

Urban Living Labs as an innovative tool for achieving the Sustainable Development Goals? Evidence from Poland

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ABSTRACT: The aim of the article is to analyse the activities of Urban Living Labs (ULL) in Poland from the perspective of supporting the realization of sustainable development goals at the local level. The article is based on an analysis of Internet materials (1,907 research units from social media and websites) of Polish Urban Labs on various types of activities they perform. The analysis of the materials helped to assess the way in which Sustainable Development Goals (SDGs) concepts are implemented as part of the urban innovations developed at Urban Labs. It helped to identify the most important directions of SDG implementation, as well as to propose a typology of urban labs in this regard. The main conclusions of the research concern the different strategies for concentrating ULL activities around the SDGs, as well as the emergence of three speeds of ULL in terms of their involvement in SDG implementation. The “great absentee,” i.e. the undervaluing of sustainable energy topics in ULL activities in Poland, was also revealed.

KEYWORDS: Urban lab, urban living lab, living lab, sustainable development, sustainable development goals, urban development

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1. INTRODUCTION

Sustainable Development (SD) constitutes the current paradigm for global change in the urban environment (UN HABITAT, 2019). In this article, we look at the local implementation of the Sustainable Development Goals (SDGs) (United Nations General Assembly, 2015) in cities from the perspective of the innovative urban stakeholder collaboration formula of Urban (Living) Labs (ULL). As there is a plethora of terms used to describe the instrument of urban labs (urban lab, urban living lab, living lab, city lab, smart lab, etc.) and two types of names tend to be the most popular, we decided to use a cluster of words in the title, referring the concept of “lab” to both the “urban” and “living” categories (which we write about in more detail in the section: Literature review).

The aim of the article is to assess the phenomenon of ULL activity in relation to SDGs implementation. We examine which SDGs are present in their agendas, which are of the greatest and least importance. We look for a typology of ULLs in relation to the issue at hand. What distinguishes our analysis from the existing studies is that our analysis refers to a comprehensive assessment of ULL activities, and not - as is often

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the case - selected activities promoted as good practices. We sought answers to the following research questions:

- Which SDGs are implemented in the framework of ULL activities in Poland?
- Which SDGs are overlooked in the framework of ULL activities in Poland?
- Are there specific types/strategies of ULL in Poland in the context of SDG implementation?

For the purposes of this article, we adopt the widespread view in the field literature that urban (living) lab itself - as a collaborative formula - is a local innovation that can cause further growth of innovative solutions and ideas (Cosgrave, Arbuthnot & Tryfonas, 2013; Kopycinski, 2018; Scozzi, Bellantuono & Pontandolfo, 2017). What do we mean when we discuss innovation in the context of ULL? In line with the literature, we assume that, broadly speaking, three types of activities can be considered to meet the prerequisites for innovation: introducing a new product or process (and improving it), defining and redefining the position of an organization or product/service, and defining or redefining the dominant paradigm of an organization (Mayle, 2006). When implementing this typology to ULL's activities in Poland, it is important to keep in mind that the category of "organization" covers both the structures/team of an ULL, as well as the individual groups involved in its activities. Thus, Urban labs can be seen as networks of inclusive innovation, shaped by the roles of individual stakeholders (Nystroma et al., 2014).

Innovation within the ULL formula should be understood not as a linear trajectory, but rather in terms of a collaborative network involving a web of multiple actors. The dynamics within these networks are illustrated by the quadruple helix model involving the business sector, higher education and research entities, public authorities and the society working together to generate new knowledge, solutions, technologies, products and services (Etzkowitz & Leydesdorff, 1998; Carayannis & Campbell, 2009; Arnkil et al., 2010; Schütz, Heidingsfelder & Schraudner, 2019; Cavallini et al., 2016). At the same time, we are aware of the limitations of this approach due to the deficit of analyses and research approaches that systematically measure the effectiveness of ULLs (Paskaleva & Cooper, 2021) and confirm their actual "innovation."

The quadruple helix theory with regard to the creation of innovative solutions in the city, including in the ULL formula, is further developed through the concept of the quintuple helix, as described by Carayannis et al. (2012), and with regard to social innovation in urban environments, also by Calzada (2020) and Piziak et al. (2022). The latter recognize two independent elements in the collective and simplifying category of "society," i.e. "residents" and "NGOs." It is a major distinction because of the highly important role in the creation of innovative solutions in cities both by two types of actors - individuals and social entrepreneurs (who do not identify themselves with any organization) on the one hand, and representatives of NGOs (who in many cases are the leaders of innovative projects) on the other hand.

