred on local institutions and their immediate context, which, as Ostrom notes, may limit the generalizability to broader systems. Additionally, selecting cases based on accessibility and existing collaborations could introduce selection bias, potentially overlooking contentious or less successful examples of urban green-space management. While our findings offer valuable insights into local dynamics, future research could broaden the scope by incorporating a wider range of case studies and multi-scalar analyses that include both local and global factors. Moreover, there is a need to explore citizen participation within bureaucratic management procedures in urban planning, such as public tenders, for which opening deliberative spaces could foster innovation. Similarly, further research should examine bureaucratic simplification processes and their impacts on citizen involvement in green space care. Investigating the broader social impacts on neighbourhoods and districts from participation experiences is also crucial. Addressing these areas in future research will enhance our understanding of how collaborative management practices can be effectively implemented and sustained across diverse urban contexts, contributing to the theoretical development of urban management and social–ecological systems while offering

practical recommendations for improving citizen engagement and the resilience of urban green spaces.

Supplementary Materials: The following data sources have been analysed as fieldwork materials produced by the group of users/residents of each case study. These sources are fundamental pieces in this research as expressions of conventions and collective-choice rules that shape the social practice of managing urban spaces. All data sources are available at the following link: https://drive.google.com/file/d/183JdeQcBUXFuWOKXkbNLb79I0Bne1wAn/view?usp=drive_link, accessed on 29 August 2024.

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Data Availability Statement: The data presented in this study are openly available in the Supplementary Materials link.

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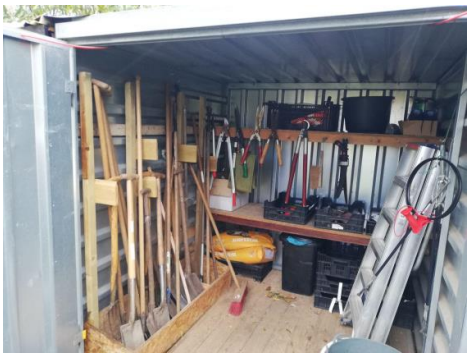
Appendix A. This Appendix Contains Additional Information about the Fieldwork Conducted, Including Photographs Showcasing Moments from the Interviews and Field Visits

(**a**)

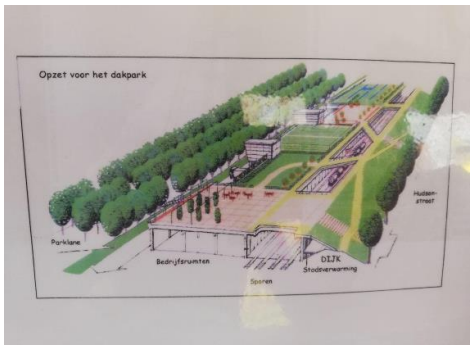


(**b**)

Figure A1. *Cont.*

(**c**)

(**d**)



(**e**)

(**f**)

(**g**)

(**h**)

Figure A1. Photographs showcasing moments from the interviews and field visits: (**a**) DakPark: Volunteers at work in the herbal garden; (**b**) Dakpark: Container to store tools for maintenance; (**c**) EVA-Lanxmeer: Guided visit with a group of university students; (**d**) EVA-Lanxmeer: interior street; (**e**) DakPark: Photo taken of the design prior to the final design, as shown by one of the volunteers; (**f**) MaximaPark: Visit with the city manager and several professors at TU Delft; (**g**) Groene Mient: Sequence of archival photos of the collaborative garden construction process; and (**h**) EVA-Lanxmeer: Screenshot of the cell phone translating two posters written in Dutch about the eco-district.

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