


Research

Transition to circular economy of urban areas and communities with special attention to lifestyles

Mariann Szabó¹  · Jan Gimkiewicz²  · Francesca Cappellaro³  · Carolina Innella⁴  · Noémi Csigéné Nagypál¹ 

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Abstract

Cities are important hubs of consumption and public services. But also, for exchange of goods and ideas among people, institutions and businesses. As current literature suggests regarding the enforcement of SDG12, Sustainable Consumption and Production in cities is supported by the promotion of circular economy (CE). There is a growing number of circular businesses, but this does not guarantee the spread of circular lifestyles in the whole society. In addition, the effects of awareness raising activities and any actions aiming to change the behavioural patterns of consumers can be limited if people cannot find sufficient offers for sustainable consumption. Therefore, in our research we aim to answer the following questions: 1. What kind of circular offers and initiatives are available which enable consumers to implement circular lifestyles in cities? 2. What kind of methodologies and forms can support engaging consumers to circular lifestyles in urban areas? In this study, we aim to enrich the knowledge base connected to encouraging CE citizenship in urban areas by providing an overview of circular offer types based on the analysis carried out in three examined cities (Bologna, Italy; Budapest, Hungary and Würzburg, Germany). Circular offers and initiatives have been examined by desk research to foster urban portfolios. 101 good examples have been collected and analysed with self-developed typology for circular lifestyle enablers. Results indicate that in the examined cities special attention is devoted on forming behavioural patterns of inhabitants. In this context, the Living Lab approach as a specific form for community engagement and awareness raising has high importance for the facilitation of circular lifestyles. Moreover, care should be taken to ensure that the important activities for a circular lifestyle and sustainable consumption, the Big Points, are considered and included within the different initiatives and offers.

Keywords Circular lifestyles · Sustainable consumption · Urban areas · Behavioural changes · Living labs

✉ Mariann Szabó, szabo.mariann@gtk.bme.hu; Jan Gimkiewicz, jan.gimkiewicz@uba.de; Francesca Cappellaro, francesca.cappellaro@enea.it; Carolina Innella, carolina.innella@enea.it; Noémi Csigéné Nagypál, csigene.noemi@gtk.bme.hu | ¹Department of Environmental Economics and Sustainability, Faculty of Economic and Social Sciences, Budapest University of Technology and Economics, Műegyetem Rkp. 3, Budapest 1111, Hungary. ²Department III 1 - Sustainable Products and Sustainable Consumption, Circular Economy, German Environment Agency, Wörlitzer Platz 1, 06844 Dessau-Roßlau, Germany. ³Section Support for the Coordination of Circular Economy Activities (SSPT-SEC), Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Bologna Research Centre, Via Martiri Monte Sole 4, 40129 Bologna, Italy. ⁴Section Support for the Coordination of Circular Economy Activities (SSPT-SEC), Italian National Agency for New Technologies, Energy and Sustainable Economic Development, Trisaia Research Centre, SS 106 Jonica Km 419, 500, 75026 Rotondella, MT, Italy.



1 Introduction

The adaption of the 2030 Agenda for Sustainable Development by all United Nations Member States in 2015 has opened a new chapter for global collaboration and partnership towards transition to sustainability [1]. The essence of the 2030 Agenda is the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries—developed and developing—in a global partnership, where the importance of place-based initiatives and practices are inevitable. A particular role in realising the SDGs is also played by urban areas. According to estimations by The United Nations Conference on Trade and Development (UNCTAD) 57% of the world's population lived in urban areas in 2022 [2], and this ratio is even higher in case of Europe. As the Competence Centre on Foresight of the European Commission estimates the level of urbanisation is expected to increase to approximately 83.7% in 2050 [3]. This situation underlines the need for redefine the role of urban areas towards transition to sustainability. Cities are important hubs of various forms of consumption, public services, exchange of goods and ideas among people, institutions, businesses, embodying a social, cultural, political, and economic interaction system [4].

An important model describing basic social geographical functions in human geography was developed by Partzsch (1964) who was inspired by the work of French architect Le Corbusier focusing on functional places which helps people to pursuit different actions [5]. Partzsch (1964) referred by Keserű (2013) introduced a portfolio of seven elements for those functions which defines a city, including 1. work; 2. living; 3. services; 4. education, training and culture; 5. transport and communication; 6. leisure time activities, 7. local community. If we observe these functions, we can conclude that the cities as cultural-social interaction systems can influence the behaviour of citizens in various ways. People share ideas about their lifestyles and may adopt to new trends like zero-waste movements or sustainable consumption. On the other hand, a sufficient portfolio of alternative offers is needed to pursuit and establish these behaviours. This interrelatedness of offers and behaviours is reflected in the SDG12: Sustainable Consumption and Production of the United Nations, where both sides of the economy are addressed. The enforcement of SDG12 in cities is supported by the promotion of circular economy (CE) as Shahzabeen et al. (2023) argue in a recent study highlighting that the reduction of waste and pollution as well as the reuse of products and materials are all alternative pathways of circular economy with strong link to SDG12 [6]. The Urban Agenda for the European Union (EU) which offers a new form of multilevel and multi-stakeholder cooperation with the aim of strengthening the urban dimension in EU policy set a priority for circular economy as well [7].

Furthermore, the implementation of the circular economy is on the agenda of the European Urban Policy of 2020 as well: The New Leipzig Charter—The transformative power of cities for the common good. It calls the attention to the implementation of the circular economy in urban settings. The Charter declares that transformation towards the green city requires investments in innovative and efficient technologies as well as fundamental changes to production and consumption, allowing for the establishment of a circular economy which redefines and ensures a sustainable use of resources, while significantly reducing waste and carbon emissions. The implementation of circular lifestyles in urban areas is important for sustainable urban transformations. Generally, cities are associated with weak sustainability as they contribute to the change of natural equity to human constructs, meanwhile incorporating circular economy principles can reduce the level of resource use and pressures on the environment [8].

A recently published Strategy Framework in the framework of an European project about enabling circular lifestyles in cities declares that once European city centres used to be busy resource-intensive centres of consumption, but since the Corona pandemic and a shift towards online trade, numerous shops had to close, and many supply chains were interrupted. Another aspect of the changing environment that although alternative and sustainable consumption models leading to more circularity and sufficiency increase do exist, but due to the current framework conditions, these models usually only remain in their niche and have low potentials to trigger societal changes. Another challenge related to the implementation of circular lifestyles that consumers often lack a central and easily accessible offer of alternative forms of consumption which would help them redefining consumption goals. Circular lifestyles can be facilitated by different political measures, action plans, development plans, strategies and programmes that support them. Besides these, circular lifestyles can be implemented if the local portfolio of various sustainable consumption offers are sufficient. The business models which define these services portfolios can be diverse both in nature and vulnerability to different various shock events or crises which highlights the importance of local-level assessment [9].

In our research related to the investigation of circular lifestyles in three European cities (Bologna, Budapest and Würzburg) we have analysed the needs and visions of different target groups (cities and initiatives/ providers of new business models, existing networks) to identify transnational challenges and potentials. In the broader analysis, we

have applied self-tailored research methods including focus group discussions, interviews, workshops. Besides these, circular offers and initiatives have been examined by desk research to foster urban portfolios, which is the topic of the current research article. Based on our findings we were able to draw some conclusions regarding how circular lifestyles can be facilitated:

1. Different stakeholders are equally responsible for CE transition in urban areas including politics, economy, inhabitants.
2. Circular offers are important but are not the exclusive solution for circularity transition also pointed out by scholars [10].
3. Education has a vital role at promotion of circular lifestyles.
4. CE citizenship is a dynamic process, in which consumers would develop their skills for understanding the sustainability concerns of their consumption and to prioritize different actions from the viewpoint of environmental benefits [11].

Concluding from the literature we can state that the growing number of circular businesses does not guarantee the spread of circular lifestyles in the whole society, as well as the effects of awareness raising activities and any actions aiming to change the behavioural patterns of consumers can be limited if people cannot find sufficient offers for sustainable consumption. Therefore, in our research we aim to answer the following questions:

1. What kind of circular offers and initiatives are available which enable consumers to implement circular lifestyles in cities?
2. What kind of methodologies and forms can support engaging consumers to circular lifestyles in urban areas?

In this study, we aim to enrich the knowledge base connected to encouraging CE citizenship in urban areas by providing an overview of circular offer types based on the analysis carried out in the examined cities. Building on this we discuss a specific form for community engagement for circularity transformation, namely the Living Lab (LL) approach. Our research is specific in a way that it highlights research for three Central European cities where research related to circular lifestyles is less common. The research is unique in a way that not a specific urban area is assessed, but three cases with different social, cultural, and regulative environments. Furthermore, the changing role of urban centres is analysed. The focus of our study is the facilitation of circular lifestyles and sustainable consumption in urban settings. Therefore, during the study—followed by the practice of the German Environment Agency (Umweltbundesamt)—we use the two terms as synonyms.

