

Co-Governance of Nature-based Solutions for Just Urban Food Futures: From Global Evidence to Local Practice

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Abstract

Urban food-growing initiatives, ranging from community gardens to networks of backyards, have gained attention within urban food policy as Nature-based Solutions (NbS) capable of delivering food security, social, and environmental benefits. Yet as the 2030 horizon for global sustainability and urban food governance agendas approaches, concerns persist that existing governance arrangements remain ill-equipped to address deep-seated power inequalities, food insecurity, and social injustice. This article examines how justice and resilience materialise through co-governance in food-growing NbS. Using a mixed-methods approach, we analyse 390 NbS projects from the Urban Nature Atlas NATURESCAPES dataset to identify patterns across food-growing NbS and combine these findings with qualitative insights from two emblematic cases: the backyard garden network Patios Productivos in Cartagena (Colombia), and the Horta Nova Horticultural Park in Lisbon (Portugal). These cases embody the predominant bottom-up and multi-actor governance dynamics identified across food-growing NbS. Drawing on the five A's co-governance framework—Authority, Agency, Arrangement, Alignment, and Accomplishment—we examine how power, recognition, and justice are negotiated over time. Our findings reveal that food-growing NbS overwhelmingly emerge as community-led responses to socio-economic vulnerability and exhibit distinctive governance patterns shaped by context-specific collaborations, long-term partnerships, and the balance between community autonomy and institutional recognition. We argue that community-led food NbS function as transformative social infrastructures, and that justice and resilience are co-produced through contested governance arrangements. By foregrounding power and co-governance, this article contributes to debates on urban food politics and helps advance a just post-2030 urban food governance agenda.

Keywords

co-governance; collaborative governance; community-led initiatives; food security; justice; nature-based solutions; resilience; urban agriculture; urban food governance

1. Introduction

Urban food governance has gained increasing global attention as cities and communities confront intertwined challenges of climate change, inequality, and food insecurity (Moragues-Faus et al., 2022; Tefft et al., 2020). Cities increasingly act as food policy innovators, engaging in translocal and transnational networks to collaborate, exchange knowledge, and amplify the role of urban actors within global and regional food policy platforms (High Level Panel of Experts on Food Security and Nutrition, 2024). International frameworks such as the Sustainable Development Goals (SDGs), the FAO Urban Food Agenda, and the European Commission's Food2030 strategy (European Commission, 2023) position cities as central actors in food system transformation (FAO, 2019; Moragues-Faus & Sonnino, 2019). Together, these developments signal a growing recognition that food systems are deeply political urban issues, tightly linked to justice, care, and everyday resilience.

Despite this policy momentum, urban food governance remains fragmented, overly technocratic, and insufficiently attentive to the lived realities of marginalised communities (Moragues-Faus et al., 2024). Much of the governance practice continues to privilege formal institutions and short-term project cycles, while overlooking the long-term, community-rooted practices that sustain urban food resilience on the ground (Cohen & Ilieva, 2015; Tornaghi, 2017). Recent research highlights persistent blind spots in urban food governance, including limited attention to power asymmetries and exclusion (Brons et al., 2022; Zerbian et al., 2023), the marginalisation of informal and community-led food practices (Certomà et al., 2020; Tornaghi, 2017; Tornaghi & Dehaene, 2020), and a tendency to frame food system transformation through managerial or efficiency-oriented lenses over justice, sovereignty, and democratic governance (Dekeyser et al., 2018). These failures are particularly consequential in unequal cities, where food insecurity intersects with housing precarity, labour informalisation, and spatial injustice. Although research on urban food resilience and urban agriculture is expanding rapidly, it remains unevenly distributed, and often disconnected from governance debates (Gu et al., 2026; Pinheiro & Govind, 2020). Empirical studies remain limited, with a persistent overrepresentation of Global North contexts, despite high levels of food insecurity and vulnerability in regions such as South America (Bertolini et al., 2026). This imbalance limits our understanding of how urban food governance operates across diverse socio-political contexts and constrains the development of more just and context-sensitive policy frameworks. The challenge is particularly relevant for food-growing Nature-based Solutions (NbS), which depend heavily on community participation, long-term stewardship, and governance arrangements capable of balancing social, environmental, and food-security objectives.

Over the past three decades, food governance has shifted, at least rhetorically, from hierarchical government towards more collaborative and networked forms involving civil society, community organisations, private actors, and researchers (Halliday, 2022; Valente, 2018). Food governance therefore increasingly depends on interactions among diverse actors operating across sectors and scales (Moragues-Faus et al., 2017). In practice, however, collaborative governance remains uneven and contested. While participation and partnership are frequently invoked, decision-making power often remains concentrated in formal institutions

or market actors, limiting meaningful inclusion of marginalised groups (Brons et al., 2022; Gordon, 2023). These constraints suggest that while collaborative governance holds promise, its transformative potential is far from guaranteed. Such governance questions are particularly relevant for food-growing NbS, which typically depend on long-term stewardship, community participation, and coordination among public, private, and civic actors.

Within this landscape, food-growing initiatives, including community gardens, urban farms, and networks of backyard plots, occupy a distinctive position at the intersection of urban food governance and NbS. Increasingly framed as NbS, these initiatives often deliver multiple benefits beyond food production, including social cohesion, health, care, and livelihood support. Many function as “more-than-food” infrastructures, embedded in everyday practices of subsistence, reciprocity, and mutual aid, particularly in marginalised urban contexts. Yet food security remains under-represented within NbS research, reflecting a broader bias towards technically measurable environmental outcomes and a geographic mismatch between research intensity and food-related vulnerability (Dunlop et al., 2024).

As the 2030 horizon for global and European sustainability agendas approaches, these gaps become increasingly visible. The approaching deadline highlights tensions between the long-term investments needed to build food security and resilience and governance systems characterised by fragmented responsibilities, short funding cycles, and limited power sharing. These conditions raise a central question for post-2030 governance: Can existing urban food governance arrangements deliver justice and resilience, or are alternative approaches required?

While previous research highlights the importance of community-led urban food initiatives, less is known about whether food-growing NbS exhibit distinctive governance patterns, how authority and participation are distributed among actors, and how these arrangements influence justice and resilience over time. Addressing these questions requires evidence at both the cross-cases and project scales. We therefore combine analysis of 390 NbS projects from the Urban Nature Atlas NATURESCAPES dataset, including 86 food-growing initiatives, with qualitative case studies from Lisbon and Cartagena. The dataset identifies governance patterns across food-growing NbS, while the case studies examine how these patterns are negotiated and translated into justice- and resilience-related outcomes in practice.

