D.1.1.1 Circular lifestyle monitor tool for cities - Manual

Activity 1.1 Status quo assessment and needs analysis of our target groups

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Content

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1 INTRODUCTION AND BACKGROUND

The 'From Niche to Centre - City Centres as Places of Circular Lifestyles' (NiCE) project focuses on two main challenges: 1. a transformation of central places in cities that make it easy for their inhabitants to implement sustainable lifestyles and 2. at the same time to (re)animate centres in a more circular way. The project aims to change the architecture of our consumption **through promoting new, sustainable consumption behaviour**.

During the project, NiCE partners introduce educational, inspirational, and exchange formats to municipalities, regions, providers of alternative consumption, citizen associations and policymakers. This circular lifestyle monitor tool - which helps to quickly analyse status quo, challenges, and potentials for circular lifestyle in cities - **is one of these formats.** Users of the monitor tool would be **municipality departments** specialized for strategic planning, environmental planning and city property management. The monitor tool would be beneficial for **NGOs** and other **specialized institutions** as well. **The tool would enhance the community-based-planning in municipalities by the selection of targets for the enhancement of circular lifestyles and definition of concrete measures, indicators.**

The **circular lifestyle monitor tool is an outcome of an iterative research and collaboration process**, meanwhile partners of NiCE project have:

- **assessed sustainable consumption patterns and supporting business models that play a role in the circular development of NiCE pilot cities/ towns** *(Bologna and Porto-Saragozza district in Italy, Brzeg Dolny in Poland, Budapest and Újbuda district in Hungary, City of Jihlava in Czechia, Graz in Austria, Košice in Slovakia, Ptuj in Slovenia and Würzburg in Germany)* and,
- **analysed the needs and visions of their target groups** (cities and initiatives / providers of new business models, existing networks) to identify transnational challenges and potentials.

We were aware of the fact that there are several monitor tools and frameworks for the promotion of circular economy, with particular concerns for circular lifestyles. Accordingly, we have analyzed and assessed a few frameworks from this range including the The OECD Inventory of Circular Economy Indicators, WBCSD – Circular Transition Indicators v4.0, the ReSOLVE Framework, EBRD Green Cities initiative, City Loops – Measuring Ciry Circularity system, indicators proposed by the c40knowledgehub and the ENEL X circularity city index for Italy.

As the European Parliament suggests, the circular economy is a model of production and consumption which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible to extend the life cycle of products (europarl.europa.eu). As we can see from Figure 1, the circular economy model applies a systematic approach for value creation (extraction of raw materials, sustainable design, production), distribution, consumption, waste collection and management. In the NiCE project the primary focus in on the consumption phase.

1. Figure The circular economy model. Source: European Parliament Research Service, acessed from: europarl.europa.eu

Reike, Vermeulen & Witjes (2018) analyse Value Retention Options in Circular Economy which would frame sustainable consumption patterns and supporting business models.

In their study they develop three main groups for value retention (Table 1):

- **Client/ user choices** by refuse (refrain from buying), reduce (use less, use longer, buy local as well as sharing) and re-sell & re-use (buy second hand or unused goods),
- **Product upgrade** by repair (making the product work again), re-furbish and re-manufacture (a remanufactured product will have all the components replaced on it, all

3

to the new specification, while refurbished products only have the failed components replaced) and,

- **Down-cycling** by re-purpose/ re-think (components in composite products), re-cycle (materials), recover (energy) and re-mine (landfilled material).

