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Co-Designing Urban Interventions Through the Lens of SDGs: Insights From the IN-HABIT Project in Nitra, Slovakia

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Abstract

Collaborative efforts and vertical and horizontal cooperation of stakeholders representing diverse interests are crucial for the effective achievement of the UN Sustainable Development Goals (SDGs). In urban planning practice, however, coordination of more technocratic and bureaucratic top-down processes and community-driven bottom-up efforts encounters many, sometimes seemingly insurmountable obstacles. The Horizon 2020 IN-HABIT project, implemented in four European cities, brings together universities, the local public sector, and non-governmental partners to co-design, co-deploy, and co-manage integrated solutions, combining technological, nature-based, cultural, and social innovations to promote inclusive health and wellbeing. This article focuses on the participatory co-design process of innovative interventions in the Nitra pilot, utilizing mixed methods—questionnaire surveys and stakeholder interviews—to evaluate the contribution to select SDGs perceived by three groups of stakeholders: process facilitators, experts, and policymakers; urban planners; and target groups. The findings suggest that the co-design process generally contributed to community engagement, strengthened partnerships, and enhanced the inclusiveness of public spaces. However, differences emerged in how stakeholders perceived these contributions, with target group representatives being more optimistic than the remaining participants. The article concludes with implications for urban planners and policymakers in making participatory processes more inclusive and effective for achieving sustainable urban development goals, e.g., incorporating capacity-building and educational aspects into the process or introducing innovative co-design methods like participatory site-specific art residencies or other methods involving direct implementation of co-designed solutions.

Keywords

co-design; inclusive public spaces; public–private–people partnership; sustainable development goals

1. Introduction

The 2030 Agenda for Sustainable Development, adopted in 2015 with 17 Sustainable Development Goals (SDGs), delivered a standalone goal toward urban sustainability (SDG 11): "to make cities and human settlements inclusive, safe, resilient, and sustainable" (UN, 2015). Thus, it reflects the adoption of sustainability goals when designing urban buildings, public spaces, landscapes, transport, etc. (Carmona, 2021). In line with the New Urban Agenda (Tavares et al., 2024), participatory design of urban projects brings diverse opportunities for urban communities. First, it strengthens the tendencies of the local community to participate in efforts to address urban development challenges (Newell & Picketts, 2020). Second, active communities or individuals take the role of initiators of innovative urban solutions (Seyfang & Smith, 2007). However, more diverse stakeholders must be recognized and included in the planning process to support inclusive life in local communities (Katrini, 2018). Co-design as a process and method can potentially represent a tool to ensure the sustainability and inclusiveness of urban design project outcomes (Angelidou et al., 2021). Ansell et al. (2022) introduce several empirical examples of how different co-creation and co-design approaches can be a sound strategy for translating SDGs into local contexts.

Although the scientific literature does include studies focused on evaluating the contribution of urban design projects to the SDGs on the local level (Acharya et al., 2020; Faivre et al., 2017), through bibliometric analysis, Avila-Garzon and Bacca-Acosta (2024) found that only 2 percent of studies on co-design and co-creation directly involved the topic of sustainability. Within those, the impacts of urban design projects related to building green, inclusive public spaces on localized SDGs were one of the topics discussed (Bambó Naya et al., 2023). However, there is still relatively limited scientific debate on comparing the often-conflicting perceptions of various actors involved in the co-design process, such as researchers, facilitators, urban planners, lecturers, and participants. At the same time, it would be beneficial to compare how the degree of involvement in the co-design process shapes participants' attitudes toward its outcomes (Enserink et al., 2023).

The article aims to evaluate the contribution of the Horizon 2020 innovation action project IN-HABIT—implemented in four European cities (Cordoba, Spain; Riga, Latvia; Lucca, Italy; and Nitra, Slovakia) in the 2020–2025 period—to select SDGs at the local level, specifically focusing on Nitra's case and the subjective perception of local stakeholders regarding the contribution of the implemented co-design approach through specific targets. The IN-HABIT (INclusive Health And wellBeing In small and medium size ciTies) project leverages underutilized resources to enhance wellbeing through testing and experimenting with innovative hard and soft solutions, combining technological, nature-based, cultural, and social innovations to promote inclusive health and wellbeing with a focus on gender equality and diversity. Co-creating these solutions consists of co-design, co-deployment, and co-management with the involvement of local institutional and individual stakeholders. In each city, the spatial scale, challenges, and target groups the project seeks to address are different. In Cordoba, IN-HABIT focuses on renaturalizing a marginalized neighborhood with hard solutions concentrated in the public spaces of the neighborhood and the entire population considered vulnerable (Mac Fadden et al., 2024). In Riga, solutions are concentrated in and around a single building (a marketplace), while the target group is the entire surrounding neighborhood. The Lucca pilot seeks to build a hum-animal city, with infrastructural solutions coupled with pet services primarily targeting the elderly and people with mobility challenges (Granai et al., 2022). In Nitra, the pilot area consists of public and semi-public spaces, with interventions aiming to boost healthy lifestyles, social inclusion, and green public space accessibility in general and specifically for vulnerable groups like ethnic minorities and refugees.

The choice of the UN SDGs as an evaluation framework to achieve this aim was informed by several key considerations. Firstly, it aims to contribute to the growing literature showcasing how the co-design and co-creation approaches contribute to delivering SDG targets locally (Ansell et al., 2022). Secondly, it addresses the need to develop and validate frameworks for monitoring and managing the co-design processes, considering sustainability dimensions (Avila-Garzon & Bacca-Acosta, 2024). The need for triangulation between the SDGs, co-design, and the co-creation process as a methodology and specifically nature-based solutions (NbS), which are the cornerstone of interventions in the Nitra pilot, was highlighted by Mahmoud et al. (2022). The authors argue that utilizing SDGs as a basis for measuring the outcomes would, among others, increase the addressability of urban intervention projects. Finally, there is also a pragmatic reason for considering SDGs as an evaluation framework—the IN-HABIT project grant agreement lists specific SDGs and the expected contribution of the project's actions, making it a contractual obligation towards the European Commission. This aspect also informed the selection of SDGs and specific targets to be included in the evaluation framework. While also considering the importance of different stakeholders' perceptions of the co-design outcomes highlighted by Enserink et al. (2023), three research questions were put forward that this study seeks to find answers to:

> Q1: According to the local stakeholders involved, which relevant SDGs did the co-design process in the Nitra IN-HABIT pilot contribute to?
>
> Q2: Does the involvement in specific co-design activities influence the stakeholders' perception of the contribution of the process to relevant SDGs?
>
> Q3: Do stakeholders' perceptions of the co-design process contributions to relevant SDGs differ across different stakeholder groups?

2. Literature Review

One of the most significant re-conceptualizations of procedural urban planning theories (Yiftachel, 1989) within the last decades of the 20th century was triggered by the development of participatory and deliberative democracy (Sanoff, 2011). The emerging participatory theories of urban development criticized planning paradigms that promoted a top-down, ethnocentric, and paternalistic view of development (Waisbord, 2018). These emerging participative approaches were strongly defined against a rationalistic approach to planning that relied exclusively on the opinions of experts or policymakers (Fainstein, 2010). Evolution of participatory local development planning and participatory urban design is closely related (Forester, 1999; Sanoff, 1999). The democratic and inclusive, people-centered concepts of local development planning (Martínez, 2011) evolved in the context of endogenous and neo-endogenous theories of spatial development (Sisto et al., 2018), alongside the processes of governance decentralization and the adoption of bottom-up principles of planning, offering collaborative solutions for complex socio-economic and environmental challenges caused by the speed of the urbanization process (Innes & Booher, 2004).