While undertaking the study of ULLs, we noted their one specific condition, related to their focus on the quality of life and the needs of residents. "(...) in research on ULL, it is important to emphasize their role as entities responsible for implementing urban innovations, understood as new concepts, ideas and solutions that contribute to improving the quality of life for residents. Urban (living) labs have a profound impact on urban innovation by integrating citizen input and real-world testing into the innovation process. They contribute to the creation of smart cities, enhance service delivery, and improve urban living conditions. By fostering a collaborative environment, living labs help cities become more responsive to the needs of their residents, driving sustainable growth and development" (Arslan, 2022). Placing the "needs of residents" and their quality of life at the center of ULLs' activities has potential implications on how the SDGs are implemented.

2. LITERATURE REVIEW

2.1. Urban Living Lab – characteristics of the phenomenon

Although there is no uniform definition of *urban (living) lab* in the literature, its conceptual roots are shared with *living labs*. These, in turn, are defined as participatory platforms created for open innovation, which support experimentation and testing of solutions by users in real-world conditions (Voytenko et al., 2016). A similar approach is also found in publications by other authors. "Living labs are recognized as progressive platforms for fostering innovation and strengthening collaborative partnerships from bottom-

up" (Molnar et al., 2023; Priday & Pedell, 2017; Westerlund, Leminen & Habib, 2018; Compagnucci et al., 2021).

In the case of ULL, the definitions are definitely broader. Y. Voytenko et al. (2016) defines them as "a form of collective urban governance and experimentation to address the challenges of SD and the opportunities created by urbanization. Urban living labs have different goals, are initiated by different actors, and create different types of partnerships (...) Urban labs are a form of experimental governance in which urban stakeholders design, develop and test new technologies, products and services to develop innovative solutions to problems, such as those related to climate change." In a similar vein, Tukiainen et al. (2015) defined ULL as a system, constructed so that it can be used to experiment and co-create with the user the solutions of which the user will be the consumer. In addition, ULL refers to a system in which end users, together with various types of entities, including researchers, companies and public institutions, jointly research, design and approve new innovative products, services and solutions of which they are to be the intended consumers. This approach to terminological issues is also shared by Polish authors, who were the first to attempt to define the phenomenon, adapting the definition of ULL to the socio-economic conditions of Central and Eastern Europe. In a publication by M. Bień et al. (2020) ULL was defined as an instrument (organization and physical space - office and/or part of the city selected for testing selected solutions) of cooperation between city authorities and residents (including, in particular, those represented by non-governmental organizations), businesses (from local micro-enterprises to global corporations) and scientific entities (universities, scientific and research units, experts), aimed at improving the quality of life of residents through innovative solutions to identified problems (initiating, testing, implementing and evaluating projects) and generating additional value using city resources.

This definition refers to the concept of creating innovation ecosystems, which was inspired by solutions used in the ICT world at the turn of the 20th and 21st centuries (Almirall et al., 2012; Paskaleva & Cooper, 2021). It was implemented in the framework of cooperation between academic centers and the external environment (Bajgier et al., 1991), and finally transferred to urban governance. It enables incubation, promotion and testing of new ideas for urban development (McCormick & Hartmann, 2017), as well as participatory intervention in the face of emerging challenges (Sandholz, de Carvalho Turmena, Hardoy & Almansi, 2022). The key features of ULL include: 1. geographic rootedness and dependence on the local context; 2. experimentation, testing and learning; 3. participatory nature; 4. support for responsible leadership; 5. openness to evaluation and improvement (Voytenko et al., 2016).

Urban Labs can be considered a form of experimental management in which city users design, develop and test new technologies, products and services to develop innovative solutions to urban problems and challenges (Voytenko, 2016). This experimental formula assumes the ambiguity of expected results, which affects the difficulty of assessing the effectiveness and innovation of ULL. However, the failure of experiments in this situation is inherent in the project's design, and coordination of activities can be cost- and resource-intensive (Steen & Van Bueren 2017), and maintaining a balance between stakeholders - can sometimes be difficult (Leminen, Westerlund & Nystrom, 2012; Hakkarainen & Hyysalo 2013). As a result, ULL is characterized by a high "mortality" rate (Nesti, 2015). In addition, if we agree that shortcomings and failures are part of the process of learning through innovation creation (Bień, Jarczewski & Piziak, 2020), the issue of performance measurement becomes even more complicated, as it suggests that performance evaluation - more than to the assumed "hard" outcomes" - should refer to the identification of valuable and ineffective approaches (Van Geenhuizen, 2018), to the process of learning and circulation of information on innovation implementation, and to the improvement of stakeholders' knowledge, competencies and skills for collaboration around innovation generation and implementation.