Our contribution is threefold. First, we identify governance patterns and divergences in food-growing NbS from the broader NbS field. Second, we advance understanding of co-governance in community-led initiatives through application of the five A's framework (Authority, Agency, Arrangement, Alignment, and Accomplishment; see Figure 1; Voytenko Palgan et al., 2026). Third, we show how governance arrangements produce, or reproduce, justice and resilience, informing pathways towards more inclusive urban food governance beyond 2030.

2. Analytical Framework

Urban food-growing NbS are multifunctional socio-ecological infrastructures that extend beyond food provision to include biodiversity enhancement, microclimate regulation, social interaction, and care (Cukierman et al., 2025). Unlike large-scale green infrastructure projects, food-oriented NbS often operate as “everyday infrastructures”: They are initiated by local community actors, maintained through daily

practices, informal arrangements, and negotiated forms of authority, and frequently sit at the intersection between formal planning and grassroots action. This hybridity makes questions of governance—who decides, who participates, and under what conditions—central to understanding how such NbS emerge, persist, and transform urban environments.

Participatory and collaborative governance have gained prominence in response to the complexity of socio-ecological challenges, demands for legitimacy, and fiscal and institutional constraints. Addressing climate adaptation, biodiversity loss, and social challenges through NbS requires diverse forms of knowledge, resources, and coordination beyond any single actor. Participation can enhance legitimacy and long-term stewardship, while fiscal and institutional limitations further reinforce the need for cross-sector collaboration (Ansell & Gash, 2008; Battisti et al., 2025; Hölscher et al., 2023; Lee, 2024).

These developments have led to a proliferation of governance concepts describing shifts away from state-centric, hierarchical steering towards more distributed forms of decision-making. Participatory and collaborative governance capture this reconfiguration of power and responsibility across actors and scales and are increasingly understood as overlapping lenses for analysing shared decision-making and negotiated authority. In this article, we build on the co-governance framework developed by Voytenko Palgan et al. (2026), which explicitly seeks to integrate these diverse strands under a single, urban NbS-oriented conceptual umbrella. Co-governance is defined as “the authorised co-production or sharing of power among diverse actors coming together across levels and scales towards a common project, even where their interests may remain divergent” (Voytenko Palgan et al., 2026). This definition is particularly suited to urban food-growing NbS, which often emerge through informal practices and contested claims to space, legitimacy, and authority. This analytical choice also aligns with collaborative governance scholarship in public policy, which emphasises cross-sector engagement to pursue public purposes that cannot be achieved by single actors alone and highlights the importance of institutional, political, and socio-ecological context in shaping governance outcomes (Emerson et al., 2012).

In the context of urban food NbS, co-governance is particularly relevant as food-growing is closely tied to social justice, access to resources, and everyday resilience, and frequently emerges from bottom-up practices that challenge conventional planning logics. To operationalise co-governance empirically, we apply the five A’s framework (see Figure 1 and Table 1) developed by Voytenko Palgan et al. (2026): Authority, referring to legitimate power to steer outcomes; Agency, the capacity of actors to govern; Arrangement, the organisational structures through which governance unfolds; Alignment, the convergence or divergence of actor interests and visions; and Accomplishment, the practical enactment and effects of co-governance.

The five A’s framework informs both stages of the analysis, albeit in different ways. The systematic analysis of the NbS dataset uncovers patterns of governance structures, actor configurations, and participation across a large sample of food-growing NbS ($N = 86$) in contrast with a wider collection of NbS ($N = 390$), offering evidence related primarily to Authority, Agency, and Arrangement. However, the standardised dataset cannot capture Alignment and Accomplishment, which depend on evolving relationships, shared visions, power dynamics, and governance outcomes. These dimensions are therefore explored through the qualitative case studies of Cartagena and Lisbon, where the full five A’s framework is applied. The framework also guided the interview protocol, enabling the collection of data on dimensions not captured by the dataset. Together, the two analytical stages provide a process-oriented understanding of how co-governance shapes justice and resilience outcomes of food-growing NbS.

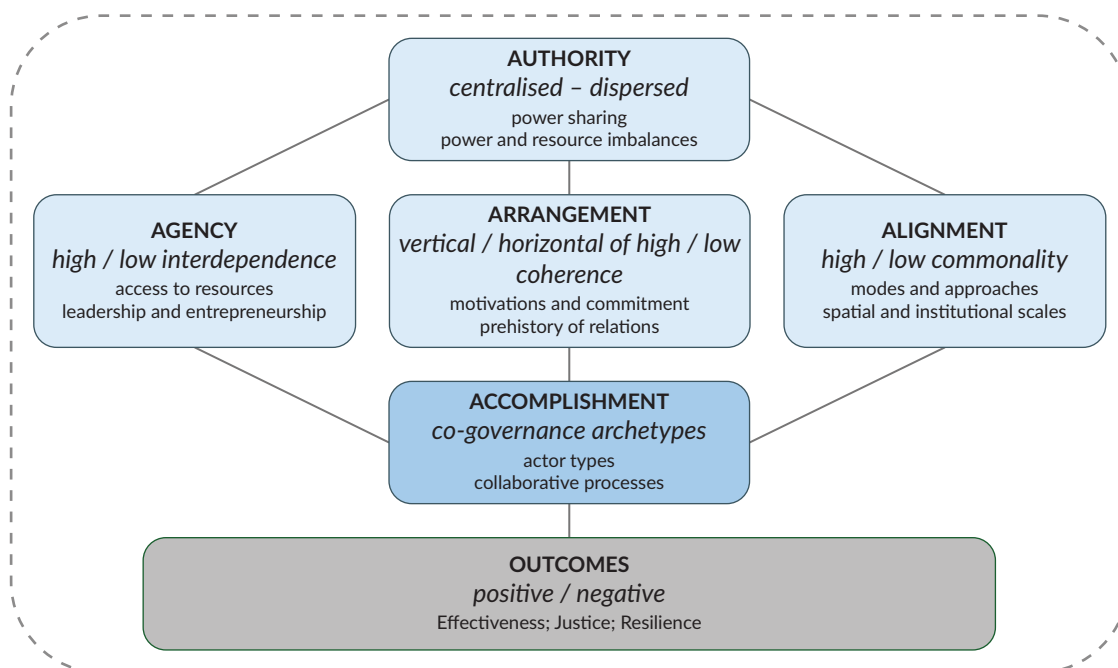


Figure 1. Five A's framework proposed by Voytenko Palgan et al. (2026): Authority, Agency, Arrangement, Alignment, and Accomplishment, adjusted by the authors to include resilience as an outcome. Source: Voytenko Palgan et al. (2026).