Participatory decision-making based on "communicative rationality" gained importance also in landscape planning and urban design (Selman, 2004). Urban design projects can be defined as specific interventions for concrete urban site scales like an urban block, broader public space, or specific objects within such sites (Oosterlynck et al., 2011). It means that urban design projects can focus only on a limited number of

needs and functions, as the implementation of projects takes place in a limited area and affects only a particular part of local stakeholders (Bafarasat, 2023). Participatory design is an approach that is more process-oriented rather than guided by specific aesthetics (Lee, 2008). In this context, Roe and Rowe (2007) noted that a part of the landscape architect's role is to become a facilitator and build consensus among those who make decisions and those who are affected by them.

Collaborative approaches involving multiple actors in the urban design process aiming to improve the solutions of urban design projects are often referred to as the approaches of "co-design." Co-design approaches contribute to enhancing the legitimacy and context-specificity of solutions, promoting inclusion within affected communities, and supporting the sustainability, resilience, and innovativeness of urban design outcomes (Basnou et al., 2020; Gaete Cruz et al., 2022; Hansen et al., 2020; Lang et al., 2012). Co-design as an approach based on negotiation, common problem-solving, and decision-making is very complex, dynamic, and multi-sectoral (Carra et al., 2018; Huybrechts et al., 2017). It is based on negotiation, integrating formal and informal knowledge from different backgrounds, skills, values, and attitudes of diverse local actors with diversified positions toward outcomes (Baibarac & Petrescu, 2019).

From a procedural point of view, the co-design of a solution utilizes various methodologies. These methodologies represent relatively complex tools involving multiple stages, iterative cycles, and deep stakeholder engagement. These include, for example, participatory action research (Cruz et al., 2022), critical design (Johannessen et al., 2019), or living labs (Lupp et al., 2021). Concrete techniques for managing the co-design process include various techniques and methods of joint decision-making, such as transect walks, emotional maps, participatory mapping, or visual collaborative methods, including GIS or 3D decision-modeling platforms (Brookfield, 2016; Chassin et al., 2022, 2023; Pontrandolfi & Scorza, 2016).

Several studies evaluating the co-design approaches and their outcomes describe the benefits of shared decision-making in urban design in the context of sustainable local development (Bossen et al., 2016; Valladares, 2017; Wang et al., 2022). The methodology for evaluating participatory design implemented in these studies is considerably heterogeneous and fragmented and offers a flood of predominantly qualitative, subjective, or normative methodologies applied to evaluate approaches, processes, or outcomes of urban design. Methods evaluating a co-design approach usually cover the assessment of co-design methods, tools, and activities designed before the workshop. Methods evaluating the co-design process focus on assessing participants' experience, engagement, and collaboration during the co-design workshop. Methods evaluating the outcomes of co-design assess the design outputs, implementation, and reached impacts after the co-design (Wang et al., 2022). The evaluation of approaches or processes of co-design is usually based on the designer's, the researcher's, or the facilitator's reflections through questionnaire surveys, semi-structured guided interviews, or focus groups (Halar et al., 2020; Whicher & Crick, 2019). The most significant volume of available studies evaluating co-design processes applied a measurement framework based on scaling questions in semi-structured questionnaires (e.g., van Beusekom et al., 2021). Some measurement frameworks evaluating the participants' satisfaction levels with the workshops have already been developed (e.g., Peters et al., 2024; Roemer et al., 2020; van Beusekom et al., 2021). Wang et al. (2022) also mention various alternative approaches to this type of data collection (e.g., observational field notes, experimental comparison studies, or social media comments).

Urban design projects and interventions give physical form to the ideas of sustainable development and represent on-the-ground delivery of the SDGs since they generate diverse impacts of social and economic

nature or contribute to the environmental sustainability of the built environment (Ansell et al., 2022; Carmona, 2021; Zabaniotou, 2020). This, along with the growing need to address the delivery of SDGs at the local level (Bambó Naya et al., 2023), opens space to consider how these goals can be integrated into the measurement framework for evaluating the outcomes and delivery of these interventions.

There are not many examples of studies utilizing SDG goals and targets as a basis for an outcome-focused measurement framework for evaluating the impacts of urban design projects and interventions. Design Council (2020, p. 38) proposes incorporating SDGs into a self-assessment framework for urban project designers; they argue that such an assessment can "nudge designers to tell their stories" but also "provide them with tools to show and communicate the social and environmental impact of their work." Mahmoud et al. (2022) have already demonstrated the use of SDGs as an assessment framework in the case of the Horizon 2020 project CLEVER Cities. The study explained how local NbS contribute to achieving the SDGs and how co-creation can help achieve these global goals at the local level. They conclude that it appears to be beneficial to embed SDGs as an integral part of a co-creation evaluation framework. Debele et al. (2023) investigated 547 case studies on NbS, most of which declared local impacts on the fulfillment of SDG 15, followed by SDGs 13 and 6. The study also proves that NbS spur diverse co-benefits of an economic or social nature. Sharifi et al. (2024) focused on elaborating smart city solutions that tend to primarily impact SDGs 11, 12, 7, and 6. Some studies pointed to the need to evaluate the contribution of market-based activities to the SDGs. Izzo et al. (2020) conceptualized the "SDG disclosure index" and the "SDG compliance index" for this purpose.

3. Methods and Data

3.1. The Case Study

The Nitra pilot area is highly diverse, encompassing a peripheral residential neighborhood (Dražovce) with a significant marginalized Roma minority community, an industrial park, a cultural and community outdoor center (Hidepark), the largest urban green space (City Park), and the corridor connecting these spaces (the newly built bike-path and Nitra River; Figure 1). This area presents challenges and opportunities for innovative redesign of public and semi-public spaces. Nitra, the fifth-largest city in Slovakia, with 78,489 inhabitants (2021 population census), is considered an important growth pole in the regional context, significantly enlarged in the previous socialist regime during planned urbanization processes through the development of satellite housing estates and the incorporation of villages into the city (Ira & Boltižiar, 2021). This included incorporating villages—like Dražovce (the residential part of the pilot area)—which retained rural characteristics and now face physical and social isolation due to industrial expansion. Dražovce hosts one of Nitra's largest Roma communities, experiencing spatial segregation, poor living standards, and underfunded public services, such as a Roma-dominated elementary school lacking basic facilities.

Nitra's industrial growth, fueled by foreign investment, has drawn a diverse immigrant population and, recently, Ukrainian refugees, creating additional pressure on infrastructure, housing, and public services (Filipec & Vargová, 2019; Moroń et al., 2024). Vulnerable groups often frequent public spaces like City Park (managed by the municipal office) and Hidepark (a grassroots cultural and community hub revitalized from a former landfill). While offering safe spaces for social interaction, Hidepark faces infrastructural limitations exacerbated by the high demand from the refugee community.