2.2. Urban Living Lab and the Sustainable Development Goals

The SDGs and Agenda 2030 have a predominantly global ambition and are targeted at policymakers representing nation-states, but with broad involvement of different types of stakeholders. The SD should be rooted in local, grassroots initiatives, which often take the form of more experimental efforts. "It is in this tension between global ambition and local necessity that living labs can play a vital bridging role (...)

The role of living labs as a contributor to the SDGs is particularly relevant through its social impact process of partnerships and innovative solution development” (Molnar et al., 2023).

Over the past few years, there has been a steadily growing interest in ULLs as a tool to support the achievement of the SDGs, such as in the context of socioeconomic development (Leal Filho et al., 2022; Rodrigues and Franco, 2018), education (Purcell et al., 2019; Findler et al., 2019;), the circular economy, urban mobility, sustainable urban planning and sustainable consumption (Sierra-Pérez & López-Forniés, 2020), and climate change challenges (Leal Filho et al., 2021). According to Compagnucci et al. (2021), ULLs as collaborative platforms can promote long-term partnerships between stakeholders, thus contributing to their effectiveness in achieving collaborative goals, particularly SDG 17 - Partnerships for the goals (Leal Filho et al., 2022). They can also facilitate the testing and scaling of various tools for SD.

It is possible to identify two main ways in which ULLs can be involved in the implementation of SD ideas. First, by implementing activities that have similar goals to the SDGs (27). Second, by contributing to SDG monitoring, reporting and dissemination. Currently, it seems that the first way is dominant in ULLs - and although their activities may lead to solutions that coincide with the achievement of the SDGs, but it is difficult to assess and parameterize (Molnar, et al., 2023). Perhaps this is the reason why urban laboratories are less active in monitoring and reporting on the SDGs.

Given the technical nature of SDG reporting, it is understandable that ULLs may not have the expertise resources to directly contribute to “hard” monitoring mechanisms. However, there are also more user-friendly monitoring tools (OECD, 2020). For example, the reporting and monitoring of local implementation of the SDGs in cities is referred to by the Voluntary Local Review - VLR initiative, which is promoted by the UN to increase the importance of local efforts to implement SDG concepts (Siragusa et al. 2022; Derner, 2022; Ruiz-Campillo & Rosas Nieva, 2022; Osman et al. 2021; Desa 2019; Andersdotter-Fabre, 2017). Although ULL's activities are sometimes shown in such reports (e.g., Hamburg), however, such mentions are found in very few such documents. It should be noted here, however, that the idea of VLR is not widespread in Poland, and according to the Online Voluntary Local Review (VLR) Lab, not a single such report has been prepared in Poland (IGES, 2024). The urban context of SDG implementation in Poland, on the other hand, is the subject of analyses prepared at the national level within the Voluntary National Review - VNR (Council of Ministers, Poland, 2023); where, however, we find no mention of the ULL phenomenon. The same is true of reporting on the subject at the European level (EU, 2023).

2.3. Selected contexts of SDG implementation at Urban Living Labs

The literature emphasizes that the practical implementation of the SDG concept is often associated with the presence of development dilemmas, which we can be considered on three levels.

1. The first level of such dilemmas is the manifestation of conflicts of interest. “While multidisciplinary urban problems often trigger transdisciplinary approaches in urban experiments, this does not necessarily lead to an integration process. Co-creation (as part of ULL's work) requires that interests and perspectives are transparent and subject to debate. If differences are not articulated openly, co-creation processes become prone to manipulation by parties (within and outside of the municipality) who want to impose their interest or perspective. Non-transparent power games are harmful for co-creation and reduce the possibility of joint learning” (Scholl, Kemp & de Kraker, 2017).

2. The second level, which can be described as temporal, refers to the timeline and addresses dilemmas in choosing short-term or long-term benefits. Long-term benefits seem easier to secure if ULL's activities are linked to a strategic vision for the city's development. It is then possible to coordinate the goals and their timeframes and how to achieve synergies of activities (Scholl, Kemp, 2016; Scholl, Kemp & de Kraker, 2017).

3. The third level of dilemmas in the context of implementing the SD concept concerns the discrepancy between individual and collective rationality. It refers to game theory and concerns the search for balance between individual and collective benefits. Individual rationality will focus on the goals of a group or organization (e.g., improving the image of the local government, CSR, solving local residents' problems, testing new products/concepts). By collective rationality, I mean adding additional criteria for individual rationality. This can manifest itself in two ways. First - as taking into account the interests of other individuals/groups/organizations, and especially certain categories of people (e.g., the most vulnerable, mar-

ginalized, dependent). Second - as a focus on maintaining or repairing social institutions deemed valuable (Dunn, 1994).