Table 1: Value Retention Options in Circular Economy

	R#	CE concept	Object	Owner	Function	Key activity customer	Key activity market actor
Client/ user choices	R0	Refuse	Product	Potential consumer	N.a.	Refrain from buying	2nd life cycle Redesign
	R1	Reduce		Consumer	N.a.	Use less, use longer; recently: share the use of products	2nd life cycle Redesign
	R2	Re-sell/ Re-use		Consumer	Original	Buy 2nd hand, or find buyer for your non-used produced/possibly some cleaning, minor repairs	Buy, collect, inspect, clean, sell
Product upgrade	R3	Repair	Components of composite products (old product with new parts)	1st or 2nd consumer	Original	Making the product work again by repairing or replacing deteriorated parts	
	R4	Re-furbish		Original or new customer	Original, upgraded (large complex products)	Return for service under contract or dispose	Replacement of key modules or components if necessary
	R5	Re-manufacture			Original, upgraded		Replacement of key modules or components if necessary, decompose, recompose
Down-cycling	R6	Re-purpose (Re-Think)	Components in composite products (new product with old parts)	New user	New	Buy new product with new function	Design, develop, reproduce, sell
	R7	Re-cycle	Materials	Collector, processor, waste mgt. company	Original or new	Dispose separately; buy and use secondary materials	Acquire, check, separate, shred, distribute, sell
	R8	Recover (Energy)	Energy content	Collector, municipality, energy company, waste mgt. company	New	Buy and use energy (and/or distilled water)	Energy production as by-product of waste treatment
	R9	Re-mine	Landfilled material	Local authorities; Land owner	New	Buy and use secondary materials	Grubbing, cannibalizing, selling (South)/ high-tech extracting, reprocessing (North)

Source: own editing based on Reike, Vermeulen & Witjes (2018)

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From the 9 value-retention option in CE the first seven is directly connected to circular lifestyles by reducing the level of buying new goods, repairing and reusing products and recycling waste, but only after an item is beyond repair and reuse. One may find the navigation between CE concepts a challanging task. The Life Cycle Assessment, a systematic analysis of environmental impact over the course of the entire life cycle of a product, material, process, or other measurable activity can be a key solution to increase the level of information. Nevertheless, we must admit, that the importance of highlighting diverse portfoilio of value retention activities is important in oder to avoid considering CE as single recycling activity which is dominant in current discourse. To receive further information and insights for the value retention options in circular economy related to circular lifestyles, *see Chapter 3.1* in the Appendix.

2 THE MONITOR TOOL

2.1 Background

NiCE partners have agreed on that the circular lifestyle monitor tool should be an easy-to-use excel datasheet. The monitor tool is available at the following link:

> https://docs.google.com/spreadsheets/d/1v5r2peeJ3gELc6oMVRLAljGWPjpa3CtP/edit?usp=sharing&ouid=113985875652512061877&rtpof=true&sd=true

The monitor tool primarily targets the local, urban level and should focus on the residential behavioural patterns. For the valorisation of the monitor tool trainings for users and adaptation to national languages would be necessary. As already mentioned in the introduction, users of the monitor tool would be municipality departments specialized for strategic planning, environmental planning, and city property management, as well as for NGOs. **We highly recommend to integrate the monitor tool into a community-based-planning process**. The planning process for the enhancement of circular lifestyles comprises the following steps:

- situational analysis about current offers,
- definition of a common vision and objectives,
- selection of various actions, definition of desired results and outcomes paralelly to the
- selection of indicators for monitoring, and finally to
- measure the short-term and longterm results, effects.

Since the enhancement of circular lifestlyes requires change in the **target audience behavioural patterns towards consumption, the importance of community engagement is high.**The monitor tool contains a dozen of indicators, that's why self-tailoring based on the vision and objectives has high importance. Thematic groups among indicators may help the selection of specific measures.

As discussed before, we have used primary and secondary sources for the definition of the monitor tool. Findings on the assessment of sustainable consumption patterns and supporting business models that play a role in the circular development of cities from NiCE project have been summarized in the D.1.1.2 Synthesis report for NiCE Consortium. Chapter 3.3 in the Appendix summarizes those outcomes which have been taken into account when developing the monitor tool. Table 2 provides an overview about the range of indicator systems and approaches analyzed. Detailed description is available at Chapter 3.2 in the Appendix.