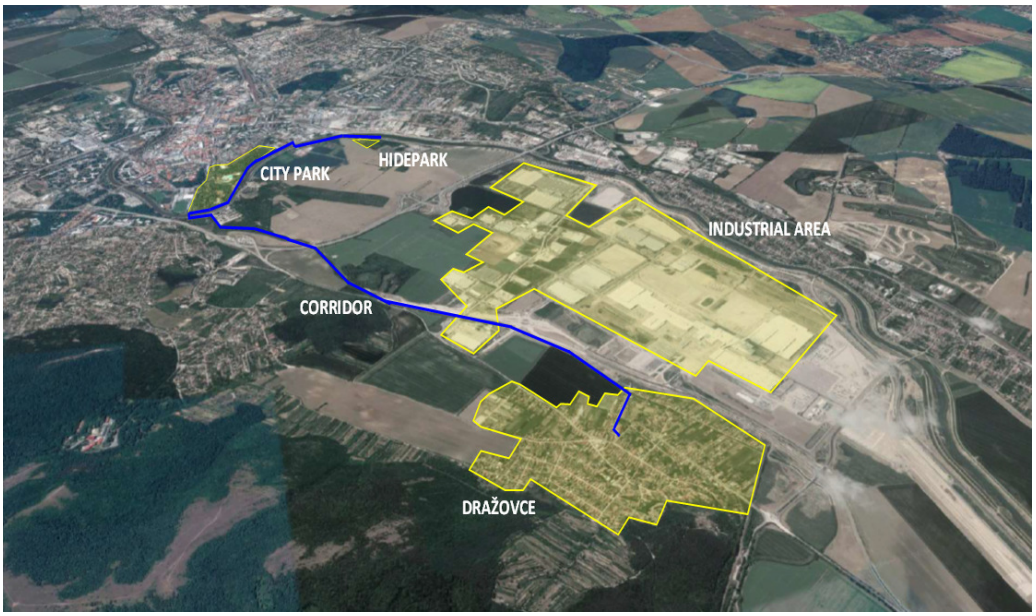

Figure 1. IN-HABIT pilot area in Nitra (Slovakia), based on imagery from Google Earth.

In Nitra's case, the undervalued resources that are the building blocks of innovative solutions of the IN-HABIT project are art and environment. Hence, most solutions combine NbS and cultural and social innovations. They are implemented in public and semi-public spaces to improve healthy lifestyles, social inclusion, and cohesion by redesigning specific urban areas to encourage active living and social interaction and create safe, accessible public spaces. In each city, three local project partners lead the process: a university, a local public authority, and a non-governmental partner.

Piloting different co-design methodologies in urban interventions is important to the local context. Schöffel et al. (2014) identify Slovakia-specific challenges in managing participatory processes that stem primarily from its post-socialist context, which lacks a strong tradition of participatory planning. According to the authors, this historical backdrop often leads to skepticism or resistance from both the public and the authorities regarding inclusive approaches. At the same time, the institutional frameworks in place are frequently rigid and do not adequately support participatory methods, with bureaucratic hurdles impeding the integration of public input. Furthermore, public awareness about the importance of participation in planning remains low, and diverse and sometimes conflicting stakeholders' interests in urban areas necessitate skilled facilitation, which is often lacking. However, Slovakia's urban development has undergone significant transformations since its integration into the European Union, with substantial decentralization efforts and a shift toward multilevel polycentric governance (Finka & Husár, 2021). The latest key step in this process was the adoption of the Urban Development Policy of the Slovak Republic by 2030 (Ministry of Transport and Construction of the Slovak Republic, 2019), which outlines a framework for fostering sustainable and inclusive urban environments, emphasizing strategic decision-making, integrated approaches, and collaboration across hierarchical and sectoral boundaries. Although it does not mention "co-design" as a specific method, it highlights the role of cities as economic and societal growth engines while addressing challenges like suburbanization, social inequality, and environmental impacts, while participatory planning is one of the pathways to do so. This connection within Slovakia's urban planning regulatory framework lends further legitimacy to the use of an SDG-based evaluation framework for the co-design process.

The participatory planning framework implemented in each IN-HABIT pilot city was based on polycentric governance principles and the concept of public–private–people partnerships (PPPPs; Majamaa, 2008; Maraña et al., 2020) to create a more inclusive governance structure. In Nitra's case, the IN-HABIT project brings together relevant actors from different stakeholder groups: vulnerable populations (primarily ethnic minorities, migrants, and refugees, but also persons with disabilities, children, the LGBTQI+ community, etc.); relevant institutional stakeholders (public sector authorities having jurisdiction in different parts of the pilot area or thematic field of intervention; civic sector organizations operating within the pilot area, at the city level and also working with or representing various disadvantaged or interest groups); and groups of specific user profiles (e.g., cyclists, fishermen, visitors, employees of the industrial park). The key milestone in this process was the establishment of four local "IN-HUBs" in each city:

> [An IN-HUB is] a laboratory of social innovation where people coming from different public and private organizations or as individual citizens work together for social change. It is a networking strategy for the enhancement of cooperation aimed at the co-design and co-management of spaces and a platform for structural dialogue and collaboration. IN-HUBs are both physical places for meeting and sharing, and organizational structures to facilitate the transformative process. (IN-HABIT, n.d.)

3.2. Data and Methods

The literature background was compiled using a narrative approach. We filtered the available literature of both Scopus and Web of Science, which led to the identification of a low number of available documents concerning the novelty of the topic (consider that searching for the terms "co-design" and "sustainable development goals" within the title, keywords, and abstract of documents provided only 26 records within the Scopus database, and the majority were out of our research framework scope). Thus, we manually searched these databases to identify (a) studies evaluating the co-design process, (b) studies focusing on linking urban design project outcomes with SDGs, and (c) studies proposing the use of SDGs as the basis for outcome measurement methodology. Results presented in this article were obtained through a questionnaire survey and interviews of three groups of participants of the co-design process: co-design process facilitators; experts, urban planners, and policymakers involved; and representatives of the target groups and other stakeholders.

The first set of respondents (N = 52) was given a short semi-structured questionnaire consisting of three sections. The first inquired about their basic demographic characteristics, role in the process, and stakeholder profile (as summarized in Table 1). The second section focused on collecting information on their participation in specific activities within the first two phases of the project (co-design and co-deployment) and participation in other activities. The final section was devoted to a short evaluation of the process.

Based on the responses of the first set of respondents, 24 key informants were selected from those reporting a higher degree of involvement in the co-design stage of the process. They were asked to fill out an additional questionnaire and rate the extent to which they agree that the planning process of the IN-HABIT project and co-designed solutions contributed or will contribute to relevant targets of select SGDs at the local level. They rated the statements on a scale from 0 to 5, where 0 = *strongly disagree* and 5 = *strongly agree*. They were grouped into four thematic focus groups of outcomes: (a) sustainable cities; (b) sustainable growth and resource stewardship; (c) equity, empowerment, and inclusion; and (d) inclusive governance.

Table 1. Characteristics of study participants.