Table 1. Definitions of the co-governance concepts included in the five A's framework proposed by Voytenko Palgan et al. (2026).

Co-governance concept	Definition
Authority	Legitimate use of power by actors to steer towards certain outcomes
Agency	Capacity or capability of actors (i.e., institutions, organisations, individuals) to govern
Arrangement	The ways in which actors are organised or related to one another, a structure for co-governance
Alignment	Actor interests and relations in co-governance arrangements and divergence/convergence of their discourses, views, ideas, and visions
Accomplishment	Operationalisation of the four other co-governance concepts through the practices that shape how co-governance unfolds on the ground

Source: Voytenko Palgan et al. (2026).

3. Materials and Methods

3.1. NbS Dataset Analysis

This study draws on the NATURESCAPES NbS dataset included within the Urban Nature Atlas (UNA), a global database hosting over 1,600 NbS projects worldwide. The UNA, originally developed in 2017 through the NATURVATION Horizon 2020 project, has since been expanded through multiple data-collection phases with support from various research and policy partners. The NATURESCAPES dataset comprises 390 NbS projects across 30 functional urban areas and was developed in 2025 through systematic analysis of secondary sources, including project documentation, municipal reports, media articles, and project websites (UNA, 2025).

The NATURESCAPES dataset contains detailed information systematically collected for all identified and included NbS initiatives, including their objectives, scale, NbS typology, governance arrangements, implementation approaches, stakeholder configurations, and reported outcomes, among other data fields. We first analysed all NbS included in the NATURESCAPES dataset ($N = 390$). Food-growing NbS ($N = 86$) were filtered based on their classification as either community gardens, allotments, or horticultural initiatives (according to the standard NbS classifications of the UNA). Lastly, to examine the focus of these initiatives, project descriptions and objectives were analysed deductively through qualitative content analysis, using the pre-established categories defined in the UNA database. As with the NbS typology classifications, the categories presented in Figure 4 and Figure 5 are standard data categories that form the structure of the NbS database and are systematically reviewed and applied to all NbS initiatives included in the database.

The analysis of this specific subset of NbS initiatives enables the in-depth study of NbS intended to address food security challenges and/or with a food-production function, with particular attention to their governance arrangements and project enabling conditions. The resulting sample comprises 86 NbS projects across 24 functional urban areas in Europe ($n = 16$), Latin America and the Caribbean ($n = 4$), North America ($n = 3$), and Asia ($n = 1$), allowing comparative analysis of governance and co-governance patterns across contexts.

The quantitative analysis addresses two questions: What characteristics distinguish food-growing NbS from the broader NATURESCAPES dataset? What governance structures and actor configurations predominate across these initiatives? These questions provide the empirical foundation of the subsequent application of the five A's framework. While the standardised dataset entries lack the qualitative depth required to assess the five A's in their full process-oriented complexity, it enables comparative analysis of governance structures, actor configurations, participation patterns, and enabling conditions across a large sample of cases. The resulting findings contextualise and inform the qualitative case-study analysis.

3.2. Qualitative Comparative Case Study

Building on the dataset analysis, two food-growing NbS, Patios Productivos in Cartagena (Colombia) and Horta Nova Horticultural Park in Lisbon (Portugal), were selected for qualitative case comparison. Both cases are included in the subset of 86 food-producing NbS and reflect key patterns identified in the dataset, notably strong community involvement and explicit engagement with food insecurity in marginalised urban contexts. Qualitative methods were used to capture informal governance practices, power relations, and lived experiences that are not visible through standardised data. Case selection was guided by four criteria: relevance to urban food poverty, diversity of governance arrangements and actor roles, contrasting socio-political contexts in the Global South and Global North, and availability of rich empirical material. Across both cases, semi-structured interviews, document and policy analysis, and governance mapping enabled systematic cross-case comparison using the five A's framework, linking governance arrangements to justice- and resilience-related outcomes.

For the case of Patios Productivos, implemented by Fundación Granitos de Paz in Cartagena de Indias, Colombia, primary data were collected through multiple field visits conducted between August and October 2024 as part of the broader NATURESCAPES project. Data collection included interviews with programme staff, three participating gardeners, and representatives of a partnering restaurant. In total, seven interviews

were conducted in Spanish, recorded with consent, translated, and transcribed for analysis. Interviews were complemented by on-site observation of participating gardens. Supplementary data were drawn from the foundation's website and project documentation (Fundación Granitos de Paz, 2026).

In the case of Horta Nova Horticultural Park, primary sources included three semi-structured interviews: one with a Lisbon City Council (Câmara Municipal de Lisboa [CML]) technician who served as the designer of the Horta Nova Horticultural Park Requalification project, and two in-situ interviews with allotment gardeners, conducted at their plots. Interviews were conducted in Portuguese, recorded with consent, transcribed, and analysed in the original language. The interview with the CML technician lasted approximately one hour; the interviews with the allotment gardeners lasted between 20–25 minutes, with additional time for observing their plots and taking photographs with their consent. Secondary sources included the NATURESCAPES database alongside CML documents related to the project, such as the project's descriptive report, the general plan, and the norms for access and use of urban allotments. Relevant newspaper articles and literature on the context and evolution of urban allotments in Lisbon were also reviewed.