The study is structured as follows: At first, we introduce the conceptual background of CE Framework on International and European Level, followed by Circular City Roadmaps, CE urban practices and finally literature review on the concept of sustainable consumption/ circularity in lifestyles in urban spaces. At second, research methods are introduced with the brief introduction of participating cities, countries and data collection methods. At the end the research findings are interpreted, discussed and finally summarized in a conclusion.

2 Conceptual background

During the next section we introduce the conceptual background of circular lifestyles and circular economy citizenship. Since the reinforcement of circular lifestyles requires the collaboration of different parties, it is reflected on the state of the art of corresponding literature. As the article focuses on urban good practices for facilitation sustainable consumption, we devote a specific chapter for circular economy urban practices too.

2.1 Policy framework for the CE on international and European level and their relevance to consumption patterns

In the current section of our article the policy context of circular economy and lifestyles is presented, by overviewing relevant international and EU level strategic papers and initiatives that have been formulated to support the circular transition. The major aspect we focus on is how consumers or citizens are mentioned and tackled with various measures.

OECD Re-Circle (Resource Efficiency & Circular Economy Project) is a comprehensive project, realised with financial support from the EU [12]. The proposals formulated within Re-Circle tackle multiple agents or actors of the supply chain, namely: extractive and mining companies, product designers, manufacturers, distributors or retailers, private and industrial consumers, collectors, landfill and incineration site operators as well as recycling companies. In case of “private and industrial consumers” the following measures have been identified: “pay-as-you-throw schemes (households only), landfill taxes, incineration taxes, product taxes on hard-to-recycle products, advance disposal fees and environmental product labelling” [13, 14]. That is, economic incentives are dominant, compared to other measures like awareness-raising.

The EU Circular Economy Action Plan is focusing specifically on the realisation of a circular economy in the EU. The first version was issued in 2015 which was followed by the 2020 edition. *The first Action Plan* (Closing the loop – An EU action plan for the Circular Economy) presented 8 chapters on 21 pages: and a whole chapter was dedicated to consumption and consumers, starting with the statement “*The choices made by millions of consumers can support or hamper the circular economy*” [6, 14]. The chapter highlights that information provision and regulation are also essential prerequisites of circular consumption patterns. The new document called “A new Circular Economy Action Plan – For a cleaner and more competitive Europe” by the European Commission (2020) highlights competitiveness besides the environmental advantages. It presents measures related to the: “*Generalization of sustainable products*”:

1. “*Promoting conscious consumer behaviour*”: This is the group of activities that directly tackles consumers as a target group.
2. “*Greater attention on those sectors that use the most resources and where there is a great opportunity to achieve circularity*”: In this case the focus is on the producers, however, the determination of most relevant sectors (electronics and info-communication technologies; batteries and vehicles; packaging; plastics; textiles; construction and buildings; food) has a *message for consumers* as well, regarding which are the major products [15].

We can conclude that both action plans consider consumers as one of the *important target groups* whose choices are determinative in making circular economy work.

The Circular Cities and Regions Initiative (CCRI) [16] forms part of the Circular Economy Action Plan,. According to the CCRI cities and regions have a huge potential in driving the circular transition. CCRI is rather practice-oriented and intend to increase synergies among projects disseminate useful knowledge and improve the “*visibility of best practices*” [16].

The European Circular Cities Declaration (ECCD) is also concerning the European level. Special attention is paid to get closer to decouple economic growth from resource use, with crucial contribution from local and regional governments. Mostly Western European cities were among the signatories, but cities from some post-socialist countries also joined. The CCD Report (2022) compiled and analysed the first submissions by the signatories on their circular activities. Ten so-called “*CCD commitments*” have been formulated, out of which “*Raising awareness of circular practices across our administration and amongst local citizens and businesses*” [8, 17] is the most relevant regarding citizens’ attitudes and behaviours. A new report (Circular Cities Declaration Report 2024) was published in 2024, covering 58 cities from 18 countries. It is quite practice-oriented, several initiatives are presented which can serve as samples for other municipalities. Improving measurement is critical topic for many cities, more than two-thirds indicated that they already have or are planning to use indicators to monitor progress. “*Indicators being adopted or considered include governance, behavioural, material flow, and impact indicators*” [4, 18]. Out of these indicators, “behavioural” ones are the most important regarding citizens.

The European Circular Economy Stakeholder Platform (ECESP) is a joint initiative by the European Commission and the European Economic and Social Committee. The aim of the Platform is to provide space for the exchange of ideas and a growing body of information [19].

Cities all over Europe also trying to implement their own roadmaps already, circular economy transition is also addressed by local plans. According to the “C40 Cities Climate Leadership Group”, in 2015 Amsterdam was the first city globally to explicitly explore and exploit the opportunities of a circular economy – the roadmap primarily aimed at to assess “*initiatives that are already being implemented*.” ([20], p. 4). A detailed implementation agenda for 2023–2026 focuses on stakeholders, value chains and responsibility of inhabitants [21]. London’s circular economy route map (2017) emphasized to provide a vision for the city “*through the adoption of the principles of circular economy: an economy which keeps products, components and materials at their highest use and value at all times*.” [4, 22]. The City of Helsinki’s Roadmap for Circular and Sharing Economy was published in 2020 emphasizing the emerging importance of the sharing economy on circular transitions, [23]. The document “Circular Turku. A Roadmap Toward Resource Wisdom” was published in 2021 focusing on: Circular energy systems; Circular food systems; Circular water systems; Circular buildings and construction as well as Circular transport and logistics [24]. The document names six “*cross-cutting enablers*”, out of whose two are

related to citizens: “Skill development and education on the circular economy” and; “Circular economy solutions for residents”. It states that “the city will work to ensure that residents of the Turku region can access circular economy solutions in their everyday lives, including sharing, leasing, re-sale and maintenance services.” [24, 66].

To sum up findings from city-level roadmaps we can conclude that they are relatively new, and some of them identify similar areas (like buildings, food, plastic waste etc.).

2.2 Circular economy Urban practices—how good practices are supported and made visible in Italy, Hungary and Germany

According to Marjanović et al. (2022), circular economy practices are an integrated set of “activities, sectors, services, resources, lifestyles, and practices” that provide cities with a “contextualized and socially inclusive circular system” [25]. Because of higher population density and higher per-capita resource consumption, cities concentrate high levels of waste production and resource consumption. Therefore, circular economy urban practices provide huge opportunities for societal shift towards circularity. Circular economy urban practices are tangible challenges with important effects from suburban initiatives to national scale and global level [25]. In addition, the European Circular Economy Stakeholder Platform (ECESP) defines CE good practice (GP) as follows: “Good practices are relevant initiatives, innovative processes and ‘learning from experience’ examples involving companies or other relevant stakeholders such as research, academia and civil society” [19, p. 7]. In the following, initiatives from the three countries discussed in this study—Italy, Hungary and Germany—are collected that bring together good practices and relevant stakeholders at national level.

From Italy, the Italian Circular Economy Stakeholder Platform (ICESP), Atlas of Circular Economy, ENEL and Symbola Foundation and Legambiente can be mentioned [26, 27]. ICESP is the Italian Circular Economy Stakeholder Platform—(mirror of the European one), established in 2018, promoted and coordinated by ENEA which aims to foster the Italian way for circular economy. ICESP was founded as a forum bringing together initiatives, experiences, criticalities and prospects that Italy will and has the potential to represent in Europe in circular economy, while fostering circularity in Italy also with specific actions. The Italian Atlas of the Circular Economy, an interactive web platform, that collects and presents the experiences of economic realities and associations committed to the application of the principles of the circular economy in Italy. The atlas is designed as an awareness-raising, information and documentation tool aimed at both citizens wishing to manage their consumption in a responsible way and companies wishing to benefit from a space of visibility or to maximise the environmental compatibility of their supply chain by getting in touch with more sustainable suppliers. ENEL is concentrating its efforts on territories renewable energy, public and private electrification and flexible work models. Every year since 2018, the Group has published a document dedicated to the analysis of circularity in urban settings. The focus of the last edition of the study was the contribution of Circular Cities to decarbonization, with evidence of positive impacts not only on direct but also indirect emissions. The Symbola Foundation has been analysing the green economy, culture, social cohesion and competitiveness through its research, contributing to the dissemination of best practices and ‘Made in Italy’ records, giving them the right visibility and recognition in Italy and worldwide. Legambiente, an Italian non-profit organization, is a pacifist and independent movement, advocated to drive the economy towards new models of green and circular economy and to improve the quality of life for everyone (environmentally and socially).

In Hungary different actors as umbrella institutions help to facilitate knowledge exchange on circular economy. The Circular Economy Platform¹ was officially established in 2018 in Hungary as an initiative of the Business Council for Sustainable Development in Hungary (BCSDH), the Embassy of the Kingdom of the Netherlands, and the Ministry of Innovation and Technology. In 2023, the second report of the circular economy in Hungary has been published with good practices of businesses which have working solutions [28]. The Circular Economy Technology Platform (KGPT)² was established in 2022 for a stronger collaboration of companies, academic institutions with strong specialization on circular economy. Sharing good practices often happen in non-regulative environments, like workshops, discussions and in the framework of local, international projects. Active NGOs like HUMUSZ Association³ and the URBAN 21⁴ initiative actively communicate good practices which can be implemented in urban areas, whereas others often publish thematic

¹ Official website of The Circular Economy Platform is available at: <https://bcsdh.hu/en/projects/circular-economy-platform/>.