An important aspect affecting the way SDGs are implemented in ULL in the context of individual and collective rationality is the formula of organization and the nature of participation of individual partners. There are laboratories that rely on self-organization and grassroots initiative (Barbanente, Mono, 2018). There are those that form their activities as a top-down planned initiative of a single entity, such as a local government or university (Morales, Segalas & Masseck, 2023; Tercanli & Jongbloed, 2022; Kaszkur, 2020). There are also those that are formed by clustering existing initiatives (Guerra & Syed, 2024). Categories of participation - core, active, passive - of certain actors are fluid (TUC, 2022), so the determination of dominant rationales is time-varying and context-dependent.

3. RESEARCH METHODS

3.1. Scope of research

Our study concerns the functioning of ULLs in Polish cities, which does not have a long history. Urban labs in Poland began to function in an organized manner and in accordance with the generally accepted operating formula in 2019. Previously, there were attempts to implement projects using the living lab method, but their implementation usually ended once funding for these projects was over. Currently operating ULLs in Poland have diverse goals, cooperation formulas, origins of functioning, and schemes for implementing and financing activities. Even an unambiguous determination of the number of urban labs currently operating in Poland poses difficulties due to factors such as diverse nomenclature (e.g. "urban lab", "living lab", "smart lab", "innovation center", "creativity center"), ephemerality, frequent dependence on external, project-based sources of funding (Bień, Ner & Piziak, 2020). We are aware that the different criteria adopted by researchers for assessing the functioning of ULLs have an impact on their identification and classification. In light of our analysis, actively operating ULLs in Poland (as of August 2024) are presented in Table 1.

Table. 1 Active urban laboratories in Polish cities (as of October 2024).

Lp.	Nazwa of the ULL	City	Address	Seat
1.	Śląski Urban Lab	Gliwice	Marcina Strzody 8, Gliwice	Minucipality
2.	Urban Lab Rzeszów	Rzeszów	3 Maja 13, 35-030 Rzeszów	Minucipality
3.	Urban Lab	Gdynia	Gdynia al. Zwycięstwa 96/98 81-451 Gdynia	The building of Pomorski Park Naukowo- Technologiczny
4.	Urban Lab Mysłowice	Mysłowice	ul. Grunwaldzka 8, Mysłowice	Minucipality
5.	UrbanLab WGSR UW	Warszawa	Krakowskie Przedmieście 30, p. 114	Uniwersity of Warsaw
6.	SmartCity Lab	Chełm	ul. Ceramiczna 3E 22-100 Chełm	Chelm Economic Activity Center
7.	Urban Lab Toruń	Toruń	ul. Fosa Staromiejska 3, Toruń	Nicolaus Copernicus Universi- ty of Toruń
8.	UrsynLab - Przed- siębiórca Ursynów	Warszawa	al. Komisji Edukacji Narodowej 61, Warszawa	Ursynów District Office
9.	Green Lab Toruń	Toruń	ul. św. Katarzyny 5 lok. 3, Toruń	Pracownia Zrównoważonego Rozwoju (Foundation)
10.	Stalove Urban Lab	Stalowa Wola	ul. Ks. J. Popiełuszki 10, Stalowa Wola	Stalowa Wola City Hall - Mu- nicipal Public Library
11.	Campus Living Lab	Kraków	ul. prof. St. Łojasiewicza 4, Kraków	Jagiellonian University in Cracow
12.	Szarłota LAB	Rydułtowy	Ofiar Terroru 49, Rydułtowy	Minucipality

It is worth noting that the quantitative growth of such initiatives and the expansion of their reach to smaller urban centers is visible, as well as their increasing association with the category of innovation and networking of cooperation in the city. Polish Urban (Living) Labs draw on good practices and foreign in-

spiration, but the implementation of solutions is sometimes difficult due to, among other things, the still smaller involvement of Poles in participatory projects in the cities compared to Western European societies, less activity in building grassroots initiatives, frequent negative attitude of residents towards public authorities, as well as the different mentality of society in its approach to cooperation and joint problem solving. Understanding the complex operations of the socio-spatial system of urban resources, actors and governance, as well as local stakeholder dynamics, seems essential for the effective functioning of ULL (Wróbel & Wisniewska, 2021).

Another major aspect of ULLs is the importance of individual sector stakeholders in initiating and leading projects and particular activities (Piziak, Bień, Jarczewski & Ner, 2023; Arnkil, Järvensivu, Koski & Piirainen, 2010), as well as their financing. Pilot programs on the implementation of the urban laboratory instrument in Poland were introduced in two Polish cities - Rzeszów and Gdynia - thanks to the cooperation of local governments and the ministry coordinating the redistribution of EU funds in Poland, as well as a research institute that coordinated the entire implementation process from the technical side (Bień, Jarczewski, & Piziak, 2020). In European countries, in addition to public funding, one can see a significant contribution of private investors or fundraising by universities, while in Poland the main source of funding is still EU funds and local government budgets, while the private sector is often not even aware of the existence of ULLs and the initiation and support of projects implemented in them (Wróbel & Wiśniewska, 2021).