3.3. Case Descriptions

3.3.1. Patios Productivos

Patios Productivos is an urban gardening programme implemented by Fundación Granitos de Paz, a non-profit organisation working in the marginalised neighbourhood of Olaya Herrera in Cartagena, Colombia (Fundación Granitos de Paz, 2026). Its mission is to provide tools and support that help Colombians escape extreme poverty and achieve a dignified and stable future. The foundation aims to implement a holistic and replicable recovery model through collaboration with public and private partners, a model that has since expanded to other areas and cities such as Barranquilla. The organisation's first programme focused on health and family planning, prioritising the most vulnerable residents. In 2005, it launched the urban gardening programme Patios Productivos to address food insecurity. Initially centred on household nutrition, the programme shifted in 2018 towards income generation through the commercial production of vegetables, edible flowers, and herbs. Participants regenerate degraded soils in small backyard plots, transforming informal waste sites into productive gardens (see Figure 2). The foundation provides initial inputs such as soil, seeds, and pots, manages logistics, and connects gardeners with local restaurants and hotels in Cartagena. Today, the programme includes over 300 urban gardens. For many participants, it has led to stable income, improved housing conditions, and the ability to work close to home, replacing insecure informal jobs. Recently, private companies have begun financing new gardens through the foundation, linking environmental and social sustainability goals.



Figure 2. Photo of an urban backyard garden of Patios Productivos.

3.3.2. Horta Nova Horticultural Park

Urban allotment gardening in Lisbon has been shaped by municipal policy since the mid-2000s, beginning with the Lisbon Green Plan and gaining momentum in 2011 with the launch of the Parques Hortícolas Municipais programme (Delgado, 2017). This agenda was consolidated in 2012 through the Green Structure of the Municipal Master Plan. The programme prioritises vulnerable areas and currently includes 22 horticultural parks covering 9.9 hectares, overseen by the Urban Gardens Unit of CML (2026). As the case of Horta Nova illustrates, however, urban agriculture in Lisbon has much deeper roots, predating formal municipal programmes by several decades (Cabannes & Raposo, 2013; Delgado, 2017; Luiz & Jorge, 2012). These longer trajectories are closely tied to Portugal's broader socio-spatial history, shaped by late urbanisation, rapid decolonisation in the 1970s, and sustained rural–urban migration.

The Horta Nova Horticultural Park (Figure 3) is in the parish of Carnide, in north-western Lisbon. The neighbourhood around it is socially mixed: a social housing estate on one side, middle- to upper-middle-income housing on the other. The park occupies the interior of a city block within the Horta Nova estate, the social housing development that gave it its name. The area has a long connection to food cultivation. The housing stock originated as prefabricated wooden houses built by CML before the 1974 Carnation Revolution to rehouse families from other neighbourhoods, but the houses sat empty until the Revolution. After the Revolution, families from nearby informal settlements and others from across Lisbon moved in. Each house had a small garden, which gave the neighbourhood its name (Reis & Leote, 2022). According to interviews and local press coverage (Reis & Leote, 2022), the garden started informally in 2013, when a group of residents began cultivating an abandoned plot overnight in response to the economic crisis, operating without official status for eight years. The formal requalification process was set when the Carnide Parish Council officially requested an intervention from CML. Technical work began in December 2016,

followed by participatory meetings and protracted legal proceedings to remove illegal car-dismantling workshops from the site. The space was inaugurated in 2021. The park now has 80 allotment plots (~75 m² each), organised in groups of four across a total intervention area of 18,700 m², financed by CML. Beyond the allotments, there is a lawn, a dog park, an outdoor fitness zone, and picnic areas, which were designed to serve the broader surrounding population and encourage social cohesion between groups that had previously shared little of the space.



Figure 3. Horta Nova Horticultural Park.

4. Results/Analysis

4.1. Profiling of Food-Growing NbS Projects

4.1.1. Key NbS Characteristics

Our analysis indicates that food-growing NbS are strongly socially oriented. Among the 86 projects, 95% identify social justice as a key priority, compared with 65% of projects in the wider NATURESCAPES dataset. In contrast, only 27% identify climate change as a primary objective, compared with 53% across the broader NbS sample.

As shown in Figure 4, food-growing NbS most frequently address green space and biodiversity challenges (97%) and social justice and cohesion (97%), followed by sustainable production and consumption (86%) and health and well-being (55%). Compared with the overall NbS dataset, food-growing initiatives are less likely to prioritise climate action and water management.

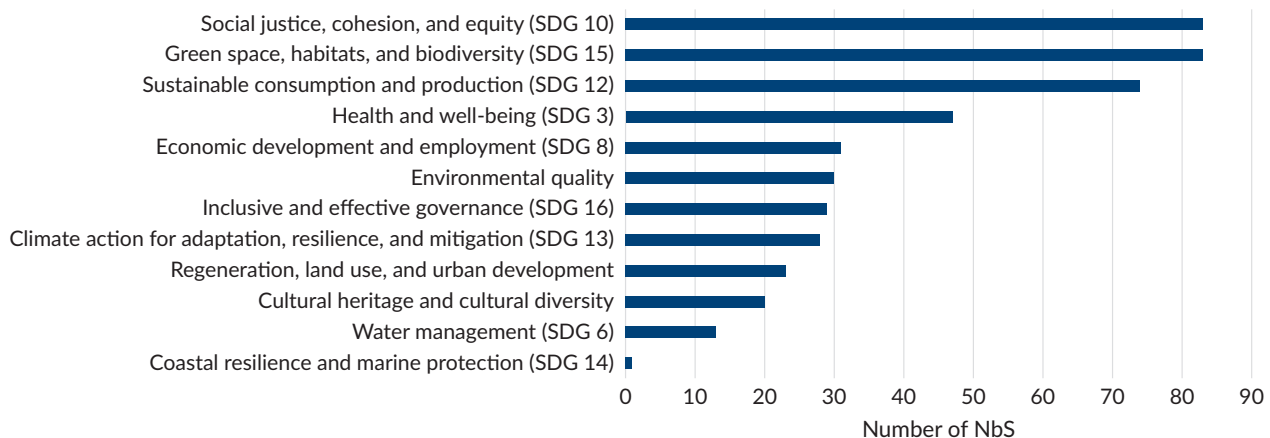


Figure 4. Sustainability challenges addressed by food-growing NbS.

Regarding their focus, food-growing NbS are primarily implemented as the creation of new green spaces (93%) and frequently incorporate knowledge creation and awareness-raising activities (70%; see Figure 5). They are also strongly localised, with most initiatives operating at street (45%) or neighbourhood scales (44%). Together, these patterns suggest that food-growing NbS function as place-based and community-oriented interventions, combining physical transformation with learning, engagement, and stewardship.