² Website of the Platform is available in Hungarian, here: <https://circularhungary.hu/>.

³ Website of the HUMUSZ Association is available in Hungarian, here: <https://humusz.hu/>.

⁴ Website of the URBAN 21 initiative is available in Hungarian, here: https://urban21.blog.hu/2022/05/03/varosi_korforgasos_gazdasag_strategiak_altal_nyerheto_elonyok.

reports including GPs on specific area (for e.g. CO-FRESH project⁵ of the National Association of Interest Representations for Small-scale producers and service providers).

With regard to the circular economy in city centres in Germany, the Innovation Platform City of the Future,⁶ initiated by the Federal Ministry of Education and Research together with the Federal Ministry for the Environment, should be mentioned. This initiative has been and continues to be used to fund exemplary projects in the areas of sustainable mobility, resource-efficient urban neighbourhoods or sustainable innovations in cities [29]. In addition, various sustainability prizes are awarded to urban projects in Germany. These include the German Ecodesign Award⁷ and the German Sustainability Award. Furthermore, the German Environment Agency (UBA) collects good examples of circular and sustainable cities in various research projects. These include for example the publications "More environmental justice: good practice at municipal level"⁸ and "Thinking together what belongs together: municipal climate protection and sustainable consumption".⁹

2.3 Implementation of circular lifestyles in urban settings

Described by Korsunova, Horn & Vainio (2021), it is widely accepted that wide range of different organizations including governments, municipalities, businesses, as well as citizens alike have a role to play in transitioning towards a CE [11]. They further add that although principles of "CE also mean significant changes to ways of living, these aspects of CE are barely addressed" [11]. As introduced earlier, with the current trends toward urbanization globally and especially for Europe, urban areas should be at the forefront developing and implementing measures towards the enhancement of circular economy and circular lifestyles respectively.

2.3.1 The 9R framework for circular construction

After synthesizing findings from current literature, Reike, Vermeulen & Witjes (2018) map different value retention options in CE based on literature findings which support the implementation of circular lifestyles. The options are divided into three main categories: 1. Client/ user choices, 2. Product upgrade, 3. Down-cycling. Building the classification upon CE concepts from R0 Refuse to R9 Re-mine they introduce a possible portfolio of value retention options covering the supply (circular businesses, service providers) and demand (customers, or citizens) side too. Circular lifestyles can be associated with the majority of options, where customers: Refrain from buying (R0); Use less, use longer; recently: share the use of products (R1); Buy 2.nd hand, or find buyer for their non-used produced/possibly some cleaning, minor repairs (R2); Making the product work again by repairing or replacing deteriorated parts (R3); Return for service under contract or dispose (R4 and R5); Buy new product with new function (R6); Dispose separately; buy and use secondary materials (R7); Buy and use energy (and/or distilled water) (R8); Buy and use secondary materials (R9). Some of the value retention options are directly linked to change in the behavioural patterns like R0 & R1, while the implementation of other forms from R2 to R9 is possible if the urban supply portfolio for promoting sustainable lifestyles is efficient [30].

The definition we have developed for circular lifestyles is rooted in the model of Reike, Vermeulen & Witjes (2018) covering refusing unnecessary goods (R0), reducing buying new goods including renting and valorising sharing economy options (R1), reusing/ re-selling (R2), repairing (R3), re-furbishing (R4), re-manufacturing (R5) and re-purposing (R6) products and only recycling waste (R7) after an item is beyond repair and reuse. The incorporation of the CE value retention options into citizens' lifestyles can affect inhabitant's purchasing behaviour in various consumption domains. [9, 30]

The value retention options represent how materials can be saved, used and reused at their highest value while minimizing waste and environmental destruction, therefore suggest different approaches for closing material loops:

- In case of short loops goods remain close to its user and function, therefore it is the best option for energy and material reduction,

⁵ Website of the CO-FRESH project is available at: <https://co-fresh.eu/>

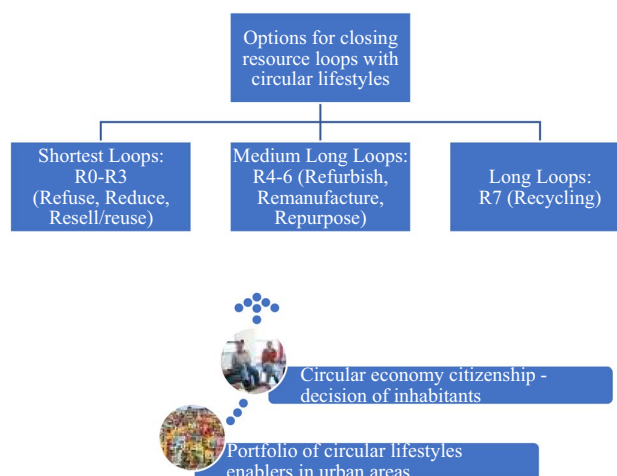
⁶ Website of the Innovation Platform City of the Future is available in German, here: <https://www.fona.de/de/themen/zukunftsstadt.php>

⁷ More information available at: <https://www.bundespreis-ecodesign.de/en>.

⁸ Publication called "More environmental justice: good practice at municipal level" is available in German, here: <https://www.umweltbundesamt.de/publikationen/mehr-umweltgerechtigkeit-gute-praxis-auf-kommunaler-0>.

⁹ Publication called "Thinking together what belongs together: municipal climate protection and sustainable consumption" is available in German, here: <https://www.umweltbundesamt.de/publikationen/zusammendenken-was-zusammengehoert-kommunaler>.

Fig. 1 Options for closing resource loops with circular lifestyles. Source: own compilation based on Reike, Vermeulen & Witjes (2018) and Szabó et al. (2024)



- In case of medium long loops goods are upgraded and producers are again involved for value creation therefore the energy and material need appear while,
- In case of long loops goods lose their original function and the value retention will require significant energy and material use compared to the short and medium long loops, but still lower level then creating a brand-new product [30].

In our research, while focusing on the circular lifestyles enablers we are targeting how city centres can contribute to sustainable lifestyles. Figure 1 represents options for closing resource loops and interrelatedness of circular lifestyles enablers.

The circular lifestyles phenomenon is related to the lifestyle below 1.6 hectare ecological footprint which takes into account the biological capacity available per person promoted by the Global Footprint Network.¹⁰ It is also related with the 1.5C compatible lifestyle approach (for e.g. EU 1.5° Lifestyles project¹¹) since both are targeting to reduce the per capita CO₂e values of various consumption segments, but different in a way, that circular lifestyles put the emphasis on the urban and human interaction, through the application of the capability approach on how the urban centres can enhance lifestyles transformations of inhabitants for sustainable consumption. In our analysis we focus on per capita CO₂e for the measurement of environmental impacts because this indicator is widely available for specific countries and cities too. Nevertheless, both the water footprint of various consumption segments and the ecological footprint would be relevant, but our experiences shows that CO₂e is highly applicable for awareness raising purposes, since consumers can understand the effect of their different consumption decisions in an easy way.

2.3.2 Circular economy citizenship—more than recycling

To call the attention to the role of awareness raising, exchange of ideas and providing access to information regarding sustainable consumption, Borello, Cembalo & D'Amico (2022) bring to reason that even a diversified portfolio of circular businesses and offers are not absolute solution for circularity transition. However, it is important to inspire consumers having a “*renewed notion of wellbeing*”. They find critical to provide new narratives to “*drive post-consumerist societies*”. [10]

Internalization of knowledge related to circular lifestyles is essential to behavioural changes as pointed out by Klug & Niemand (2021) examining a “precycling” lifestyle as a sustainable consumer lifestyle following the zero-waste approach covering waste rejection caused by packaging materials, reduction of the amount of waste produced, back-to back with reusing items. They consider precycling as a preventive, pre-consumption approach characterized with the consideration of the environmental consequences before consumption[31].

Since circular economy citizenship is a dynamic process, actions for the engagement of consumers for implementing circular lifestyles must consist in tailor-made solutions. Consumer surveys and research can collect relevant data on how

¹⁰ Global Footprint Network, official website is available at: <https://www.footprintnetwork.org/>.

¹¹ EU 1.5° Lifestyles project, more information at: <https://onepointfivelifestyles.eu/>.

consumers currently implement circular lifestyles and what are the most relevant focus points. Next, we introduce two research approaches which have been carried out on how consumers implement circular lifestyles.