3.2. Research procedure

We used a multi-stage research procedure. The first stage consisted of determining the research sample. It was intended to include all currently (as of 2024) operating ULLs in Poland. The very identification and selection of labs and the selection of those to be analyzed posed a challenge due to the aforementioned diversity of names, goals and forms of operation. In the end, we decided to adopt a declarative criterion, supported by an assessment of the activity profile. This means that if a structure identifies itself with the ULL concept, e.g. in the form of a reference in its own name or in the way it presents itself in certain expert circles (e.g. in the media, during public appearances) as an urban laboratory, then there is a sufficient argument for us to consider it as part of the sample. Such a method has been adopted by ULL researchers before (Evans & Karvonen, 2014).

Table 2. Sources of knowledge and number of entries about the activities of the studied ULLs in relation to the SDGs.

	Name of the ULL (initial research sample)	Source	Entries	Collected from	Collected to
1.	Śląski Urban Lab	Facebook	26	30/06/2022	26/04/2024
2.	Urban Lab Rzeszów	WWW	483	09/10/2019	10/10/2024
3.	Urban Lab Gdynia	WWW	275	30/09/2019	16/03/2024
4.	Urban Lab Mysłówice	Facebook	126	23/01/2024	18/10/2024
5.	UrbanLab WGRS UW	Facebook	168	13/06/2024	20/10/2024
6.	Smart City Lab Chełm	WWW, Facebook	46	01/03/2024	18/10/2024
7.	Urban Lab Toruń UMK		Less than 20 entries		
8.	UrsynLab - Przedsiębiorczy Ursynów	Facebook	512	17/01/2022	18/10/2024
9.	Green Lab Toruń		Less than 20 entries		
10.	Stalove Urban Lab		Less than 20 entries		
11.	Campus Living Lab	Facebook	83	30/03/2023	15/10/2024
12.	Szarłota LAB	Facebook	188	04/02/2022	24/04/2024

Source: own work

Thus, initially the research sample included 12 entities: Śląski Urban Lab, Urban Lab Rzeszów, Urban Lab Gdynia, Urban Lab Mysłówice, UrbanLab WGRS UW, SmartCity Lab Chełm, Urban Lab Toruń UMK,

UrsynLab - Przedsiębiorczy Ursynów, Green Lab Torun, Stalove Urban Lab, Campus Living Lab oraz Szarlota LAB. The range of dates of origin of the material and the sample size for each laboratory is illustrated in Table 2. The cut-off date for collecting the material was October 20, 2024.

The second stage of the research procedure consisted of netnographic analysis of the websites of selected ULLs, as a result of which 1,907 research units (entries) were collected, i.e. snapshots of websites/FB describing ULL events and activities. Materials available on the Internet, websites and profiles on social media were analyzed, hence the information under the news tab - their frequency, regularity and timeliness - was important for the evaluation of activities. By far, the most frequently used medium by ULL was Facebook, which may indicate that in communicating the activities of these institutions, direct contact with residents is important, as well as the ability to inform and invite people to events held there. We assumed that we would eventually adopt the caesura of a certain number of entries (20) as a minimum threshold. As a result, we obtained a final sample consisting of 9 ULLs: Campus Living Lab, Ursyn Lab, UrbanLab WGRS UW, Urban Lab Rzeszów, Śląski Urban Lab, Urban Lab Gdynia, Urban Lab Mysłowice, Smart City Lab Chełm, Szarlota LAB Rydułtowy.

The third stage of the research procedure involved coding the research material. Each research unit in the MaxQDA software environment was assigned from 0 to 3 SDGs (maximum 3 SDGs) related to the entries under analysis, depending on the issue of the entry. The codes were assigned to the maximum 3 SDGs that were most prominently reflected in the given entries. Coding was done based on semantic field analysis and keyword search related to SDGs. In total, 3,374 codes were assigned to 1,907 entries, resulting in an average of 1.7 codes per entry. Based on the assigned codes, a ratio was calculated - the sum of codes for a particular SDG target for a particular ULL was divided by the total sum of codes of all SDG target codes for a particular ULL. The last column titled "Total" in Table 3 indicates the calculated indicator - the sum of codes for a particular SDG goal from a particular ULL divided by the sum of all assigned codes of all SDG goal codes for a particular ULL. This allowed us to determine the level of ULL activity in Poland in relation to each SDG.