Stakeholder type	All respondents ($N = 52$)	Key informants ($N = 24$)
Co-design process facilitators	5	5
Experts, policymakers, urban planners	9	7
Target groups (individual and institutional representatives)	38	12
Stakeholders' location of interest within the pilot area	**All respondents ($N = 52$)**	**Key informants ($N = 24$)**
Residential district Dražovce	10	7
Industrial Park North	2	2
Cultural and community center Hidepark	45	21
City Park	39	18
River and cyclo-corridor	38	20
Stakeholders' involvement in the process as…	**All respondents ($N = 52$)**	**Key informants ($N = 24$)**
Representative of institutions, groups of stakeholders	16	11
Individual	38	18
Expert	9	7
Subcontractor	4	3
Indirectly, as a visitor and/or participant of activities	5	1
Stakeholders' affiliation with target groups	**All respondents ($N = 52$)**	**Key informants ($N = 24$)**
Families	15	8
Students	16	2
Migrants and refugees	9	4
Elderly	5	3
Persons with disabilities	5	3
Cyclists	14	9
Roma community	2	1
Persons living alone	8	5
LGBTGQI+	6	3
None	3	2
Gender	**All respondents ($N = 52$)**	**Key informants ($N = 24$)**
Female	30	14
Male	21	9
Prefer not to say	1	1
Age	**All respondents ($N = 52$)**	**Key informants ($N = 24$)**
18–25	12	1
26–35	16	11
36–55	18	8
56–65	3	1
66+	3	3

Table 2 introduces the proposed SDG-based evaluation framework, listing select SDGs and specific targets corresponding to the four thematic groups. The selection of SDGs and targets to include in the framework was informed by several considerations. First, the grant agreement of the IN-HABIT project already lists a set of SDGs that the project commits to contribute to and a description of the expected outcome. The key one listed in the grant agreement is SDG 11—Sustainable Cities and Communities—while the rest are secondary. These were supplemented by additional SDGs, most notably SDG 10, where we can expect contributions primarily due to the focus of the Nitra pilot on specific vulnerable populations (Roma ethnic community, Ukrainian refugees, economic migrants, etc.). Additional targets were included that are also Nitra specific, e.g., 11.a—strengthening economic, social, and environmental links between urban, peri-urban, and rural areas—the argument for inclusion stemming from the peri-urban, or transitional character of the pilot area. We also consider SDG 16—Peace, Justice, and Strong Institution—and SD17—Partnerships for the Goals—which can benefit from the co-design as a process.

After completion of the quantitative evaluation, the 15 most involved key informants were selected for an in-depth interview: all five co-design process facilitators, three experts, policymakers, and urban planners, and seven representatives of target groups and community stakeholders.

Table 2. SDG-based evaluation framework aligned with the IN-HABIT project and Nitra pilot.

SDGs-based evaluation framework aligned with the IN-HABIT project			Rationale for goal/target consideration		
Thematic focus	SDGs	SDG targets/evaluation scales	Expected contribution per grant agreement	Linked to objectives and solutions of Nitra pilot	Linked to the co-design process
Sustainable cities	SDG 11: Sustainable Cities and Communities	(11.3) Enhancing inclusive and sustainable urbanization and planning	x		x
		(11.4) Protecting and safeguarding cultural and natural heritage	x	x	
		(11.6) Reducing the environmental impact of cities, air quality, and waste management	x	x	
		(11.7) Providing access to safe, inclusive, and accessible green and public spaces	x	x	
		(11.a) Strengthening econ., soc., envir. links between urban, peri-urban, and rural areas		x	
Sustainable growth and resource stewardship	SDG 12: Responsible Consumption and Production	(12.2) Promoting sustainable management and efficient use of natural resources	x	x	
		(12.5) Substantially reducing waste generation through prevention, recycling, and reuse	x	x	
		(12.7) Adopting sustainable public procurement practices	x		
		(12.8) Raising awareness for sustainable development and lifestyles	x	x	
	SDG 8: Decent Work and Economic Growth	(8.3) Supporting job creation, creativity, innovation, and entrepreneurship	x		

Table 2. (Cont.) SDG-based evaluation framework aligned with the IN-HABIT project and Nitra pilot.

SDGs-based evaluation framework aligned with the IN-HABIT project			Rationale for goal/target consideration		
Thematic focus	SDGs	SDG targets/evaluation scales	Expected contribution per grant agreement	Linked to objectives and solutions of Nitra pilot	Linked to the co-design process
Equity, empowerment, and inclusion	SDG 4: Quality Education	(4.7) Promoting education for sustainable development and global citizenship	x	x	x
	SDG 5: Gender Equality	(5.5) Ensuring women's participation and equal opportunities in leadership	x		
	SDG 10: Reduced Inequality	(10.2) Promoting social, economic, and political inclusion for all		x	x
		(10.3) Ensuring equal opportunities and reducing inequalities of outcome		x	
		(10.7) Facilitating safe and responsible migration and mobility of people		x	
Inclusive governance	SDG 16: Peace, Justice, and Strong Institutions	(16.6) Developing effective, accountable, and transparent institutions			x
		(16.7) Ensuring inclusive and participatory decision-making at all levels			x
	SDG 17: Partnerships for the Goals	(17.16) Fostering multi-stakeholder partnerships to support SDG achievement			x
		(17.17) Encouraging public, private, and civil society partnerships		x	x
		(17.9) Enhancing international support for capacity-building			x

4. Results

4.1. The IN-HABIT Co-Design Process in Nitra

The process began with extensive stakeholder mapping and engagement efforts in the pilot city, followed by capacity-building activities for community activators who facilitated the project. These community activators, trained through sessions led by transversal project partners, were responsible for coordinating the co-design process and engaging local target groups. After Nitra's IN-HUB was established, specific activities included the initial co-design workshop, where participants identified key locations in the pilot area for development, and a transect walk to assess these sites. The project also piloted the IN-HABIT Co-Design Atelier. In this elective university course, students conducted field research and co-developed some of the solutions for urban spaces and technical documentation based on inputs from the IN-HUB. These activities aimed to identify and implement interventions such as a community kitchen, a community and experimental garden, and therapeutic urban picnic meadows. Additional workshops were conducted to engage specific communities, such as the Roma community in Dražovce, through activities like art therapy and landscape architecture workshops in the local segregated school. The project also included the Mindset Change workshop, which trained local educators in the Design for Change methodology to equip them for the co-design process. The co-design process concluded with validation meetings to align proposed interventions with city policies, followed by developing technical specifications and budget allocations again with the help of the Co-Design Atelier. Figure 2 illustrates some of these activities.

Within the pilot area, the Hidepark location proposed a community kitchen, an experimental garden, and a DIY workshop. The Dražovce residential district focused on revitalizing an elementary school yard to create an outdoor education space to attract residents beyond the Roma community. A cycling corridor that connects

Figure 2. Co-design activities in the Nitra pilot. Source: IN-HABIT (n.d.).

these spaces would feature reversible urban furniture and art installations. Additionally, two experimental and therapeutic urban picnic meadows were planned. These initiatives would be supported by training in urban gardening, culinary events, therapy gardening, vocational training, and cultural and art activities.