The first one is from Finland, a recent study by Korsunova, Horn & Vainio (2021) where they examined the perceptions of young adults on how CE affects their everyday lives. The research defines CE citizenship as a such dynamic process, in which consumers would develop their skills through education, experience changing, challenge-based learning. The researchers have collected information how citizens pursue circular lifestyles, then they grouped the associations into the following groups. Based on the number of mentions we can conclude that the majority of solutions consumers identified are recycling (408), followed by reuse (233), CE as industrial solutions (94), other sustainable behaviour including buying sustainable, recyclable, durable & using sustainable transport (88), refuse (58), reduce covering, reduce buying single use, reduce consumption, waste, reduce buying short-lived products (44), caring towards nature (40), repair (27) and education deepening understanding, seeking more information (15). Results underline that CE is often perceived mainly as involving recycling activities. From the client/ user choices reuse has received the highest mentions. Mentions to refuse, reduce, repair and education received significantly lower values. The value of this analysis is that it uses free associations of consumers, therefore the results are highly dependable [11].

The second report, which is based on survey-method, is 'The Sustainable Consumer 2023' report for the United Kingdom (UK) developed by Deloitte declares that the adoption of more sustainable lifestyles continues to grow in the country, however sustainable choices need to be made more affordable and widely accessible for consumers to contribute to the net zero, sustainability transition. In this report consumers also associate CE in particular with recycling. Activities that involve low costs and a personal benefit are also favoured. On the other hand, activities that appear time-consuming and expensive but save a lot of CO₂, like reduced air travel or switching energy supplier and sources, are less popular [32].

2.3.3 Challenges with the area of individual sustainable consumption

In our research, we focus on solutions for consumers who we want to encourage to adopt a circular lifestyle citizenship. Citizens as inhabitants of urban spaces are of course the central target group when it comes to improving urban life. Although it is described by Korsunova, Horn & Vainio (2021), that governments, municipalities, businesses, and citizens alike have a role to play in transitioning towards a CE [11], the focus on the individual as a responsible acting subject is also viewed critically. In the following, we will examine the critical voices and counter these with concepts of shared responsibility for circular lifestyles and sustainable consumption.

A fundamental challenge in addressing the topic of sustainable consumption is the fear that this places too much responsibility for climate protection measures on individuals. In addition to scientific articles [33], there are also some institutions and organisations, like Fridays for future Germany,¹² that are therefore staying away from the area of sustainable consumption at an individual level. Representative opinion polls among citizens in Germany show that they believe that companies and politicians in particular have a responsibility to address the issues of climate protection and sustainability [34]. Belz and Bilharz also state that *'the responsibility for realising sustainable consumption cannot be unilaterally and completely attributed to individual consumers. This would be tantamount to structurally overburdening consumers'* ([35], p. 38). The misunderstanding here lies in the fact that the aim is not to transfer sole responsibility to individuals. However, it is also not recommended that citizens should be completely relieved of their responsibility or that only politicians or companies should be held accountable. It is much more important to see political actors, the economy, scientific institutions and citizens as sharing responsibility, always with an awareness of who bears responsibility for what in relation to the socio-ecological transformation [35].

In addition to the benefits of involving citizens through urban living labs (ULLs) in circular and sustainable activities (discussed in detail in chapter 5.2), there are further advantages to seeing consumers as co-responsible: scientific studies show that sustainable consumption can be 'contagious'. This can be observed, for example, in the spread of solar panels [36]. The number of vegan products in supermarkets would also not be increasing so much if there wasn't a corresponding demand from consumers [37]. In this way, citizens are becoming triggers and drivers of circular lifestyles and sustainable consumption [35]. Sustainable consumption is also worthwhile at a private level: by reducing living space, using public transport or saving electricity and hot water, money can be saved and added value can be created for health. For instance, in this regard Riefler et al. are describing a taxonomy of individual-level gains and losses with consumption reduction [38].

¹² Official website of Fridays for future Germany is available at: <https://fridaysforfuture.de/>.

3 Research methods

3.1 Participating cities

In the next paragraphs we introduce briefly the cities where research on circular offers has been carried out. The short introduction of the cities covers the population size, importance of the cities, local strategies for the enhancement of circular economy.

3.1.1 Bologna and porto-saragozza district (Italy, Emilia-Romagna)

In a nutshell Bologna is a city in the centre of the Emilia-Romagna region, in Northern Italy. Population size of greater Bologna is approximately one million people, whereas the city itself is estimated to have a population closer to 390,000 as well as it is one of the most highly populated and urban areas in Northern Italy, an important economic, cultural and administrative centre. Describing the city attitude towards circular economy transitions we can say that even though Bologna does not yet have a specific circular economy plan, the municipal administration is dedicated to tackle climate change related challenges and to introduce transition processes towards a CE. Bologna has developed both Sustainable Energy and Climate Action Plan SECAP and Climate adaptation plan proving its strong commitment to EU Mission “Climate-Neutral and Smart Cities”. The study area, Porto-Saragozza District, founded in 2016 from the merger of the previous Porto and Saragozza districts, is the largest in Bologna in terms of residents and has significant share of renovated brownfield areas. [9]

3.1.2 Budapest and Újbuda district (Hungary)

Budapest, the only capital city in our research is the political, administrative, industrial, and commercial centre of country with its approx. 1.7 million inhabitants in Hungary. Concerning local governance aspects of CE we could say that the capital does not have a specific circular economy strategy, but there are strategic documents for facilitating sustainability transitions like Sustainable Energy and Climate Action Plan (SECAP) and the Integrated Urban Development Strategy. Embodying its commitment towards CE, the city has joined the European Circular Cities Declaration as a founding participant in 2020. During the analysis, our research area in Budapest is the 11.th district of the capital with 143,111 inhabitants (2022). called Újbuda (in eng.: ‘New Buda’) reflecting that is one of the newly constructed districts of the city. It is one of the most vibrant parts of the capital with heritage sites, top green-belt areas, but there are also huge panel blocks, abandoned and temporarily used industrial brownfields, as well as two of the biggest university campuses of the country[9].

3.1.3 Würzburg and historic centre (Germany, Bavaria)

Würzburg, the third city in our research is with 130,671 inhabitants in 2023 the seventh largest city in Bavaria, in the south of Germany. The historic centre with 18,500 inhabitants, is the second largest district in Würzburg in terms of residents. For the city of Würzburg, there is no specific strategic document towards circular economy existent. Circular economy is considered in three areas within the Climate protection concept 2021 of the city [39]. Furthermore, the city runs an Environment-Centre (Umweltstation) for waste, energy and environmental counselling as well as education for sustainable development. Würzburg is also an official partner of the initiative “Einmal ohne, bitte” (engl. Once without, please). This was launched by the Munich-based association rehab republic e.V. and aims to stop the current the high use of disposable packaging. Below the city level, Würzburg has so far had four “energy neighbourhood concepts” for different study areas and a “Masterplan for FREIRAUM for the city of Würzburg (2021)”. But both activities are linked only loosely to the concept of circular lifestyles. [9]

3.1.4 Per capita carbon footprint of the examined cities and ecological footprint of countries

Published in 2021, the OpenGHGMap—Europe—CO₂ Emissions in 108,000 European Cities by Daniel Moren¹³ covers CO₂ emissions for 116,000 administrative areas (108,000 cities/municipalities) in 34 European countries. Although the data is

¹³ OpenGHGMap—Europe—CO₂ Emissions in 108,000 European Cities by Daniel Moren, available at: <https://zenodo.org/records/5482480>.

Table 1 Ecological Footprint Indicators of the participating cities' countries. Source: World Population Review (2024)

Country	Total Ecological Footprint (Global hectares) 2024	Ecological Footprint per person (ha/ capita) 2024	Total Biocapacity (Global hectares) 2024	Biocapacity per person (ha/ capita) 2024	Ecological reserve or deficit
Germany	392M	4.7	133M	1.6	−190%
Italy	251M	4.2	56.3M	0.9	−350%
Hungary	38.8M	4	25.1M	2.6	−55%

for 2018, this database consist of data for the three examined cities, therefore we can compare their values. Perhaps the absolute values have changed since this time, but comparisons can be made. According to the database, the per capita CO₂e is the lowest for Budapest (3.4t/cap), followed by Bologna (6.7t/cap) and Würzburg (6.7t/cap). The heating & light industry (1), vehicles (2) and industrial (3) sources are the most important sources for Budapest and Würzburg, while in case of Bologna the air traffic (1) stands on the first place followed by the heating & light industry (2) and 3. vehicles.

For environmental challenges the national level and the local level is always in interaction. The lifestyles are often derived from socio-cultural traditions, values. The ecological footprint is a metric developed by the Global Footprint Network¹⁴ for the assessment of humans' impact on the environment for different territorial scales. The World Population Review,¹⁵ an independent for-profit organization committed to delivering up-to-date global population data and demographics has recently published measures for countries which indicates that on national level similar patterns can be found regarding the impacts like for carbon-dioxide emissions of the participating cities (Table 1). The value of the ecological footprint per person is at the highest in Germany, followed by Italy and Hungary. On national level there are significant differences on the total biocapacity. All participating countries have realized ecological deficit in 2024, whereas Italy has the highest proportion. (Table 1).