In addition, in order to deepen the conducted research, two study visits were made to ULLs in Rzeszów and Warsaw. The purpose of the visits was to qualitatively analyze the space, observe the activities carried out at ULLs, as well as to obtain, through IDI, information from those involved in the operation of ULLs about their experiences and perceptions of the issue in question.

4. RESULTS

In the context of our research, the most prominent themes when it comes to SDGs within the activities of ULLs in Poland are those related to sustainable cities and communities (SDG 11), decent work and economic growth (SDG 8) and Industry, innovation and infrastructure (SDG 9).

The data are interesting when it comes to the prevalence of interest in specific SDGs, 6 of the 17 SDGs were the focus of all ULLs surveyed. These are SDGs 4, 8, 9, 11, 16 and 17. The least interest of ULLs can be seen with SDGs 1, 2, 6, 7 and 14.

Analyzing the involvement of individual ULLs, it is possible to propose a certain typology relating to the level of focus of activity on specific SDGs.

1. one-pillar strategy - identifies ULL activities in which the dominance of one SDG is clear. This group includes 4 ULLs focused on SDG 11 - UrbanLab WGRS UW, Urban Lab Rzeszów, Urban Lab Gdynia, Urban Lab Mysłowice, as well as 2 ULLs focused on SDG 8 - Ursyn Lab and Szarlota LAB Rydułtowy.

2. two-pillar strategy - defines ULLs activities with focus on 2 SDGs. Such a strategy is represented by 2 ULLs - Śląski Urban Lab (SDG 11 and SDG 16) and Smart City Lab Chełm (SDG 9 and SDG 11).

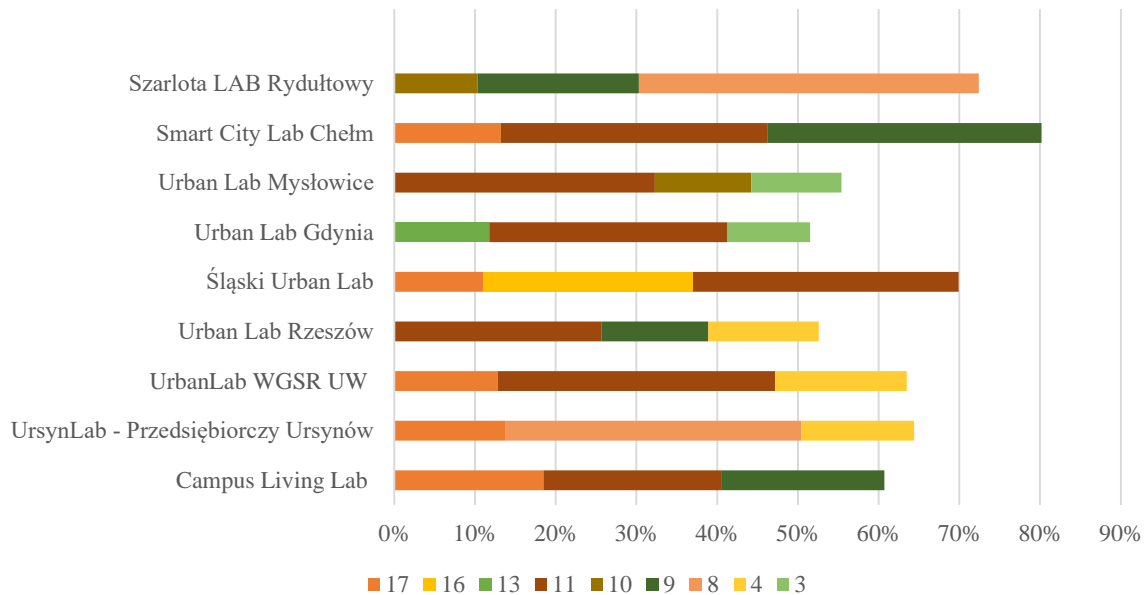
3. dispersion strategy - defines the type of ULLs in which activities are concentrated on several SDGs, without a clear dominant. This type was represented by one ULL - Campus City Lab.

The results of our research (Figure 1) show that there are three speeds among ULLs in Poland when it comes to involvement in SDG implementation. The ULLs of the "First Speed" that are most focused on and committed to the main three selected SDGs are Smart City Lab Chełm, Szarlota LAB Rydułtowy and Śląski Urban Lab. Second speed ULLs included Urban Lan WGRS UW, Ursyn Lab - Przedsiębiorczy Ursynów and Campus Living Lab. The "Third Speed" group as far as SDGs are concerned included ULLs from Gdynia, Rzeszów and Mysłowice.

Table 3. ULLs activity in Poland in terms of individual SDG targets.