4.2. Co-Design Activities and Their Contribution to Select SDGs

As is evident from the questionnaire survey results (Table 3), different stakeholders were involved in the co-design process in different stages and through different means. Most participated in general planning meetings and workshops organized within IN-HUB, held onsite at the public spaces being addressed, and in various other thematic workshops and educational activities. Most co-design activities also served multiple purposes. In some instances, incidental, unplanned results emerged. For example, additional data was collected during certain educational activities, capacity-building activities for the representatives of local target groups, during workshops with expert panels, and the pilot of participatory site-specific art residency.

To analyze the subjective perception of the contribution of listed co-design modes, the overall scores for each SDG group were obtained by adding up each participant's grading of individual targets (see Section 3.2). The final quantified contribution indicator can take values ranging from 0 to 25. The difference in subjective perception of contribution indicated in Table 3 represents a difference in the median perceived contribution of those who participated in a given co-design activity versus those who did not. In the case of primary data collection activities, we can observe that those participating in more innovative or participatory ones (transect walks, behavioral games) consider the entire process more beneficial towards advancement across almost all groups of SDGs analyzed. However, those engaged in the analytical fieldwork primarily focused on traditional data collection consistently scored the process contribution lower across all SDG groups. On the other hand, this does not seem to carry over to the planning stage of the process as participants who engaged in co-design workshops directly in public green spaces that were being redesigned scored the contribution to sustainable growth and resource stewardship significantly lower and SDGs targeting equality and education moderately lower than the rest of the interviewed. They had a slightly more positive view of the contribution to sustainable cities and communities. Surprisingly, similar views can be identified within a group participating in co-design workshops in the community garden, with moderately lower scoring of targets representing inclusive governance and institutional change within SDGs 16 and 17. This finding contradicts the information we obtained through an interview with the facilitator working with the gardeners and managing the garden:

> In the garden, people became closer because of the interventions. As they prepared it and dismantled everything, people came together and wanted to make some change. As the garden expanded, they helped clean it up because they wanted it to be for more people so that more people would participate in creating edible greenery. And then, gradually, as they also attended the workshops, they educated themselves and then applied it in their small plots, these small green solutions like using renewable resources and waste materials. (Facilitator interview, 2024)

The contribution of the IN-HABIT co-design process to the SDGs pertaining to reducing inequality was also seen significantly more unfavorably in the groups of participants that attended meetings with expert panels. One of the reasons can be found in an interview with a representative of the Dražovce community:

Table 3. IN-HABIT co-design methods, their purpose, participant involvement, and perception of contribution to select SDGs.

IN-HABIT co-design methods, activities, and processes	No. of participants involved		Purpose of activity					Difference between the median overall scores of the SDG groups between participants and non-participants			
	All respondents (N = 52)	Key informants (N = 24)	Data collection	Capacity-building	Planning and making decisions	Co-design in situ	Co-deployment of interventions	Inclusive governance	Equity, empowerment, and inclusion	Sustainable cities	Sustainable growth and resource stewardship
Analytical fieldwork (atelier, data collection, evaluation)	8	6	xxx					–1.5	–2	–0.5	–1
Behavioural games	14	9	xxx					3	2	2	2
Analytical and planning meetings with an expert panel	12	9	xx	x	xxx			1	–4	0	0
IN-HUB planning and co-design meetings	22	19			xxx			3	3	2	0
Interactive corridor transect walk	10	9	xxx			xx		1	3	1	0
Co-design workshops in green public spaces	18	15			xxx	xxx		0	–1	1	–4
Co-design workshops at Dražovce Elementary School	8	6		xxx	xx	xx	xx	1	2	0	0
Co-design of specific solutions with individual stakeholders	12	11			xx	x		1	3	–1	1
Design for Change workshops	4	4		xxx				1	2	1	1
Other workshops and educational activities	22	16	x	xxx		xx	xx	4	7	0	4.5
Community garden workshops	13	8		xx	xx	xxx	xxx	–1	0.5	0	–0.5
Participatory site-specific art residency	11	10		x	xx	xxx	xxx	4.5	2.5	1.5	1.5

Notes: xxx = primary purpose; xx = secondary purpose; x = incidental.

> That rhetoric should be, basically, plain. Because using scientific words did not work. Here, it is important to choose a simple language. And simple and constructive, what they will get out of it. (Target group representative interview, 2024)

Overall, we can observe the most positive impact on participants' subjective perception of the advancement of analyzed SDGs with their involvement in capacity-building activities, whether the capacity-building was their primary or secondary purpose. This also holds, albeit to a lesser extent, concerning those who participated in activities that merged co-design and co-deployment of real physical solutions. The highest positive impact can be seen with participation in training workshops, educational activities, and the site-specific art residency. This was also reflected in the sentiments of all groups of stakeholders in the process of interviews:

> You see, participation naturally carries with it another significant outcome, which is precisely the education of the community…for example, regarding the meadow in the floodplain, the solution and the technical side of the solution were really demanding and still are. (Facilitator interview, 2024)

> One of the most important points is the education about the need to approach public spaces in this way. (Facilitator interview, 2024)

> And that is why I really thought that when something is realized, it should be tangible, they should see that yes, it was not just promised, but it actually happened. (Target group interview, 2024)

> It is, for example, important to have a budget for prototyping and experimenting with these solutions. If we want to introduce participatory methods…it is good to have external resources to kickstart it through them. (Interview with public authority representative, 2024)

4.3. Stakeholders' Evaluation of the Contribution of the IN-HABIT Co-Design Process to Specific Targets of Select SDGs

To better understand the mechanisms of how the IN-HABIT project's approach did or could potentially advance the select SDGs, we compared the individual scoring of specific chosen targets by different stakeholder types involved in the co-design process. The following analyses illustrate the scoring of individual targets corresponding to the four thematic groups of SDGs across three groups of stakeholders. Box plots are used to visualize the average score and the variability in the scores, illustrating the degree of agreement among individual stakeholders regarding the perceived contribution of the process to different SDG groups. Figure 3 depicts the assessment of contribution towards the "Sustainable cities" thematic focus.

The contribution to the "Sustainable Cities and Communities" goal was perceived as less significant by process facilitators, experts, and policymakers than by community representatives. What they mostly agreed on is a significant contribution to the safety, inclusiveness, and accessibility of public green spaces, which is one of the key objectives of Nitra's pilot and also came up in interviews with policy representatives:

> Even public spaces are coming to life. We can see it, whether it is the park, Hidepark, or those unused spaces that were suddenly filled with life. The community is starting to use them; they are becoming part of the city's life. (Policy representative interview, 2024)