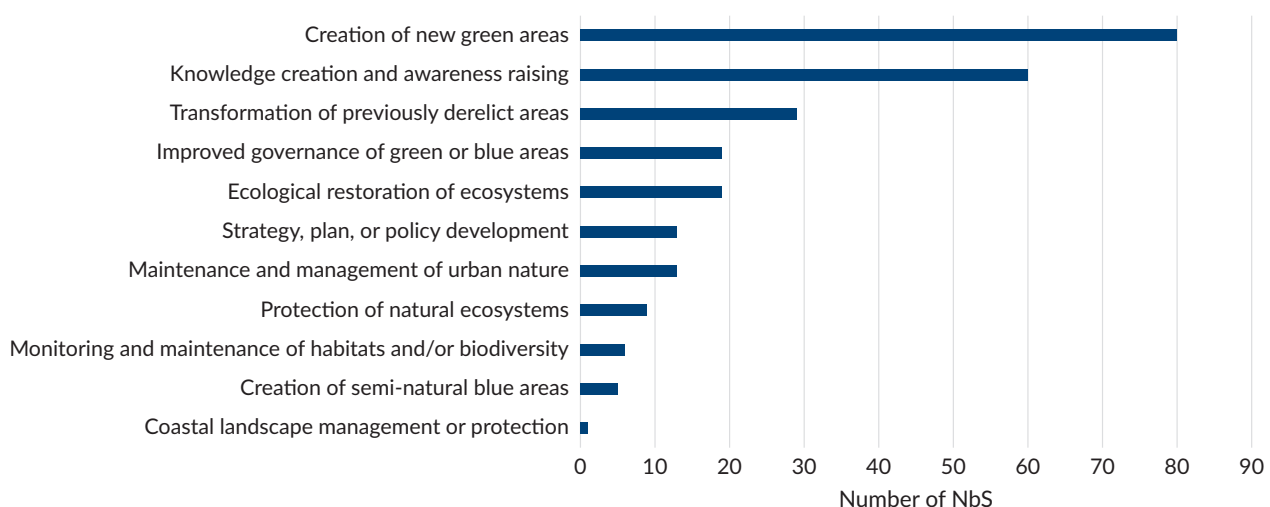


Figure 5. Focus of food-growing NbS.

In terms of expected NbS primary beneficiaries, food-growing NbS primarily include citizens and community groups (94%), with over half identifying marginalised groups (51%), including children, adolescent, or socio-economically disadvantaged population groups. Compared with the overall NbS dataset, food-growing initiatives are more likely to identify both marginalised groups and food producers as primary beneficiaries and to implement measures to support vulnerable or marginalised communities, including dedicated programs and the provision of resources to address the needs of these communities. These findings further reinforce the strong social orientation of food-growing NbS.

4.1.2. Governance Structures

Across food-growing NbS, the most common governance model is non-government-led (53%), followed by projects co-governed by government and non-government actors (26%) and government-led projects (21%). This prevalence highlights the socially driven and civil-society-led character of food-growing NbS, where leadership most commonly rests with NGOs and civil society (51%), as well as citizens or community groups (43%). Compared with the overall dataset (390 NbS), food-growing NbS tend to also have NGOs more often represented as NbS project initiators, while, in contrast, these projects are initiated less commonly by local governments or municipalities.

Most initiatives fall toward the “bottom-up” end of the governance spectrum, with a high level of citizen and community involvement throughout their activities, the majority in stages of involvement related to on-the-ground implementation (67%), but also during planning and design (e.g., site selection, identification of key priorities; 38%) and proposal development (22%). Compared with the broader dataset, food-growing NbS are more likely to include participatory activities related to knowledge sharing, education, and joint implementation (e.g., tree planting).

The analysis showcases that food-growing NbS are predominantly initiated as spontaneous and voluntary initiatives (81%) rather than through deliberate policy intervention. Across the studied initiatives, non-financial contributions took a significant role in the implementation, either through the provision of labour (81%), land (64%), or expertise (56%), mostly by citizens volunteering in these spaces (70%), but also with the support or in partnership with public authorities (e.g., use of vacant land, utility services; 43%). Together, these findings indicate that food-growing NbS generally emerge and are governed through civic initiative, with public actors more commonly playing enabling than leading roles.

These patterns suggest that food-growing NbS are distinguished from the broader NbS population not only by their social orientation but also by their reliance on community-led and collaborative governance arrangements.

4.2. Comparative Results

Building on the dataset findings, we compare Patios Productivos (Cartagena) and Horta Nova (Lisbon) using the five A's framework (Table 2). The two cases share a commitment to long-term urban food co-governance in socially disadvantaged neighbourhoods but arrive at it through different paths and operate through distinct governance logics and scales. These differences provide insight into how co-governance shapes justice and resilience outcomes across contrasting contexts.

4.2.1. Authority and Arrangement

In Patios Productivos, *authority* is exercised through a hybrid and relational configuration that combines centralised strategic leadership with locally recognised household-level decision-making. Fundación Granitos de Paz holds primary authority by defining programme objectives, participation criteria, and strategic direction, while individual gardeners retain decision-making authority over their backyard plots. Authority is therefore neither purely hierarchical nor fully decentralised but distributed across actors in socially recognised and functionally effective ways.

The foundation's legitimacy derives less from formal mandates than from its long-term embeddedness in Olaya Herrera. Through more than two decades of engagement in food-growing, health, education, employment, and elderly care, Granitos de Paz has become a trusted local actor whose authority is perceived as legitimate and aligned with community needs. This contrasts with the fragmented authority of municipal institutions, where instability and unclear responsibilities often undermine public trust.

Authority becomes most visible at key moments of strategic decision-making, such as the shift in 2018 from subsistence-oriented food-growing towards partial commercialisation aimed at strengthening household incomes. While initiated by the foundation's leadership, this transition did not displace household-level authority, as gardeners continue to decide how much to produce and whether to sell surplus.

This authority is operationalised through a hybrid co-governance *arrangement* that combines decentralised household food-growing with central coordination by Fundación Granitos de Paz. While backyard gardens remain privately managed and spatially dispersed, the programme functions as a semi-formal platform that organises participation, inputs, training, logistics, partnerships with restaurants and hotels, and technical support from agronomists. The arrangement blends informal and formal elements and has remained deliberately flexible over time. Coordination relies less on rigid institutional rules than on relational practices, shared norms, and ongoing interaction, allowing the initiative to adapt, including its shift towards partial commercialisation, without undermining community ownership, participation, or trust.