SDG	Campus Living Lab	Ursyn Lab	Urban Lab WGRS UW	Urban Lab Rzeszów	Śląski Urban Lab	Urban Lab Gdynia	Urban Lab Mysłowice	Smart City Lab Chełm	Szarłota LAB Rydułtowy	TOTAL
1. No poverty	0%	0%	0%	0%	0%	3%	0%	0%	1%	0%
2. Zero hunger	1%	0%	1%	0%	1%	1%	0%	0%	1%	0%
3. Good health and well-being	4%	1%	3%	6%	0%	10%	11%	0%	1%	5%
4. Quality education	16%	14%	16%	14%	10%	8%	11%	11%	5%	12%
5. Gender equality	0%	1%	1%	1%	0%	1%	7%	0%	1%	1%
6. Clean water and sanitation	1%	0%	0%	1%	0%	1%	0%	0%	0%	1%
7. Affordable and clean energy	0%	0%	0%	1%	0%	0%	0%	0%	1%	1%
8. Decent work and economic growth	2%	37%	2%	6%	1%	2%	5%	3%	42%	14%
9. Industry, innovation and infrastructure	20%	11%	13%	13%	3%	6%	2%	34%	20%	13%
10. Reduced inequalities	4%	8%	2%	6%	1%	8%	12%	0%	10%	7%
11. Sustainable cities and communities	22%	9%	34%	26%	33%	30%	32%	33%	4%	23%
12. Responsible consumption and production	3%	2%	3%	2%	3%	3%	5%	0%	2%	2%
13. Climate action	3%	1%	4%	7%	1%	12%	0%	5%	1%	5%
14. Life below water	1%	0%	0%	0%	0%	1%	0%	0%	0%	0%
15. Life on land	5%	0%	4%	2%	7%	1%	0%	0%	0%	2%
16. Peace, justice, and strong institutions	1%	3%	6%	6%	26%	7%	10%	1%	4%	6%
17. Partnerships for the goals	19%	14%	13%	10%	11%	7%	5%	13%	7%	10%

Source: own work

**Figure 1.** ULLs' involvement in SDG activities.

Source: own work

5. DISCUSSION

In this article, we sought answers to 3 research questions: 1. Which SDGs are implemented in the framework of ULLs activities in Poland? 2. Which SDGs are overlooked in the framework of ULLs activities in Poland? 3. Are there specific types/strategies of ULLs in Poland in the context of SDGs implementation?

Regarding the first research question, we have noticed a strong interest in the goals related to sustainable cities and communities (SDG 11), decent work and economic growth (SDG 8) and industry, innovation and infrastructure (SDG 9). SDG 11 is clearly related to urban development, so its presence in this list is certainly not surprising. The emphasis on economic issues may be related to the fact that the first experience of Urban lab in Poland is related to the concept of smart city. This model was the axis of the concept of the first pilot program, which became the beginning of change and the inspiration for the creation of subsequent ULLs.

In the context of the low interest in the issues of poverty, hunger, clean water and sanitation, we can look for an explanation in the fact that Poland has reached a certain level of civilization development, which makes the issues largely solved and they lose their importance. In Poland, the issue of living underwater does not seem to be the subject of public debate in wider circles, and even less so in relation to the quality of urban life, which, as we pointed out in the introduction, is the central focus of Polish ULLs. Consequently, this leads to less interest in the topic at ULL. What is most surprising to us, however, is the lack of emphasis on affordable and clean energy in the activity. This is a topic that is of strong interest of Polish local governments, widely covered by the media and affecting residents to a large extent. Strategic documents are being created in this regard, new industries are being developed, legislation is being passed, financial tools are being launched, and all this results in a high relevance of the topic in relation to local development. Some explanation may be provided here by the fact that energy issues, however, concern capital-intensive issues and projects and are the responsibility of companies operating in cities or commercial entities appropriate for this, while urban laboratories, however, deal with micro-innovations and projects on a much smaller scale implemented in cities.

As for ULLs in Poland, most of them are initiated and managed by local governments. This is a different trend than the state of the art indicates, where the initiative and involvement of universities is emphasized (Piziak, Bień, Jarczewski & Ner, 2023; Leal Filho W., 2021). In the light of our in-depth research, when we had the opportunity to speak directly with ULLs stakeholders, it became clear that although ULLs are a local government initiative, however, the local government as a single entity is not involved, but only selected organizational units. This confirms the analyses that speak of the siloed nature of public administration, which can involve dilemmas related to differing rationales for SD, and even conflicts of interest between different offices or departments. Only when engaged in innovative collaborative formulas (like ULL) can it move beyond narrow specializations and see complex problems holistically. Perhaps, at this stage, the energy issue is precisely a “victim” of the indicated siloed character of public administration, and additional efforts are needed to invite local government stakeholders to open up the field of dialogue and cooperation on this issue more.