3.1.5 Local economy and roles

All three examined cities are important hubs for knowledge accumulation, transport and different industrial activities. The cities represent different sizes, as besides a capital city (Budapest), Bologna is a metropolitan city and Würzburg is a mid-size city. A common point is that universities are available in all of them. With addition to university city role, they are important transportation hubs and host various businesses: Bologna's chief manufactures include agricultural machinery, electric motors, motorcycles, railway equipment, chemicals, and shoes, Budapest is an important centre of finance, banking, and commerce, research and development, Würzburg is a centre of grape growing and of rail and river traffic based on the brief overview available at "Encyclopedia Britannica".¹⁶

3.2 Data collection

The development of the research database is divided into two phases. During phase one, to ensure the robustness of the empirical research, international discussions took place in form of co-creative workshops with professionals competent in circularity transformations before analysing urban portfolios. As a first step, we have defined general selection criteria including for cases: 1. strategic relevance (the offer or the initiative supports the realization of circular lifestyles), 2. contribution to sustainability transitions (meets current needs without compromising the ability to address future needs), 3. easy to understand, 4. replicable and finally 5. contributes to urban resilience, adaptability. As a next step, the institutional background of the good practices has been defined covering businesses (manufacturing, commerce and service providers), Living Labs/ Circularity Labs, municipalities, municipal institutions, NGOs, public service companies, regional authorities and urban initiatives either. Through the application of mutually agreed conditions, the urban portfolios have been evaluated. During phase two, we have evaluated the single cases.

¹⁴ Global Footprint Network, available at: <https://www.footprintnetwork.org/our-work/ecological-footprint/>.

¹⁵ World Population Review—Ecological Footprint by Country 2024, available at: <https://worldpopulationreview.com/country-rankings/ecological-footprint-by-country>.

¹⁶ Encyclopedia Britannica is available at <https://www.britannica.com/>

Table 2 Typology of the circular lifestyle enablers. Source: own compilation

Circular lifestyles enablers	References
Services, circular offers	Partzsch (1964) in Keserü (2013)—[5], Borrello et al. (2022)—[10], Korsunova et al. (2021)—[11], EC (2020)—[15], Circular Cities Declaration (2024)—[18]
Education and awareness raising	Partzsch (1964) in Keserü (2013)—[5], EC (2015)—[14], EC (2020)—[15], Circular Cities and Regions Initiative—[16]
Local community exchange	Partzsch (1964) in Keserü (2013)—[5], Korsunova et al. (2021)—[11], EC (2020)—[15], Circular Cities and Regions Initiative—[16], Circular Cities Declaration (2024)—[18]
Incentives and support	OECD (2022)—[12], EC (2020)—[15], Circular Cities and Regions Initiative—[11], Circular Cities Declaration (2024)—[18]

3.3. Research design

Based on findings from the literature we have developed a typology for analysing circular economy lifestyles enablers (Table 2). The first category is for the *circular offers* which can be provided by wide range of institutions including traditional businesses, companies meeting the requirements of sustainable business models, NGOs, municipal companies etc. The second category is the *education and awareness raising* related to sustainable consumption, circular lifestyles. Education integrates various stakeholders as well, awareness raising initiatives are similar to education in some extent but are for shorter periods and have a nature that they address specific topics. Idea and information exchange, exchange of products, services among inhabitants are major fields for shaping behavioural patterns of consumers, thereby *local community exchange category* has been defined. Different *incentives and support* formats for changing either consumption or production patterns by municipalities, NGOs or other institutions have major role in upgrading urban circular lifestyle portfolios.

We have collected 101 good examples altogether which have been categorised with the typology.

Based on the literature review two research questions have been formulated regarding:

1. What kind of circular offers and initiatives are available which enable consumers to implement circular lifestyles in cities?
2. What kind of methodologies and forms can support consumers to engage in circular lifestyles in urban areas?

For the first question we have classified the good examples according to the typology to assess the distribution of cases. We have analysed the spatial distribution too. Both permanent and temporary offers can facilitate circular lifestyles, therefore we made an analysis on these attributes. Finally, the range of stakeholders who provides specific forms have been mapped.

For the second question we have dived into deeper dimensions and examined the methodologies and forms supporting consumers implementing circular lifestyles. For this we have discovered that the various solutions by four the circular lifestyles enablers categories.

4 Research findings

If we want to understand the dynamic process of circular lifestyle citizenship, it is important to assess the local conditions and enablers both on urban and on national level. As Fig. 2 indicates, all the four types of enablers are relevant for the examined cities. If we analyse the distribution of enablers, we can see that the highest share for the three cities is represented by the services and circular offers. The category of incentives and support is the second for the Hungarian and Italian cases, while education and awareness raising for the German cases. Nevertheless, if we consider the number of identified good examples, we can draw the conclusion that education and awareness raising initiatives are common for all participating cities and countries. Various forms related to local community exchanges have been identified. The relative high number of initiatives from Budapest, Újbuda is due to that the district hosts the largest university campus in the country, as well as the housing is characterized by panel block houses which generates market opportunities

Fig. 2 Circular lifestyles enablers by participating cities, countries. Source: own compilation

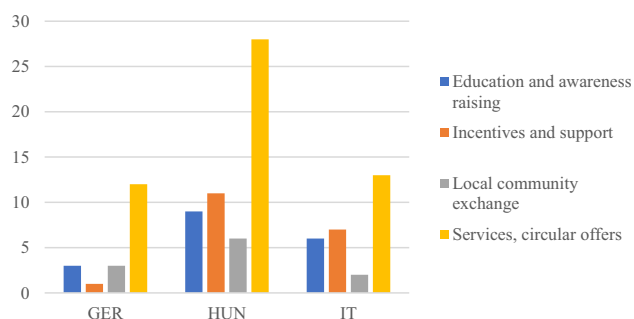
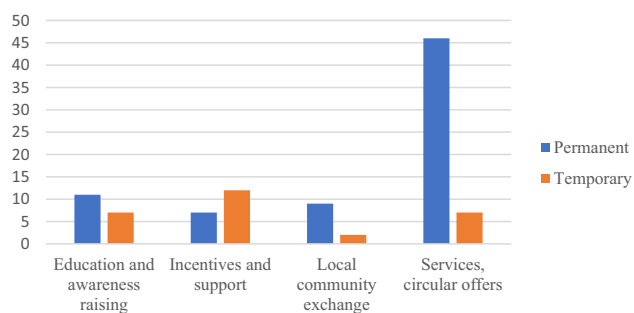


Fig. 3 Permanent and temporary good practices. Source: own compilation



for smaller scale circularity offers. Another aspect, that although we concentrated on the district level, there are some offers, which are in the district, but have larger catchment area from the metropolitan area and neighbouring districts.

If we assess the temporal nature of circular lifestyles enablers we can state, the dominant share of the identified good practices is offered permanently (Fig. 3). In case of the category of incentives and support schemes, the identified good practices with temporary nature has higher share. Nevertheless, there is an important message behind this result: the role of temporary initiatives can be dominant in case of pilot projects enhancing circular lifestyles in urban areas, the dynamic process of upgrading circular lifestyles portfolio of cities and activation of users may start with different experiments.

The institutional ecosystem of circular lifestyle enablers has diverse nature (Fig. 4). As already discussed, cities are complex systems and with the increase of the number of inhabitants service portfolios become widely available. Behind each identified good practice there is someone or groups of people committed to sustain coming from either public or private sector. Representatives from the public sector are regional authorities, public service companies, municipalities and municipal institutions, and different initiatives, and municipalities. NGOs, initiatives by different collaborations of public and private institutions and Living Labs are important representatives too. The growing importance of sustainable consumption and the increasing level conscious consumers provides business opportunities for the private sector as well.

Research findings has revealed that education and awareness raising activities are provided by wide range of stakeholders covering NGOs, Municipalities, Municipal Institutions, Living Labs and different Initiatives. Incentives and support are provided by Regional Authorities, Public Service Companies, Municipal Institutions, and businesses. Local community exchange opportunities are provided by NGOs, Municipal Institutions, and different Initiatives. Services, circular offers are provided by wide range of private and public organisations including Public Service Companies, NGOs, Municipalities, different Initiatives and Businesses. It is important to highlight that there are a few examples among initiatives where different organizations cooperate with each other. This is in line with previous research findings, that circular economy initiatives are provided by wide range of stakeholders. In other words, the portfolio of circular lifestyle enablers is rooted in the urban network of private and public businesses, NGOs, active groups of people in different organizations.

Different circular lifestyles enablers could address various target groups and can be different in their methodologies how they would enhance circular lifestyles citizenship in urban areas as well as forms. Therefore, we have evaluated the good examples on these dimensions (Fig. 5).

Further research was elaborated on how the circular lifestyles enablers have can lead to absolute levels of energy and material/ resource reduction. For this, we have mapped how the different methodologies and forms of circular lifestyles enablers (interpreted in Fig. 5) have the potential to close the loops (Table 3).