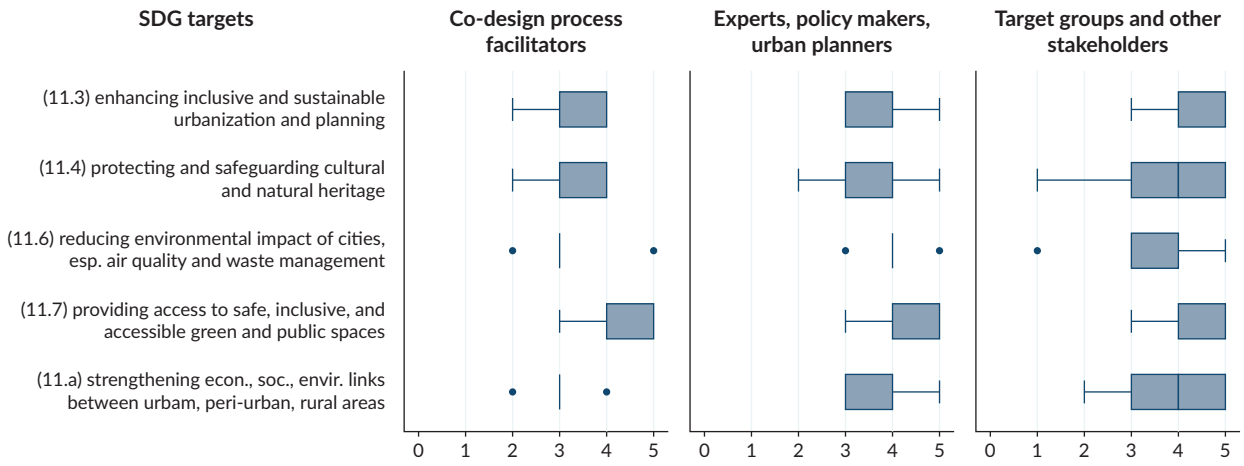

Figure 3. Evaluation of the IN-HABIT co-design process contribution to the "Sustainable Cities" thematic focus.

On the other side of the spectrum, they also seem to be more in agreement with each other regarding a lesser contribution to reducing the environmental impact of the cities (relative to other targets in this group). The opinions of community members varied most regarding whether the approach could help protect cultural and natural heritage and whether it could strengthen the economic, social, and environmental links between urban, peri-urban, and rural areas. Some of these findings are explained by one of the interviewed community representatives as follows:

> When you plan something, anything, and it should somehow contribute to, for example, green interventions, that is in the hands of people at higher levels of leadership. The fact that we meet as a community group or do some participatory planning, I think will not influence that. However, just from the principle that when something is done in a participatory manner, the community is more connected to it…it is somehow more connected with local thinking and awareness. Moreover, people are more interested in the sustainable maintenance of their locality and community. (Target group representative interview, 2024)

Their subjective perception was different from the opinions of facilitators and experts in their contribution to inclusive and sustainable urbanization and planning. More pessimistic facilitators and local public authority representatives explain:

> It is an innovative methodology and something that we are introducing on a smaller scale; it seems to me that it will not change such rigid institutions as the city because, for formal institutions, the project is short. It is necessary to either ensure the continuation of the next Horizon, which would bind us to that, or to ensure the project's sustainability through implementation through the city so that it expands more broadly. Ideally, these solutions should be long-term. Although this project spans five years, it may need to continue with another Horizon project to become more anchored here. (Public authority representative interview, 2024)

This notion of building on these experiences in subsequent projects and initiatives to ensure the effective integration of participatory methods into urban planning also resonated with facilitators:

> But I have more of a feeling that within this project, we were dealing with the basics of how such mechanisms work or do not work. I think it has contributed more to improving these processes for future projects. (Facilitator interview, 2024)

Based on Figure 4, we can see that stakeholders involved in the process view it as slightly more impactful towards the institutional change in inclusive governance than the previous thematic focus. Co-design process facilitators seem to be the ones who were less optimistic overall. In their words:

> What I think we were very successful in was supporting partnerships among various NGO stakeholders; those partnerships have been strengthened. But I think that residents are definitely not used to it….I think the biggest barrier is the expectation that the participatory process itself will solve a problem. However, it cannot solve the problem without their direct involvement. (Facilitator interview, 2024)

> There was always the expectation that we would be the ones who would eliminate or solve the problem that had been there for 20 or 30 years. There is also a certain degree of expectation that some communities have and quite a few misconceptions about what all the other sectors should solve for the residents. (Facilitator interview, 2024)

Representatives of the target groups and local community rated the co-design process as having great potential to advance most of the targets but with some variability of perceptions regarding the contribution to the inclusiveness of decision-making on all levels and in PPPPs. On the other hand, experts mostly agreed about the process's strong positive impact on encouraging PPPPs. However, they could not agree on the contribution towards making local institutions effective, accountable, and transparent and ensuring inclusive and participatory decision-making at all levels. According to a local public sector representative, the issue is specifically with the "at all levels" part:

> Collaborations that are happening horizontally, because Nitra is not a big city, and more or less the organizations that exist here, we know each other. So, I see that as good. I see more bureaucratic

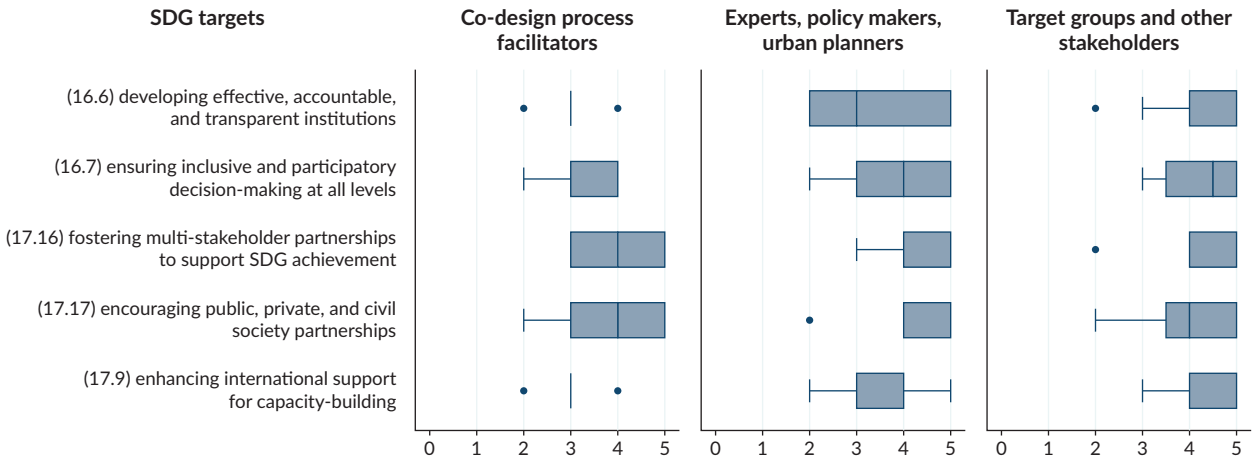

Figure 4. Evaluation of the IN-HABIT co-design process contribution to the "Inclusive Governance" thematic focus.