2. Table indicator systems and approaches from secondary sources for the development of monitor tool

Name	Description & access
The OECD Inventory of Circular Economy Indicators)	The OECD published its comprehensive inventory of circular economy indicators in 2021. The main objective was to collect and provide measures to assess circularity at different spatial scales, such as national, regional and local. The indicators are taken from existing studies, roadmaps and strategies.More info: https://www.oecd.org/cfe/cities/InventoryCircularEconomyIndicators.pdf
World Business Council for Sustainable Development [WBCSD] Circular Transition Indicators v4.0	As an umbrella association of companies with real commitments regarding sustainable operation, the WBCSD published its renewed set of indicators and framework concerning circular transition in 2023. The applied methodology is a 4-step approach; depending on whether how deep a company wants to dive into the circular transition steps, it goes through closing, optimizing, valuing its loop, and the impact of the loop. More info: https://www.wbcsd.org/Programs/Circular-Economy/Metrics-Measurement/Resources/Circular-Transition-Indicators-v4.0-Metrics-for-business-by-business
ReSOLVE Framework by The Ellen MacArthur Foundation	The ReSOLVE framework is dedicated to describe and assess circularity principles regarding the built environment (Iyer-Raniga, 2019). It is based on the action side of the circular economy, providing an easy-to-adopt system for decision-makers on every level of cities and companies. The acronym encodes a six-step approach: regenerate, share, optimize, loop, virtualize, and exchange. More info: Iyer-Raniga, U. (2019). Using the ReSOLVE framework for circularity in the building and construction industry in emerging markets. *IOP Conference Series: Earth and Environmental Science*, *294*(1). https://doi.org/10.1088/1755-1315/294/1/012002
European Bank for Reconstruction and Development (EBRD) Green Cities initiative	The platform showcases over 50 policy instruments to promote a more sustainable future for cities and their residents, and contextualizes these measures through practical examples from more than 60 case studies across the world. More info: https://www.ebrdgreencities.com/green-cities/about/
City Loops – Measuring Ciry Circularity system of seven	The ultimate aim is to enable the development of circular cities in which no resource goes to waste, driving the transition to the circular economy. The project has developed a comprehensive indicator set for circular cities, including guidance on how to measure them. More info: https://cityloops.eu/
The C40 Knowledge Hub	Provides access to cutting-edge insights and practical resources from leading climate cities. More info: https://www.c40knowledgehub.org/s/?language=en_US
ENEL X circularity city index	The Circular City Index is a free tool that calculates the 'level of urban circularity' of Italian municipalities. More info: https://www.enelx.com/it/it/istituzioni/sostenibilita/open-data-pubblica-amministrazione/circular-city-index

Source: own editing

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After the review of the existing measures, systems the final monitor tool incorporates findings of NiCE partners and specific selected indicators from the OECD Inventory of Circular Economy Indicators (2021) as the later is a wide-spectrum document itself which considered several relevant strategies and programmes in different countries, cities.

2.2 Indicators in the monitor tool for local planning

The selected indicators follow the interpretation of OECD Inventory of Circular Economy Indicators. They cover all the five categories with respectively to 1) Environment, 2) Economy and business, 3) Governance, 4) Infrastructure and technology, 5) Social (Jobs) and all sectors (Air, Built environment, Culture, Education and knowledge, Energy, Food, Industry, Land use, No sector specific, Public administration, Resources, materials, waste, Reuse, repair, share, Textile, Waste, Water).

The monitor tool helps the planning process for the enhancement of circular lifestyles by providing cireria for the situational analysis about current offers (1), helping the definition of a common vision and objectives (2), selection of various actions (3), definition of desired results and outcomes (4) paralelly to the selection of indicators for monitoring (5), and finally measure the short-term and longterm results, effects (6). During the selection of relevant indicators measuring the circular lifestyle in cities, we have defined the following categories to the indicators (type) which helps for what purpose the indicator can be used:

- **Circular lifestyle ecosystem** (facilities, businesses for circular lifestyle) for situational analysis to define realistic vision an objectives on the enhancement the circular lifestyes based on what the settlement have or could have,
- **Circular lifestyle actions** (actions for promoting circular lifestyle) for demonstrating insights what kind of actions can contribute to the realization of the vision and objectives,
- **Performance indicators** (track specific actions or activities) for measurement,
- **Policy interventions** (interventions for enhancing circular lifestyle) as special types of actions for the enhancement of circular lifesytles, and finally
- **Result indicators** (measure the results from various actions as an aggregate) for the measurement of short-term and long-term effects.