6. CONCLUSIONS

To summarize the research conducted, we would like to point out its limitations. One type of limitation stems from the way we obtained data. We analyzed information made public on websites regarding ULLs' activities. However, using this method, it is impossible to be sure that we found information on all forms of activities that were actually carried out for the SDGs. A possible way to confirm the consistency of information from the website with the facts would be to conduct interviews with people with longer tenure in ULLs' structures. Here, however, there is a danger arising from the selectiveness of memory, as well as putting a better value and giving more importance to the types of activities in which people were directly involved.

There are several remarks worth making in the context of the very choice of ULLs as the subject of the study. The most significant conclusion regarding the ULL study procedure itself relates to a challenge we encountered early on in our research work, namely their ambiguity (in terms of naming and formula) and instability (due to the sources of financing and the managing entity). Our research shows that they have varying dynamics. Some are operating vigorously, while some seem to be currently in a dormant phase, but are not officially dissolved. ULLs do not report the end of their activities, hence it is not always clear whether what we are investigating is still an active entity or just appears “on paper.” This “hibernation” may be related to the way ULLs' activities are financed in Poland and their dependence on having external grants (especially support from European funds) to carry out specific projects.

The second challenge in studying ULLs is related to their embeddedness in the map of urban institutions. In light of our analysis, one can risk the thesis that redefining the position of local government and the dominant paradigm (from governance to management) plays an important role in assessing ULL activity in Poland. As said in the introduction, the following can be considered as activity that meets the prerequisites of innovation:

introducing a new product or process, defining and redefining the position of the organization, and defining or redefining the dominant paradigm of the organization (Mayle, 2006). If we assume that ULLs as innovation networks are shaped by the roles of individual stakeholders (Nystroma et al., 2014), and that ULLs in Poland are mainly led by local governments, then it should be recognized that innovation in ULLs will face the same opportunities and constraints as innovation in local government. As the main opportunities, one can point to personnel and organizational resources, high clout and a high level of trust of target groups. On the other hand, the most important drawbacks for innovation in this context are subordination to politics and tenure (resulting, among other things, in the turnover of personnel), proceduralism, less willingness to address topics that are controversial to the public and high risk.

The agenda of issues taken up by the ULLs we surveyed does not address topics that are antagonistic to the Polish public, such as the issue of converting religious buildings into facilities with different functionality. There also seems to be little use of culture and art for activities around SD (Urban Lab Rzeszów is an exception and a good example here). All this to some extent narrows the area of potential ULLs research and thus creates a somewhat hermetic circle of interested parties from the researchers of the phenomenon. This affects the possibility of showing ULLs activities in different contexts and to different audiences. In conclusion, we would like to point out potential directions for further research.

1. Our research confirmed that ULLs are involved in the implementation of SD ideas, but have almost no contribution to SDG monitoring, reporting and dissemination. As for the key features of ULL (mentioned by Voytenko), our research shows that in Polish ULLs, geographic rootedness and dependence on the local context and participatory nature are of particular importance. The activities analyzed by us in terms of SDG indicate the multiplicity of stakeholders from different environments. This opens a potential field for further research on ULLs as elements of the network of municipal institutions.

2. Our research has resulted in the proposal of 2 typologies. One is based on ULLs' activity strategy with respect to one, two or multiple SDGs. The other typology relates to ULLs' involvement in the implementation of the SDGs, and based on this we distinguished 3 speed groups. The typologies we proposed can be used for further analysis focused on the research problem posed.

3. Our article was based on desk research. The analysis of the literature on the phenomenon of ULLs and innovative urban development management tools, as well as on approaches to local implementation of the SDGs, and a search of the websites and social media of selected ULLs was conducted. We sought information on ULLs activities in Poland from the perspective of the SDGs. Our research included a qualitative component on a limited basis, in the form of four verification interviews. It seems that this exploratory research in the next step could be supplemented by survey tools. With these, it would be possible to obtain the opinions of the participants in these events on their assessment of the connection between the activities of urban laboratories and specific SDGs. A postulate for further research is an in-depth qualitative analysis and conducting a broad panel of interviews with representatives of the ULLs community - stakeholders and beneficiaries of the activities (with the limitation related to subjectivity that we wrote about earlier).

At the same time, we would like to note that the ULL research we have undertaken in the context of achieving SDG goals is one of the few that has been carried out in such a broad sense in relation to a given country. Such publications, addressing this timely and relevant topic amidst global urbanization trends and sustainable development challenges, are still relatively few.

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