Fig. 4 Circular lifestyles enablers by institutions. Source: own compilation

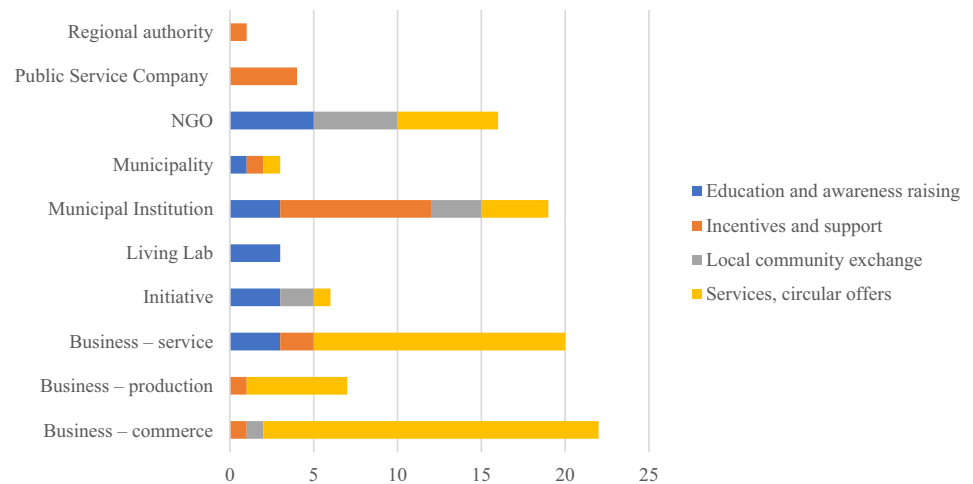
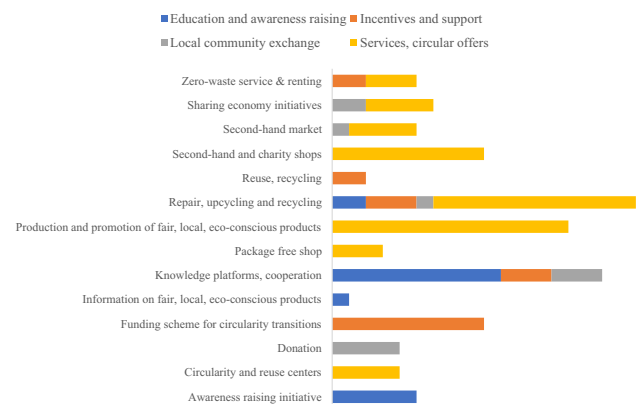


Fig. 5 Methodologies and forms of circular lifestyles enablers. Source: own compilation



5 Discussion

5.1 Circular economic enablers, transitions towards the circular economy

All cities have specific local history, governance, social stratification, institutional background. Although there are certainly a lot common in urban structures that they are not isolated from current trends and effects. Economic shocks, social challenges, stress situations by the climate change, change of industrial structures are all relevant aspects forming future cities trajectories. From sustainable development point of view, cities are human constructions creating high level of demand for resources for specific purposes including natural and built infrastructure, consumption of inhabitants, social services like education, healthcare, culture etc. Urban structures simultaneously have narratives—they are not just human constructions of bricks and stones but embody specific unites with own stories, rules, celebrations and human interactions, governance. Cities can adopt and change lots of measures to meet the requirements of being circular—in our research we paid special attention to circular lifestyles. If cities want to adopt new policies for circular lifestyles or fine-tuning existing policies for sustainability transitions they could gain valuable insights from our research.

Circular lifestyles can be facilitated through various forms either on permanent or temporary base. The assessment of good examples for enablers can help to identify right decisions. Like in our assessment, it is important to assess various forms of offers and initiatives.

Services and circular offers can be easily detected since they are visible in the urban fabric. Traditional forms of these offers are provided by local producers, second-hand & charity shops, markets, small businesses for repair, re-manufacturing. Newer forms of these offers are the circularity and reuse centres, package free shops, sharing economy initiatives. These alternatives often build on community engagement, and education as a supplemental element. *Education and awareness raising* activities targets to raise the level of knowledge and providing new alternative narratives to sustainable

Table 3 Relationship of circular lifestyles enablers and resource loops. Source: own compilation

Loops				
	Shortest (refuse, reduce, resell/reuse)	Medium long (refurbish, remanufacture, repurpose)	Long loops (recycling)	
Circular lifestyles enablers	Education and awareness raising	Awareness raising initiatives (promotion of zero waste approach, thematic activities for sustainable consumption for e.g. zero waste educational trails, parks) Information on fair, local, eco-conscious products Knowledge platforms, cooperation (online platforms, Living Labs, third places, environmental education) Repair, upcycling and recycling (educative workshops for repairing)	Awareness raising initiative (communication campaigns, festivals for the promotion of longer use of products and alternative redevelopment options)	Awareness raising initiative (communication and education on waste collection)
	Incentives and support	Funding scheme for circularity transitions (grants for individuals for e.g. rainwater collection, composting, gardening, increasing the number of kitchen gardens on balconies, with financial incentives; community-based online point collection competition for organizations where winners can receive funding for circularity transitions) Knowledge platforms, cooperation (grants for NGOs for small urban-scale projects for circularity, digital innovations that promotes and facilitates sustainable solutions, for e.g. withdrawals from the market) Reuse, recycling (yearly waste collection of larger goods) Zero-waste service & renting (reusable goods provided by municipalities or other nonprofit organizations)		Repair, upcycling and recycling (innovative upcycling and recycling options via digital platforms or physical waste treatment plans) Reuse, recycling (Yearly waste collection of larger goods)
	Local community exchange	Donation (food sharing, donation of various items to non-profits) Knowledge platforms, cooperation (community places offered temporary by nonprofit organizations and municipalities for citizens, other organizations for events, idea exchanges, community gardens) Repair, upcycling and recycling (repair cafés) Second-hand market (swaps by different nonprofits) Sharing economy initiatives (places in which people can borrow and lend their items for free upon registration, shared premises by NGOs and municipalities)	Repair, upcycling and recycling (repair cafés)	
Services, circular offers		Circularity and reuse centres (hubs for donation, reuse, repair services and events) Package free shop (businesses with strong community building, renewing urban and rural linkages, promotion of zero waste culture) Production and promotion of fair, local, eco-conscious products (embodying short supply chains, slow life, small scale production with community development) Repair, upcycling and recycling (specialized businesses) Second-hand and charity shops (specialized businesses including non-profits) Second-hand market (regular and irregular permanent swaps, often thematic for e.g. books, plants, clothes, homeware) Sharing economy initiatives (businesses providing place with tools and equipment for DIY, repair, vehicle sharing, coworking places) Zero-waste service & renting (lending tools, bicycle delivery services)	Circularity and reuse centres (some centres' offers refurbishing) Repair, upcycling and recycling (businesses for refurbishing, remanufacturing and upcycling deadstock materials)	Repair, upcycling and recycling (recycling businesses)

consumption. Awareness raising activities can take form in various ways, like festivals (for e.g. Future action Day—sustainability Festival, organized by Memo Stiftung in Würzburg), educational and outdoor activities (for e.g. Villa Chigi Park in the southern side of Bologna with an ideal outdoor space to practice and teach environmental education offer by the Fondazione municipal institution) and exhibitions (Zero-waste learning trail by a Hungarian NGO). Communicating on circular lifestyles via different platforms can help customers including online and printed media, workshops, Living Labs. Cities are ideally can facilitate exchange of ideas and social interactions among inhabitants resulting *local community exchanges*. Interactions may include different types of donations, swapping, community workshops at repair cafés, engaging inhabitants to community gardens. These activities are carried out by enthusiastic individuals and different cooperatives for driving specific social change. *Incentives and support* to sustain circular lifestyles have high importance. Free waste collection services; funding schemes for circularity transitions (replacing traditional light bulbs with energy-saving LED bulbs in homes); building cooperations for recycling and providing access to plants where non-used items can be given forward have the potential to raise the level of the commitment of inhabitants.

Our results are underlining the importance of physically manifested enablers of circular lifestyles as well as the role of educative, awareness-raising activities and measures. The methodology how local inhabitants can be engaged into specific urban questions have been enriched in the last decades. New forms of participatory approaches have been introduced, including the concept of Living Labs. In the next chapter, we will discuss the importance of stakeholder engagement with special attention to the Living Lab approach. Regarding awareness raising activities both good and bad news are available. Nowadays there are tremendous alternatives for communication purposes which contributes to the creation of both reliable information and fake news. Institutions with positive reputation have the role to communicate on social questions, formulating debates on classical channels and social media platforms. Another case study is related to this concern.

5.2 The importance of stakeholder engagement for enhancing circular lifestyles

The European Commission, since in the first Action Plan for the Circular Economy in 2015 [14] highlighted the importance of stakeholders' engagement, adopting a systemic approach [40]. According to the European Commission's New Circular Economy Action Plan (EU-COM 2020 98 finale), for achieving CE transition, the co-creation between different actors (public institutions, economic actors, citizens and civil organisations) is of paramount importance. Therefore, the urban communities and citizens involvement is an essential aspect to implement CE in territorial areas [41].