Horta Nova follows a distinct governance trajectory in which authority shifted fundamentally over time. Between 2013 and 2021, *authority* was exercised in a dispersed and informal manner by a self-organised community operating without institutional recognition. Although CML formally held authority over the site, it refrained from intervening against the occupation. Following formalisation, authority became centralised within the municipality. The municipal executive initiated investment in the project after a request from the Carnide Parish Council, while technical authority was exercised by staff from the Green Infrastructure Project Division through the definition of standards, programme design, and implementation plans. The Carnide Parish Council acted as an intermediary during the transition by identifying existing cultivators, organising preparatory meetings, and supporting plot allocation, without holding decision-making power. In contrast to Patios Productivos, where authority is embedded horizontally through programme design and community legitimacy, authority at Horta Nova was consolidated through municipal intervention, with proximity and trust serving to mitigate associated asymmetries.

The resulting governance *arrangement* at Horta Nova is tripartite and vertically structured. CML financed the requalification project and retained a regulatory role, with its Urban Gardens Unit. The Carnide Parish Council mediated the transition phase, while plot holders are responsible for daily management. As in Patios Productivos, each gardener exercises decision-making authority over their own plot, including what to grow and at what pace, within a framework of rules established by the municipality governing shared infrastructure, prohibiting pesticide use, and limiting tree height. Governance values are also embedded in the physical design of the site, as plots are organised in groups of four with shared shelters and irrigation points, fostering interdependence and encouraging collaboration through negotiated use of common resources.

4.2.2. Agency

The contrast between the two cases is most pronounced in relation to agency. In Patios Productivos, Fundación Granitos de Paz and the programme as a whole display a high degree of collective *agency*. The foundation mobilises personnel and resources, maintains partnerships with local hotels and restaurants that purchase produce, and has built a supportive community in which knowledge is shared and mutual support is fostered. Participating gardeners have gained opportunities for income generation, entered the formal economy, and developed the capacity to provide food and care for their households.

In Horta Nova, by contrast, community *agency* preceded and enabled the governance arrangement. The informal occupation initiated in 2013 drew on a longstanding culture of collective action and was sustained for eight years through self-organisation, shared agricultural knowledge, and collectively managed infrastructure, without external support. During formalisation, strong community organisation ensured that all existing cultivators retained their plots. After 2021, agency remained high and largely autonomous, with plot holders continuing to manage daily operations and resolve infrastructure issues with minimal municipal involvement. Formalisation provided legal security, access to water, and shared infrastructure while acknowledging governance capacity that was already in place. Analytically, this highlights a key difference between the cases: In Lisbon, institutional intervention recognised and stabilised pre-existing community agency, whereas in Cartagena, institutional support is the condition through which such agency is gradually developed.

4.2.3. Alignment

Both cases exhibit a high degree of alignment, but this commonality is achieved through different mechanisms and over different timescales. In Patios Productivos, *alignment* is built around a shared commitment to addressing poverty and reducing dependency through enhanced resilience. The collective vision is rooted in tackling structural inequalities in the marginalised neighbourhood of Olaya Herrera, with backyard food-growing functioning as a practical and symbolic tool in this process. Shared values, experiences, and a sense of ownership act as a unifying force that sustains alignment among participants.

In Horta Nova, alignment developed gradually well before any formal governance arrangement was established. A long history of collective action created social foundations that framed the initial occupation as civic engagement rather than illegal appropriation. Formalisation consolidated rather than created alignment through participatory processes, trust-building, and tangible benefits. Cultivators retained access to their plots, gained infrastructure, and saw a previously stigmatised practice become publicly recognised. Although actors pursued different goals, including community food security, municipal urban improvement, and public safety, these interests largely converged around shared outcomes.

Both cases also reveal persistent tensions. In Horta Nova, dissatisfaction with fees among elderly low-income cultivators and uneven compliance with pesticide regulations remain points of friction. In Olaya Herrera, Patios Productivos operates amid broader structural challenges such as unemployment, poverty, violence, which periodically generate conflict. Here, the foundation adopts an integral and relational approach that acknowledges these struggles and seeks collective pathways towards resolution. In both cases, these tensions are managed within rather than resolved by the governance arrangement, highlighting that alignment remains dynamic and incomplete.

4.2.4. Accomplishment

Patios Productivos has connected dispersed backyard gardens into a city-wide network of largely commercial urban food-growing through a society-led collaborative partnership. By coordinating households, technical actors, and market partners, the initiative has enabled more stable incomes, greater engagement with the formal economy, and increased social recognition within and beyond the neighbourhood. Its durability is reflected in expanding partnerships and early replication in other Colombian cities, suggesting the transferability of this co-governance approach.

Accomplishment in Horta Nova is reflected in the iterative, multi-phase process through which a bottom-up informal initiative was progressively embedded within a formal municipal co-governance framework, moving from a society-led partnership towards collaborative governance with the municipality. In material terms, formalisation delivered 80 formally allocated plots integrated into a public park, along with shared infrastructure that cultivators had not previously enjoyed. The case's most significant accomplishment lies, however, in what the transition produced socially and institutionally: A formerly illegal, stigmatised practice became publicly legitimised; a space used exclusively by social housing residents became shared by the surrounding neighbourhood; and a community that had governed itself under austerity conditions for eight years was embedded in a formal co-governance structure without losing its people, its autonomy, or its practices. Table 2 summarises the comparison of both cases across the five A's.

Across both cases, justice emerges primarily through recognition, legitimacy, and inclusive governance rather than formal redistribution. In Patios Productivos, justice is reflected in the expansion of household and community agency, as participants, particularly women and elderly residents, gain access to skills, resources, and social networks that enhance food security, income generation, and control over everyday living conditions. Flexible arrangements integrate local knowledge into programme design, supporting strong alignment and legitimacy within marginalised communities, even as authority remains centralised in Fundación Granitos de Paz.

In Horta Nova, justice outcomes are closely linked to the formal recognition of long-standing informal practices. The formalisation process preserved the agency of pre-existing gardeners, many of whom are elderly and socio-economically disadvantaged, by guaranteeing continued access to plots through inclusive decision-making. Embedding food-growing within a public park serving a socially mixed neighbourhood strengthened procedural justice and public legitimacy, despite ongoing tensions related to fees and regulation.