> obstacles between formal institutions that are vertical. It is worse, the cooperation at the level of state institutions. (Public authority representative interview, 2024)

Interviews with multiple participants from all stakeholder groups revealed a prevalent theme regarding barriers to promoting community participation in urban planning: mistrust, which seemed to run in all directions. This included mistrust from people toward formal institutions, from public authorities toward citizens, and even among people themselves, as illustrated by the following responses:

> There was a significant reluctance to participate in some communities, with many people feeling that their input would not matter or that they were not relevant players in the process. (Facilitator interview, 2024)

> There is significant mistrust in institutions, and many community members do not believe that their participation will lead to real change due to past experiences where promises were not fulfilled. (Facilitator interview, 2024)

> No matter how reasonable, willing the people that represent these institutions are, there are still those barriers of processes that cannot be overcome at all. (Facilitator interview, 2024)

> They lack trust in people and do not believe they can take care of these interventions and see them through. There are doubts, not only about inviting citizens to a participatory meeting but also about not giving them the tools to really participate and implement these solutions. However, they would need guidance, especially when it is their first project; they definitely need facilitators. You need people for that. (Facilitator interview, 2024)

Regarding the contribution towards gender equality targets, quality education, and reducing inequalities (Figure 5), we again observe differing evaluations in the expert group. Even though they agree that the process promotes inclusion for all, they do not agree on its impact on promoting women's participation in decision-making and leadership. Conversely, the community representatives seem to agree that it

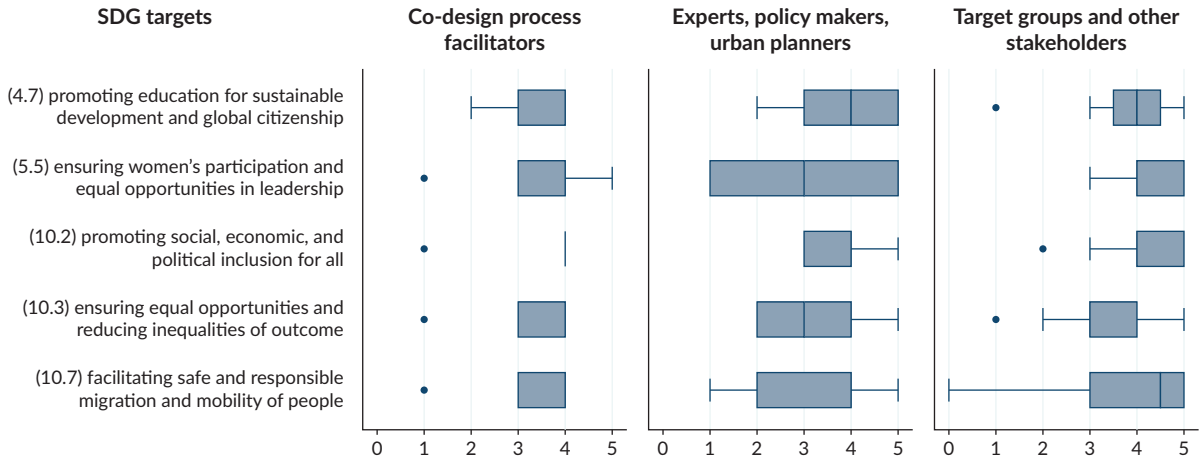

Figure 5. Evaluation of the IN-HABIT co-design process contribution to the "Equity, Empowerment, and Inclusion" thematic focus.

significantly contributed to this target and inclusion in general. Facilitators rated all targets slightly above average. Migrants and refugees represent one of the key target groups of the project, and the positive impact it has on some of those involved can be observed through one of the interviews with a person from the Ukrainian refugee community involved not only in planning but also volunteer activities in implementing the co-designed solutions:

> Before, I perceived Slovakia and Nitra completely differently. Because, truthfully, I never felt such communication, such help, such…understanding, perhaps. You see, after the injury, it is not just about not having arms; it is about the psychological state. That is why every job that involved people from Hidepark and every activity helped me. It was like psychological rehabilitation. (Target group representative interview, 2024)

Overall, education in the context of advancing sustainable development was seen as one of the more positive outcomes to come out of the process by experts and target groups alike. According to facilitators, there is a gap in the cultural and educational background of different communities, particularly in understanding their role in participatory processes:

> In the beginning, there was a lack of basic education and awareness, and even the idea of what citizens themselves are capable of solving. (Facilitator interview, 2024)

> Through workshops and educational activities focused on sustainability topics and civic engagement, we tried to instill knowledge and skills, and we achieved something. (Facilitator interview, 2024)

The last group of SDG targets (Figure 6) is one where community representatives agreed the least regarding the impact of the co-design process they were a part of. Although experts disagree, the potential for job creation, supporting innovation, and creativity was observed by both facilitators and target group representatives as above average. Although the contribution to all targets was perceived as strong, promoting sustainable management of natural resources was not as evident. Also, while raising awareness for sustainable development was a major positive point of the process, transposing the experiences into a

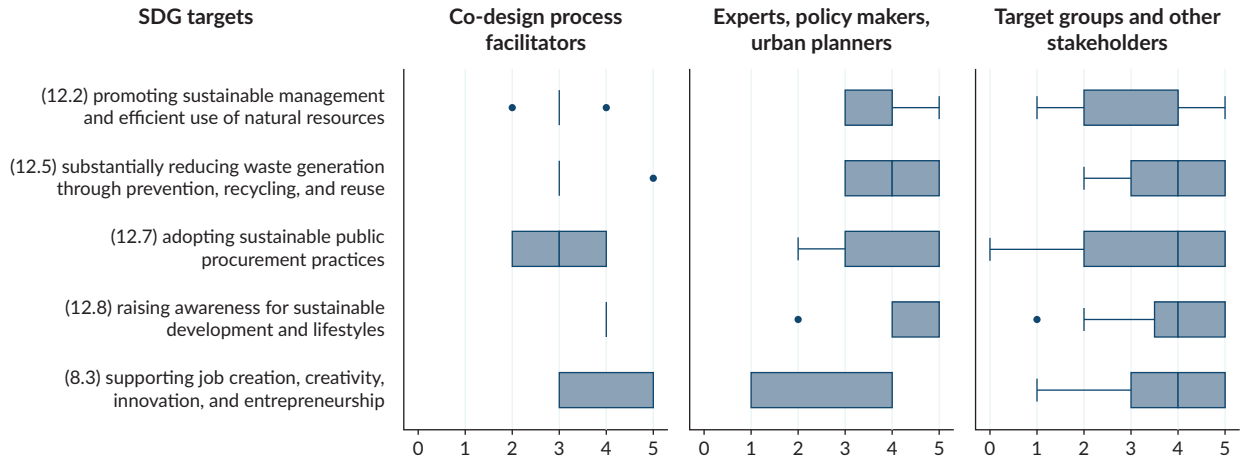

Figure 6. Evaluation of the IN-HABIT co-design process contribution to the "Sustainable Growth and Resource Stewardship" thematic focus.

more sustainable public procurement practice did not happen. The facilitators shared an example of using recycled materials in their community projects, saying:

> We used waste wood to create public park furniture, which not only reduced waste but also served as an educational tool for the community about the importance of recycling and reuse. (Facilitator interview, 2024)

The public authorities' representative was, however, skeptical about the potential of scaling up such solutions on the city level primarily due to procurement process regulations:

> The office, as a formal institution, is still bound by the threat of quite high fines from the office for public procurement, so it is more inclined to avoid these things because there is either a risk of misunderstanding or retrospective checks….Basically, the whole national legislation is set up in such a way that if you do something, you get punished, and it does not support people in finding solutions that would be ultimately more sustainable and even cost-effective. (Public authority representative interview, 2024)

Most facilitators agreed that local public authorities do not need to engage in these types of interventions themselves. It would suffice to provide physical space, sometimes facilitation if necessary, and funds through small grants, and the communities would be able to achieve this more effectively by themselves.