The involvement of communities and individual citizens, particularly in their role as consumers and users, is a key part of the EU Action Plan to accelerate the transition to the new circular model. By adopting behaviours and making choices consumers can reduce their environmental footprint [42], both by expressing their demand for goods and services designed and produced according to the principles of the of circularity, and both by stimulating changes in the way companies produce products or services. However, consumers need to be supported and actively involved in this process of transformation of the economic model, as many different barriers may prevent them from them from taking a conscious and active role. These barriers are linked, for example, to a lack of knowledge and environmental awareness, information asymmetries and lack of confidence in the possibility of real change, the conditions of the market, institutional/regulatory and social context [43].

Involving citizens in initiating and conducting experiments and learning about sustainable pathways can enhance the governance capacity needed to accelerate effective and efficient transitions to innovative urban systems based on circular economy principles. These transformation processes also generate cultural shifts in society, affecting everyday social practices [44].

In drafting the Helsinki Manifesto at the end of 2006, the EU explicitly referred to Living Labs as a promising public policy tool to bring institutions and businesses into direct communication with citizens and research [45]. The Living Lab in urban contexts is defined as an innovative policy instrument that is open to involving people as users and co-creators throughout the development process to explore, investigate, experiment, test and evaluate new ideas and creative solutions in complex, everyday contexts [46].

The Living Labs approach can be used to design, explore and test policies, programmes and projects and assess their potential impacts, using methods and tools that integrate technical and policy assessments. These approaches allow for the analysis of changes in the relationship between the natural and built environment and the human community, stimulating reflection on the collaborative aspects of decision making [47]. However, it is only in the last three decades that the concept of LL has gained acceptance and attention among policy makers, academics and private sector organisations,

with very different interpretations depending on the context of application [48]. According to recent literature, LLs can have different meanings and can be interpreted as research methods, learning environments or policy instruments [49].

ULLs differ from LLs in their search for locally sustainable solutions to urban problems. Indeed, in ULLs, the actual context of innovation is a specific territory or place, and the answers are found by involving citizens and local stakeholders. ULLs have been implemented to support cities in accelerating sustainable transitions (such as climate and energy transitions) by facilitating the development and operationalisation of innovation, experimentation and knowledge in real urban contexts, and by highlighting the important role of participation, engagement and co-creation [50]. The circular economy is a priority for many agencies and academic institutions in European countries and is a promising concept for industry, society, and policy development.

Involving local communities has been shown to have a positive impact on citizens, encouraging them to work together to find solutions and strategies to operationalise sustainability principles, leading to increased trust in institutions and between actors in new communities. Co-creation can generate new and unusual ideas through the presence and collaboration of different stakeholders at the same time and in the same place. They can help to identify problems and challenges, desired trajectories that are seen as feasible solutions and can be followed to address complex systems [47]. Urban Living Labs provide a forum for innovation applied to the development of new products, systems, services and processes, using working methods that involve people as users and co-creators throughout the development process, to explore, investigate, experiment, test and evaluate new ideas, scenarios, processes, systems, concepts and creative solutions in complex, real-world contexts, thus enabling innovative and transformative improvements throughout the urban environment, from buildings to green spaces, from transport to energy systems, from local food to sustainable forms of consumption [51–53]. Other experiences that have seen the active involvement of citizens are related to circular economy issue. Through the ULL methodological approach, the co-design of circular economy solutions was achieved with the involvement of local community and stakeholders [54, 55]. As a result, a systemic and collaborative change has seen an inception especially for what concern the activation of local urban communities through the experimentation of circularity and capacity building in the development of new skills and consumption models.

5.3 Awareness raising for the enhancement of circular lifestyles—big points for sustainable consumption

5.3.1 Concept of big and key points

We have already established that citizens are part of the shared responsibility for sustainable and circular consumption. By adopting behaviours and making choices consumers can reduce their environmental footprint [42], but they need support. The Living Lab approach is one option to support the local community to learn about circular lifestyles and to develop new solutions. For everyday life, one challenge may remain: how do citizens know which guidelines for a circular lifestyle are best to follow? The findings in chapter 2.3 underline that CE and sustainable lifestyles are perceived mainly as involving recycling activities. Whereas activities that appear time-consuming and expensive but save a lot of CO₂, like reduced air travel or switching energy supplier and sources, are less popular. In addition to the much-cited ‘jungle of labels’ for sustainable products [56], there are also countless tips and guides on sustainable consumption in popular literature. This diversity can be overwhelming, and it is possible that either the wrong priorities are set, or people capitulate completely in the pursuit of a circular lifestyle.

The concept of Big Points for sustainable consumption, which is based among others on ideas by Michael Bilharz [57] and is constantly being further developed at UBA, is designed to counter the challenges mentioned above and support interested citizens in sustainable consumption. It can be easily combined with the LL approach.

Despite methodological differences and different approaches to the topic, the majority of existing studies confirm the following three areas as the most important areas of need in the field of sustainable consumption in terms of environmental relevance: construction and housing, mobility and nutrition are responsible for 70 to 80 per cent of the environmental impact of consumption. [58]

This high relevance is also evident when looking at the average CO₂ footprint¹⁷ per capita in Germany. On average, of the total annual 10.5 tonnes of greenhouse gas emissions of a German, around 24 percent are attributable to housing and electricity, 21 percent to mobility and 17 percent to food. The ranking of relevance within the three fields can also change depending on the impact category under consideration [58].

¹⁷ CO₂ data in this study refer to CO₂ equivalents (in short CO₂e).

It is important to prioritize these areas of need, although it is not sufficient. Not all individual measures allocated to these areas have necessarily a particular high environmental relevance. In the area of nutrition, for example, the “amount of meat consumption” or the “purchase of organic products” are Big Points. Whereas “not eating strawberries in winter” only has a small savings potential in absolute terms [58].

Measures in the area of sustainable consumption thus differ depending on their actual environmental relevance. However, this is not the only differentiation that should be considered. In addition, the measures can also differ in terms of their likelihood of implementation and acceptance among the population. The Big Point “no flying”, which has a high environmental relevance, is rather unpopular among the population and is perceived as restricting freedom [58]. But there are also Big Points that are more in demand and implemented by a growing number of people. These measures can have a positive impact on the actions of other stakeholders in sustainable consumption, such as politicians, companies and other consumers. For this type of measures, also known as Key Points or Key Decisions, research includes among other things thermal insulation, car sharing and investment in renewable energies [57, 59].

Overarching questions of sustainable consumption, the level of disposable income is also relevant for the individual carbon footprint. People with higher incomes tend to live in larger homes, are more mobile or own a larger car. Therefore, their CO₂e emissions, resource consumption and the associated environmental impact tend to be higher as well. People in Germany with a personal monthly income of less than €1,000 have average per capita greenhouse gas emissions of 8.45 tonnes—9.21 tonnes. For people with a monthly income of over €3,500, the average greenhouse gas emissions are almost 14 tonnes [60].

5.3.2 Seven Big Points for change

Based on its own CO₂ calculator [61], UBA proposes 7 measures that can halve the average CO₂ footprint of a person per year in Germany. In line with the Key Points concept, most of these measures are also characterised by the fact that once they have been integrated into people’s routines, they do not need to be considered any further. One example of this would be the energy-saving shower head: the energy-saving shower head can save up to 0.3 tonnes of CO₂e. The decision to use the energy-saving shower head only has to be made once, after which citizens do not have to change their behaviour. The same applies to decisions to give up their own car and use public transport/car sharing or switch to green electricity [62].

The following 7 measures are proposed:

- Saving shower head = −0.3t CO₂e
- Avoiding flying = −0.5t CO₂e
- Insulated living space = −0.5t CO₂e
- Plant-orientated diet = −0.5t CO₂e
- Green electricity = −0.5t CO₂e
- Drive less by car (public transport, bike, car sharing) = −1.0t CO₂e
- Conscious consumption (use products longer, repair, 2nd-hand) = −2.0t CO₂e

We can therefore see that the activities considered by citizens to be most relevant to circular lifestyles and which are highly popular in implementation (like recycling or limiting of single use plastic) differ from the Big Points. Although recycling activities are important, it can sometimes help in decision making to know which activities have a higher positive impact on the environment.

However, we can also see that the methodologies and forms of circular lifestyles enablers in Fig. 5 partly consider the Big Points: for example, the sharing economy (car-sharing) and conscious consumption in the form of longer use, 2nd-hand and repair are addressed.

5.3.3 The handprint as a positive addition

Shared societal responsibility for sustainable consumption measures is important because, even if people want to reduce their own CO₂ footprint, they have limits. The possibilities for reduction of individual CO₂e emissions depend among other things on the structures available to us, socially, politically and in terms of infrastructure. Working to change these structures or encouraging other people to adopt climate-friendly behaviour means increasing the own handprint. The handprint concept was first introduced by the Indian NGO ‘Center for Environment Education’ (CEE) at the 4th International

Conference on Environment Education [63]. Since then, it has been continuously developed by various organizations and there are even concepts for carbon handprints for cities and regions [64].

So, the carbon footprint refers to the emissions each person causes and to corresponding individual opportunities one can take to reduce these emissions. One's own handprint, on the other hand, refers to actions that reduce CO₂ emissions and other environmental consumption by other people. In contrast to the reduction of the footprint, the potential of the handprint is unlimited [63].