Both cases also demonstrate strong social and institutional resilience, supported by co-governance arrangements that combine collective agency with adaptive organisational and spatial configurations. In Horta Nova, community-led food-growing emerged as a rapid response to economic crisis, with shared infrastructure and spatial design fostering cooperation and mutual support. In Patios Productivos, resilience is built through decentralised production, diversified livelihoods, and dense social networks coordinated through a central organisational actor. At the same time, resilience outcomes remain uneven, as both initiatives concentrate risk among poorer groups, and Patios Productivos remains potentially vulnerable due to reliance on a central coordinating organisation.

Table 2. Comparison summary of both cases using the five A's.

Co-governance concept	Definition	Granitos de Paz (Cartagena, Colombia)	Horta Nova (Lisbon, Portugal)
Authority	Legitimate use of power by actors to steer towards certain outcomes	In the absence of effective municipal governance, Patios Productivos operates within an authority vacuum that Fundación Granitos de Paz has filled by assuming a central steering role. Authority is <i>largely centralised</i> around the shared objective of addressing food insecurity and poverty, with the foundation defining strategic direction and controlling key resources. At the same time, authority is <i>partially dispersed</i>, as urban gardeners retain limited but recognised decision-making power over their own production practices.	The configuration of authority in Horta Nova shifted fundamentally across the two phases of the case. Before formalisation (2013–2021), authority was managed <i>in a dispersed way</i> by the community. After formalisation in 2021, authority became formally <i>centralised</i> in CML.
Agency	Capacity or capability of actors (i.e., institutions, organisations, individuals) to govern	Governance agency is actively built by expanding participants' capacity to make and act on decisions through access to resources, skills, knowledge, and physical space. Agency is characterised by <i>high interdependence</i>, as household autonomy depends on coordination and leadership provided by Fundación Granitos de Paz. Over time, agency becomes <i>increasingly collective</i>, through learning-by-doing, peer exchange, and trust-based leadership, reducing dependence on direct intervention.	Community agency in Horta Nova was not produced by the co-governance arrangement; it preceded and enabled it. During the formalisation process, the community continued to exercise agency in consequential ways as the community organised to guarantee all cultivators kept their plots. After formalisation in 2021, agency remained high and largely autonomous.
Arrangement	The ways in which actors are organised or related to one another, a structure for co-governance	Patios Productivos operates through a <i>hybrid vertical–horizontal arrangement of relatively high coherence</i>, in which a central organisation (Fundación Granitos de Paz) coordinates partnerships, resources, and processes, while households manage decentralised, plot-level production. The arrangement blends formal organisational practices with community-embedded routines and remains flexible, allowing adaptation to spatial constraints, household needs, and ecological conditions while supporting scalability.	The governance arrangement is vertical: CML (financed the requalification and regulates via the Urban Gardens Unit), Parish Council (transition mediation), and plot holders (daily management). Plots are organised in groups of four with shared shelter and irrigation to foster mutual accountability and social cohesion. Spatial integration: allotment area within public park serving wider mixed-income neighbourhood.

Table 2. (Cont.) Comparison summary of both cases using the five A's.

Co-governance concept	Definition	Granitos de Paz (Cartagena, Colombia)	Horta Nova (Lisbon, Portugal)
Alignment	Actor interests and relations in co-governance arrangements and divergence/convergence of their discourses, views, ideas, and visions	Alignment is characterised by <i>high commonality</i> among actors, despite operating at different spatial and institutional scales and emerges through the convergence of actor motivations: the foundation's focus on community well-being, households' interest in food security and income generation, and external partners' commitment to urban resilience. Ongoing communication, participatory workshops, and visible, short-term benefits help maintain alignment over time.	Alignment in Horta Nova was earned through decades of accumulated history and sustained through continuous trust-building practices. High commonality: Actors' interests and visions broadly converge and reinforce each other without being identical. Points of tension persist: dissatisfaction with annual fees and uneven compliance with pesticide rules.
Accomplishment	Operationalisation of the four other co-governance concepts through the practices that shape how co-governance unfolds on the ground	Co-governance arrangement of a <i>society-led partnership</i> characterised by distributed authority, high collective agency, and strong alignment across actors. Accomplishments include both material outputs (increased food availability, dietary diversity, stable income) and social transformations (strengthened cohesion, self-efficacy, and dignity in marginalised neighbourhoods). These outcomes reinforce the legitimacy of collaborative processes, attract new partners, and support long-term effectiveness, justice, and resilience within a context of weak formal urban governance.	Co-governance trajectory: from bottom-up initiative to formal municipal collaboration. Material outputs: 80 plots, shared infrastructure, and an integrated public park. Social and institutional shift: legitimisation of practices, broader spatial inclusion, and community retained within formal governance.

5. Discussion

Both cases, Horta Nova and Patios Productivos, align closely with patterns identified in the NATURESCAPES dataset. They focus on marginalised and low-income communities, prioritise knowledge generation and sharing around food-growing and self-sufficiency, and create or reshape green spaces while addressing social justice and cohesion challenges. This reflects broader dataset findings showing that food-growing NbS are more socially oriented than other forms of NbS and more likely to prioritise justice and social cohesion.

The governance characteristics of both cases closely mirror the broader dataset. Food-growing NbS are predominantly initiated and governed by citizens, community groups, and NGOs rather than public authorities, and most emerge as spontaneous and voluntary initiatives, suggesting that public actors are most effective when taking collaborative or supporting roles with non-governmental-led actors, rather than policy-driven enablers. Both Horta Nova and Patios Productivos were initiated through civil society action, reinforcing the observation that food-growing NbS often emerge in response to governance gaps in addressing food insecurity and urban poverty. For urban food policy administrators, this implies a shift towards investment in flexible governance frameworks, secure land tenure, and access to shared infrastructure that allows existing community-led initiatives to endure and adapt.

A central insight from both the dataset analysis and the case studies is that food-growing NbS cannot be understood as food-producing in a narrow, technical sense. They operate at a human scale, responding to how people grow, access, share, and organise food in relation to broader social needs. This helps explain why climate change appears as a primary driver in only 27% of food-related NbS, compared to 53% across the wider NbS dataset. Neither Horta Nova nor Patios Productivos was initiated with a climate rationale. In Lisbon, this rationale was introduced later through formal planning instruments, reflecting a gradual shift in how these spaces came to be recognised as green infrastructure assets after decades of informal practice. In Cartagena, comparable formal recognition has not occurred, although private partnerships and early replication signal emerging acknowledgement of the programme's sustainability value.