5. Discussion

This study contributes to the discussion on the perceived benefits of the co-design process as a participatory planning approach in the context of the SDGs (Ansell et al., 2022; Debele et al., 2023; Sharifi et al., 2024), bringing a better understanding of how different modes of involvement within co-design of innovative urban solutions shape the perception of the outcomes. The process and the outcomes are measured using the SDG-based self-evaluation framework.

Indeed, the SDGs and SDG targets proved to be a meaningful framework for evaluating local outcomes of urban design projects. The co-design of the IN-HABIT project interventions in Nitra contributed to a different degree to several SDGs (4, 5, 8, 10, 11, 12, 16, 17), indicating that interventions aimed at developing innovative, green, and inclusive public spaces in combination with participatory planning and co-design can yield wide-ranging co-benefits (Bambó Naya et al., 2023; Debele et al., 2023). The role to be played by partnerships and communities of various stakeholders at the local level in solving the "wicked problems" of the sustainable development of cities is explicitly expressed in the 17th goal of sustainable development (Mariani et al., 2022). Based on our findings, this role appears to be twofold. Firstly, our results suggest that using co-design as an urban intervention tool strengthens the contribution to SDG 17 by supporting the forming of viable active local communities and PPPPs (Avila-Garzon & Bacca-Acosta, 2024). Facilitators, experts, policymakers, and participants involved in co-designing IN-HABIT solutions agree that the co-design approach strengthened community members' sense of ownership and involvement (Debele et al., 2023; Mahmoud et al., 2022). At the same time, forming such partnerships is a decisive precondition for mobilizing local capacities and resources to deliver sustainable solutions addressing other SDGs, which means that the advancement of certain SDGs can actively support and enhance progress toward others (Bennich et al., 2023).

The study also addressed the gap in the literature concerning the differing attitudes toward project outcomes resulting from different modes and depths of participant involvement within the co-design process (Enserink et al., 2023). Previous studies concluded that participation in the co-design process, in general, increases the chance that participants can recognize the project's positive outcomes (Hughes et al., 2023), while our study showed that rather the mode and depth of the participation shape perceptions. Generally, it appears valid that those participating in more innovative participatory and co-design processes (transect walks and site-specific art residencies) consider the entire process to be more beneficial towards advancement across almost all groups of SDGs analyzed. This claim can be supported by the fact that participants engaged in the traditional analytical fieldwork and more common data collection methods consistently scored the perceived contribution lower across all SDGs. This is of importance for urban planners looking to make the process more inclusive since these traditional methods of public involvement still dominate in Slovakia (Finka & Husár, 2021; Ladzianska et al., 2019), but also in the urban planning of other post-socialist countries of Central and Eastern Europe (Poljak Istenič & Kozina, 2020).

It seems helpful to compare our study with the study of the stakeholders' perceptions in central government-led Scottish Urban Partnerships conducted by Hastings (1996) almost 30 years ago. Although these were some of the earliest partnership-based community engagement approaches in modern urban development policies, we can see clear parallels in the positions of specific stakeholders. As for our co-design process facilitators, among the public sector representatives in Hastings' study, aside from the suspicion towards the process, "there was a strongly held perception…that the Partnerships presented local authorities with the opportunity to 'educate' resident representatives" (Hastings, 1996, p. 265). Similarly, community representatives reported they had limited decision-making power within the partnership in both studies, with a relatively strong feeling of mistrust. This comparison is useful because it "calibrates" the state of preparedness of the local institutional landscape to introduce the 4P concept into urban planning procedures. Combined with hints of institutional rigidness of public sector institutions identifiable from interviews with all three groups of respondents, it suggests that as a post-socialist country, local authorities and communities in Slovakia still lack specific capacities to effectively implement PPPPs as a model to include the end-users and vulnerable communities in the co-design of public spaces. However, our study also shows that it is possible to promote capacity-building efforts on both sides through the process itself. Coupled with that, according to the public sector representatives involved in our study, continuity is crucial for the gradual transformation of public institutions to accommodate more inclusive and participatory approaches (Ng et al., 2013).

Based on participants' perceptions, results suggest that the co-design process itself supports the achievement of SDGs at the local level through capacity-building activities, strengthening of the sense of community cohesion, and awareness of sustainable practices. However, if the co-design process is to be a source of sustainable change in itself, it requires well-thought-out communication, avoiding the use of technical language (Carra et al., 2018), sensitive facilitation that leads to building trust and a more accommodating learning environment between experts and target groups, and ensuring multi-stage involvement of participants, whose "degree of participation" (Martínez, 2011) will potentially affect the perception of the outcomes (Enserink et al., 2023)—especially methods where co-design is merged with implementation, like in the case of participatory site-specific art residencies.

However, this study is not without limitations. Our sample of participants may not fully capture the diversity of opinions within the community, limiting the generalizability of the findings to broader urban contexts. The subjective nature of stakeholder evaluations introduces potential bias, as perceptions could be influenced by personal experiences or predispositions toward the project, its facilitators, or their subjective attitudes toward individual SDGs (Bautista-Puig et al., 2024). While providing valuable insights, qualitative data may lack the objectivity offered by quantitative measures, potentially impacting the robustness of the conclusions drawn about the project's effectiveness in advancing SDG-related targets. Another limitation is the relatively short project timeline, which may not be sufficient for fully embedding changes in institutional practices or ensuring the sustainability of the interventions.

There are also limitations to the transferability of the knowledge and the policy implications to other local and national contexts. They may be more beneficial to other post-socialist and low-trust settings, where institutional capacity and public participation are still evolving, but less informative in other settings. The context may also change the validity of findings regarding the effectiveness of specific co-design tools and methods analyzed here. This is why, in further research, it would be beneficial to conduct comparative studies between cities with different socio-political backgrounds, which could provide insights into the adaptability of these methods and the conditions needed to ensure their success across diverse urban contexts. Another important research direction should involve developing more robust frameworks for evaluating the effectiveness of participatory processes in general and advancing local SDGs in particular (Avila-Garzon & Bacca-Acosta, 2024).

6. Conclusions

The study provides insights into the process and challenges of implementing participatory co-design processes in urban planning. While the project successfully engaged a diverse range of stakeholders, including marginalized communities, the outcomes reveal both strengths and limitations of the approach. On the positive side, the project contributed to a sense of ownership and involvement among community members, particularly through capacity-building activities and direct engagement in the co-deployment of interventions. These aspects were positively received and contributed to greater community cohesion and awareness of sustainable practices. However, the results also highlight significant challenges. There were notable differences in how different stakeholders perceived the contribution of the co-design process to specific SDGs. Despite efforts to engage participants, some stakeholders remained skeptical, particularly regarding the integration of participatory methods into formal urban planning processes. A recurring theme of mistrust between the community and formal institutions hampered the project's collaborative potential.

Overall, while the IN-HABIT project in Nitra made advancements toward creating more inclusive and sustainable urban spaces, the results underscore the need for more tailored and context-sensitive approaches in participatory urban planning. The challenges highlight the importance of addressing communication barriers, building trust, and ensuring that participatory processes are genuinely inclusive and capable of influencing formal planning decisions. These lessons are crucial for future projects aiming to achieve similar goals. What we can learn from the IN-HABIT approach is that proper and inclusive capacity-building and creating room for prototyping and experimenting can help bridge this gap.

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Conflict of Interests

The authors declare no conflict of interests.

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