Table 3 highlights the categories, subcategories, and sectors of selected indicators.

3. Table Categories, sub-categories & sectors of the selected indicators for the circular lifestyle monitor tool from the OECD Inventory of Circular Economy Indicators and solutions identified by NiCE partners

Subcategory / Sectors	Environment			Economy and business				Governance									Infrastructure and technology				Social
	Emissions	Output material process	Production and consumption	Business	Gains and revenues	Investments	Savings	Awareness raising	Capacity building	Collaboration	Education	Financing	Innovation, pilots and experiments	Monitoring and evaluation	Stakeholder engagement	Strategy and initiatives	Area	Certificates	Design	Equipment	Jobs and human resources
Air	■																				
Built environment				■				■	■							■			■		
Culture													■								
Education and knowledge								■	■												
Energy																■					
Food								■	■							■	■	■			
Industry				■				■													
Land use																	■				
No sector specific								■	■	■	■	■	■		■		■	■	■		■
Public administration								■	■												■
Resources, materials, waste		■	■											■	■		■			■	
Reuse, repair, share		■		■	■	■	■	■	■	■					■	■	■			■	
Textile		■						■							■		■				
Waste		■													■		■				
Water			■					■								■					

Source: own compilation based on OECD (2021) and NiCE Synthesis report (2024)

3 APPENDICES

3.1 Description of Value Retention Options in Circular Economy relevant to lifestyles

Refuse generally means saying no to everything that's not essential or that's of no use in daily life. Free pens, brochures, cheap clothes and product samples? Single-use materials? To change in these habits, small behavioural adjustments are needed.

Reduce would mean decrease everything you consume in general and adopt minimalist tendencies to reduce daily waste production. Buying local products, using bike or community transport reduces the CO_2 emissions related to your consumption. Purchasing products for longer use (for e.g. slow fashion products, products with progressive warranty policies) are optimal choices for reduce. While refuse and reduce activities often require individual commitment, sustainability education and communication would engage citizens. Communication campaigns by institutions, living labs are all good ways for the promotion of circular lifestyle. Local products' shops both online and offline, farmers/ producers' markets are common forms for the promotion of local products. Certain shops have educative character. Package-free shops raise interest and attention of consumers avoiding single-use materials.

Re-sell and re-use are about to buy second-hand or find buyer for the non-used products or donate. Re-use items after some cleaning, minor repairs. Both re-sell and re-use would take place both online and offline, in permanent outlets or markets.

Repair means making the product work again by repairing or replacing deteriorated parts which can be done by specialized service providers or individuals at home or in repair cafés, where they could get support.

Re-furbishing and re-manufacturing are possible with return for service under contract or dispose to have the failed components replaced/ product remanufactured. Primarily these services are typically provided by specialized service providers, otherwise there is a trend for self-made refurbishment fuelled by stories of prosumers who successfully did re-furbish projects. Furniture upholstery is one of the most popular re-furbish forms.

Re-purposing is a typical behavioural pattern for consumers with commitment to zero-waste lifestyle, however there are several businesses which introduces upcycling activities: making wide range of products from leftover materials for e.g.

Re-cycle integrates multiple actions for circular lifestyle like dispose separately; buy and use secondary materials.

3.2 Monitor tools and frameworks analysed

During the definition of the circular lifestyle monitor tool we have analyzed and assessed a few frameworks including the The OECD Inventory of Circular Economy Indicators, WBCSD – Circular Transition Indicators v4.0, the ReSOLVE Framework, EBRD Green Cities initiative, City Loops – Measuring Ciry Circularity system, indicators proposed by the c40knowledgehub and the ENEL X circularity city index for Italy. In this chapter, detailed information is provided about them.