Combining dataset analysis with qualitative case studies allows us to examine not only what food-growing NbS do, but how justice and resilience emerge through co-governance. Applying the five A's framework reveals how authority, agency, arrangements, alignment, and accomplishment evolve over time and shape outcomes. This temporal perspective allows the analysis to move beyond static descriptions of governance forms and towards identifying the conditions under which justice and resilience emerge through everyday governance practices. The sustained relational investment built up over long periods of presence in the community, as observed in the in-depth case studies, also demonstrates that community autonomy develops gradually and cannot be achieved through short project cycles. In practical terms, public and private funders seeking scalable outcomes should therefore prioritise long-term partnerships that build on existing social infrastructure, rather than treating community participation as an isolated component of the project.

This process of recognition and institutionalisation, however, does not come without trade-offs. In Horta Nova, the transition to municipal co-management delivered tangible material benefits to an ageing and vulnerable community but also introduced annual plot fees that generated dissatisfaction among elderly and low-income growers who had developed and maintained the allotment for years without institutional support. This tension between recognition and autonomy reflects a broader structural risk in co-governance

processes. While institutional involvement can provide legitimacy, resources, and stability, it also introduces regulation and financial obligations that may conflict with the voluntary and self-organised practices on which such initiatives depend. How this balance is managed, whether institutional recognition reinforces community agency or gradually displaces it, constitutes a central governance challenge for food-focused NbS beyond 2030, shaping whether urban food governance works with communities on their own terms or imposes institutional logics upon them.

Taken together, these findings indicate that food-growing NbS cannot be adequately designed, evaluated, or scaled using frameworks developed for climate- or biodiversity-focused NbS. Instead, they require governance approaches that prioritise community agency, recognise informal authority, and treat justice and resilience as outcomes of sustained everyday practice rather than policy delivery. By tracing how governance arrangements evolve over time, this article advances a process-oriented understanding of urban food-growing NbS as critical infrastructures of everyday resilience under conditions of socio-economic and climatic uncertainty.

From a policy perspective, the findings suggest that the central challenge is not simply how to manage food-growing NbS more efficiently, but how to recognise and support governance capacities that already exist within communities. Across both the dataset and case studies, food-growing NbS emerged primarily in response to broader social challenges, including food insecurity, poverty, exclusion, and weak institutional support. Through different configurations of authority, agency, arrangements, alignment, and accomplishment, communities developed governance capacities before substantial governmental involvement. For resource-constrained municipalities, this suggests that supporting existing community-led initiatives through access to land, water, infrastructure, technical assistance, and long-term recognition may be more effective than creating new programmes from scratch. The challenge, therefore, goes beyond resource allocation and involves recognising whose knowledge, priorities, and capacities are treated as legitimate within urban food governance.

These findings also carry implications for emerging post-2030 urban food agendas. While frameworks such as the FAO Urban Food Agenda and Food2030 have advanced recognition of food security and sustainability within cities, our results suggest that they underemphasise the strongly social and community-driven dimensions of food-growing NbS. Across both the dataset and in-depth case studies, food initiatives function not only as mechanisms for food provision, but also as spaces of learning, care, social cohesion, and community empowerment. A post-2030 agenda should therefore place greater emphasis on co-governance, community agency, and the redistribution of governance capacities alongside more conventional food security and sustainability objectives. For urban food policy administrators, this means designing instruments that protect and sustain community-led food spaces over time, rather than drawing them into short-term implementation cycles that extract outputs without maintaining the governance conditions that allowed them to grow.

6. Conclusion

Despite differences in sociopolitical, cultural, and institutional contexts, Horta Nova and Patios Productivos reveal similar governance trajectories. In both cases, food-growing NbS emerged from marginalised communities as bottom-up responses to food insecurity, poverty, economic crisis, and social isolation. These initiatives strengthened community cohesion and resilience, not only during periods of disruption such as

economic crises or the Covid-19 pandemic, but also in everyday life. While organisational forms and degrees of institutionalisation vary, community agency precedes formal policy intervention, and governance arrangements evolve through practice and necessity rather than deliberate design.

These dynamics are not exceptional. Across the NATURESCAPES dataset, 81% of food-growing NbS emerge as spontaneous, voluntary initiatives governed outside formal state structures, while 95% identify social justice as a primary objective, compared with 65% across the broader NbS dataset. The two cases illuminate how this broader pattern is translated into justice and resilience outcomes through co-governance. They also show that food access, poverty reduction, and social cohesion often remain more immediate drivers than climate adaptation or biodiversity objectives.

Both cases demonstrate how communities generate authority and governance capacity before substantial state involvement. Co-governance therefore emerges not as an abstract governance ideal but as a mechanism through which justice and resilience are produced in contexts where food remains weakly institutionalised as a public responsibility. Yet institutional recognition also introduces new tensions related to regulation, fees, and control. Without careful attention to power, authority, and community autonomy, co-governance may reproduce rather than reduce existing inequalities.

The five A's framework proved valuable as a process-oriented tool for linking large-scale governance patterns with lived experiences of justice, care, and autonomy. Combined with the mixed-methods approach, it reveals a central finding of this study: Successful food-growing NbS rarely emerge through top-down design alone. Rather, they develop from existing community capacities that are subsequently recognised, supported, and stabilised through co-governance arrangements. For post-2030 urban food agendas, the challenge is therefore not only to fund food initiatives, but to create governance arrangements that sustain community agency while expanding justice and resilience outcomes. Urban food governance should recognise communities not merely as beneficiaries or stakeholders, but as governance actors in their own right.

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Conflict of Interests

The authors declare no conflict of interests.

Data Availability

Data such as maps, the interview guides, or more photos are available on request.

LLMs Disclosure

Any use of generative AI in this manuscript adheres to ethical guidelines for use and acknowledgement of generative AI in academic research. Each author has made a substantial contribution to the work, which has been thoroughly vetted for accuracy, and assumes responsibility for the integrity of their contributions. Microsoft Copilot (based on GPT-series LLMs) was used as a writing support tool during the preparation of this manuscript. Its use was limited to language editing, shortening and improving readability of draft text, and support with stylistic consistency.

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