Overall, there are three levels on which your own handprint can be increased [62]:

- In your personal environment: e.g. by sharing your own sustainable consumption patterns with others (Purchase of organic products or procurement of green electricity for the entire housing community),
- Through financial means: this includes green investments, donations to organisations that are committed to climate protection or offsetting your own CO₂ emissions,
- At a social level: petitions, demonstrations, referendums, political commitment to climate protection.

With the Big Points concept, citizens are able to overcome their possible reservations about sustainable consumption and circular lifestyle. They only need to focus on a few, but relevant, measures in order to contribute to climate protection. This can free up capacity and motivates to advocate for better structures for circular lifestyles beyond their own carbon footprint and thus increase their own handprint. For example, by participating in urban living labs in their neighbourhood. The concept can also help to improve the relevance of initiatives and offers for circular lifestyles. In particular, if they focus on topics that address the three most important areas of need.

5.4 Recommendations, limits

While we were able to identify several circular lifestyle actors, forms and methods for the implementation of circular lifestyles in urban areas, it is important to note that the influence of these activities on concrete energy and material/resource saving can be different to high extent due to different characteristics. Our research focused on cities with high population density, therefore they have market potential for various for-profit businesses because they offer significant threshold. Nevertheless, based on previous analyses we assume that circular offers can be maintained in smaller settlements too, but in such cities, the role of local governance and nongovernmental institutions are vital. Innovative business models which can provide answers for scattered market area are also profitable options like periodic circular offers, moving shops, or pop-up stores. Nevertheless, we believe that different options described in our research can be adopted to various urban context. Our research also contributes to that how urban portfolios are linked to resource loops, which as a general model can be applied in each type of settlements from hamlets through small- and medium-sized towns to metropolitan areas since in all we must address the "weak sustainability approach". Concerning limitations, we must admit, that quantifying the energy and material/resource savings of the identified 101 good examples are not part of the analysis (it would be a topic of a broader research project), for which purpose we recommend cities to implement circular roadmaps with integrated monitoring systems for measuring the direct and indirect benefits.

As we have seen, the examined cities are dedicated towards circular transformations, however there are certain obstacles both on local and national level for implementing CE initiatives. Based on the classification for 'gaps' (Funding, Regulatory, Policy, Awareness, Capacity) of the „Circular Economy in Cities and Regions: Synthesis Report by OECD" in 2020, we have identified several problems, weaknesses, challenges and perspectives for cities, when trying to implement circular lifestyles in their centres. Among these gaps, the regulatory gap is applicable for the national and regional level, and we can say, that in countries where multi-tier governance is typical (Germany and Italy), a broader range of regulatory measures are available. Concrete policies can be made on the basis of these gaps. On an urban and district level this means, for example:

- Financing of businesses linked to environmental responsibility, reduction of environmentally harmful subsidies (Funding Gap);
- CE-Capacity building for local authorities, business owners, citizens; promotion of cooperation and coordination between different action levels (Capacity);
- Expansion of cycling and public transport in city centres (Capacity); Formulation of concrete targets for recycling, food waste, mobility, etc.; right to repair (Policy) [9].

At European level, activities that promote cooperation and exchange between cities and regions are particularly important. These include the aforementioned CCRI, ECCD and ECESP. Here, good examples can be exchanged and disseminated. Other cities across Europe have taken action to promote circular lifestyles and consumption. In particular, the authors analysed the cases reported in the 2024 Circular Cities Declaration report:

- In Espoo (Finland), i.e., various events and exhibitions for citizens have been organised to increase awareness and motivation for a circular lifestyle. The topics have covered sorting of household waste, circulation of plastic, repairing of clothing, and sharing economy among others
- In Leuven (Belgium), the circular economy strategy of the city was built around five objectives, in which circular consumption and repair-share-reuse are the main objectives.
- In the city of Mechelen (Belgium) the circular consumption habits is promoted through a multidimensional approach and initiatives from below, promoting digital inclusion for the elderly, disabled, and the economically disadvantaged [18].

6 Conclusion

Considering the current trends of urbanization and progress towards the implementation of 2030 Agenda, the 17 Sustainable Development Goals (SDGs) pose stress on cities. There is need for redefine the role of urban areas towards transition to sustainability as cities are important hubs of various forms of consumption, public services, exchange of goods and ideas among people, institutions, businesses, embodying a social, cultural, political, and economic interaction system [4].

Although alternative and sustainable consumption models leading to more circularity and sufficiency do exist, due to the current framework conditions, these models usually only remain in their niche. Consumers therefore lack a central and easily accessible offer of alternative forms of consumption. Circular lifestyles can be facilitated by different political measures, action plans, development plans, strategies and programmes that support them. Besides these, circular lifestyles can be implemented if the local portfolio of various sustainable consumption offers are sufficient. The business models which define these services portfolios can be diverse both in nature and vulnerability to different various shock events or crises which highlights the importance of local-level assessment.

But even then, a growing number of circular businesses alone does not guarantee the spread of circular lifestyles in the whole society. Therefore, in our research we aimed at answering two questions, namely: 1. What kind of circular offers and initiatives are available which enable consumers to implement circular lifestyles in cities? and 2. What kind of methodologies and forms can support engaging consumers to circular lifestyles in urban areas? Answering the first question, based on literature findings, we have developed a typology for circular lifestyle enablers covering: Services, circular offers; Education and awareness raising; Local community exchange and Incentives and support. Our results from the three participating cities (Bologna, Italy; Budapest, Hungary and Würzburg, Germany) has proved that demand-side solutions must be accompanied by initiatives which aim at the transformation of behavioural patterns of inhabitants. Answering the second question, it is important to pay attention to that CE citizenship is a dynamic process. Furthermore, engagement of stakeholders with the application of Living Lab approach and awareness raising has high importance for the facilitation of circular lifestyles. Moreover, care should be taken to ensure that the really important activities for a circular lifestyle and sustainable consumption, the Big Points, are considered and included within the different initiatives and offers.

Our research shows the diversity of both circular lifestyle offers and the stakeholders who implement them. It is therefore important for cities to consider all these options if they want to promote circular lifestyles in their centres. Our analysis has proved that consumption alternatives for circular lifestyles are offered by wide range of stakeholders including not just businesses rather NGOs, municipalities, municipal institutions, public service companies, Living Labs and different initiatives, regional authorities. We have mapped 14 different methods for implementing circular services including 1. zero-waste service & renting, 2. sharing economy initiatives for transportation, co-working spaces and community places for goods' exchange, 3. second-hand markets on temporary base, 4. second-hand and charity shops, 5. reuse and recycling initiatives, 6. repair, upcycling and recycling including good examples of Repair Cafés, services, businesses, social enterprises with recycling purposes, 7. production and promotion of fair, local and eco-conscious products, 8. package free shops, 9. knowledge platforms, cooperation, 10. information on fair, local and eco-conscious products, 11. funding schemes for circularity transitions, 12. donation, 13. circularity and

reuse centres, 14. awareness raising initiatives. Circular lifestyles can be facilitated through various forms either on permanent or temporary base. The assessment of good examples for enablers can help to identify right decisions. Like in our assessment, it is important to assess various forms of offers and initiatives.

For politics on each level, this means that in future they should actively consider circular lifestyle offers in urban development and take advantage of their benefits for citizens and the environment. On the other hand, funding and support services should be designed flexibly so that the diversity of offers can be fully utilized (who will implement it how; permanent or temporarily).

Cities must consider environmental protection and sustainability in their planning. In doing so, they are dependent on circular lifestyle pioneers and offers. And our Research shows: The range of circular lifestyle actors, forms and methods is almost unlimited. Practitioners should therefore also think about unusual cooperation's. Temporary actions also have many advantages, such as making options and visions tangible before they are planned in a time-consuming and permanent manner, they are creating opportunities for small businesses/offers, they are increasing the attractiveness of real estate as well as stakeholders can test new formats.

In order to sustain circular offers the cooperation of local actors is inevitable. An important aspect that can be the subject of future research is to explore the possibilities of the model of co-governance in the form of public-community partnerships, as extensively explored by Sheila R. Foster and Christian Iaione (2022) [65] raising from Ostrom's design principles [66, 67].

The present paper suggests that the future perspective of research related to circular lifestyles enablers should also be directed towards studying how to consolidate the alliances between the different actors involved in the process towards more circular consumption and lifestyles. It might also be interesting to analyse in more detail the results of concrete pilot projects for the enhancement of circular lifestyles and their impact at both individual and societal level, and to compare them with other initiatives or methods. In addition, other important aspects of research are related to the gender aspects of circular lifestyles.

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Data availability For this study, a dataset of 101 circular good examples related to the enhancement of circular lifestyles has been developed. As not the individual cases, rather their patterns are analysed in the study, the list of concrete initiatives – with special attention to the size of the dataset – are not publicly available but are available from the corresponding author on reasonable request.

Code availability Not applicable.

Declarations

Competing interests The authors declare no competing interests.

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