3.2.1 The OECD Inventory of Circular Economy Indicators

The OECD published its comprehensive inventory of circular economy indicators in 2021 (OECD, 2021). The main objective was to collect and provide measures to assess circularity at different spatial scales, such as national, regional and local. The indicators are taken from existing studies, roadmaps and strategies. The inventory covers five main aspects related to the circular economy (see Table 4). Most indicators fell into the first category, as almost 40% of the total circular economy indicators collected reflect the direct impact on the environment through various types of emissions, production material processes and the assessment of consumption and production patterns. Since the integration of circular economy principles plays a crucial role in the overall effectiveness of such interventions, the inventory includes numerous indicators (34% of the total) that focus on governance-related issues such as regulation, education or capacity building.

4. Table Categories and sub-categories of the OECD inventory

Category	Sub-category
Environment	Efficiency
	Emissions
	Output material processes
	Production and consumption
	Savings
	Use
Economy and business	Added value
	Business
	Economic efficiency
	Economic structure
	Gains and revenues
	Investments

Category	Sub-category
	Productivity
	Savings
Governance	Awareness-raising
	Capacity building
	Collaboration
	Education
	Financing
	Innovation, pilots and experiments
	Monitoring and evaluation
	Public procurement
	Regulation
	Stakeholder engagement
	Strategy and initiatives
Infrastructure and technology	Area
	Equipment
	Facilities
	Products and services
	Other
Jobs	Jobs and human resources

Source: OECD (2021)

Furthermore, indicators are allocated to different sectors (Air, Built environment, Culture, Education and knowledge, Energy, Food, Industry, Land use, Public administration, Resources, materials, waste, Reuse, repair, share, Textile, Waste, Water). The number of indicators per sector varies greatly. Almost a third of indicators cannot be specified as a sector-specific measure; therefore, its category is "non-sector specific" and consists of indicators such as:

- the number of companies that have received financial support related to the circular economy;
- and the number of city contracts assessed according to circular economy principles.

The second most weighted sector is waste, which is not surprising since the circular economy is closely linked to waste management issues by closing the linear model of material and energy flows within a given region, city or even company. However, material flows and the measurement of the success of material recycling belong to the "resources and materials" category, accounting for 9% of the total number of indicators.

Repair, reuse and sharing (e.g. the number of reuse centers in the city, the number of organized recycling centers, etc.), built environment (indicators that focus on the entire life cycle of buildings, e.g. the recovery rate of construction - and demolition waste, (number of companies with life cycle or ecodesign certification), energy-related indicators (energy efficiency in buildings and houses, number of energy recovery projects implemented), and food sector with food waste-related indicators make up a relatively small share (7 and 8% respectively) of the total pool. Finally, water, public administration and air represent only 2-2% of the total number of indicators; therefore, these sectors are relatively underemphasized in the OECD inventory.

3.2.2 WBCSD – Circular Transition Indicators v4.0

As an umbrella association of companies with real commitments regarding sustainable operation, the World Business Council for Sustainable Development published its renewed set of indicators and framework concerning circular transition in 2023 (WBCSD, 2023). The applied methodology is a 4-step approach; depending on whether how deep a company wants to dive into the circular transition steps, it goes through closing, optimizing, valuing its loop, and the impact of the loop. The circular transition indicators (CTI) are based on material flows by applying five principles in elaborating the framework:

- simple – the framework is as simple as possible to be easily adopted,
- consistent – the CTI can be used as a cross-industry tool; therefore, the applied indicators are relevant from a circular economy point of view, but they are sector-independent as well,
- complete and flexible,
- complement – the applied indicators can be identified as sustainability and business metrics, so the analyses cannot take place in isolation,
- neutral – the framework does not specify or prioritize any materials over one another.

Table 5 indicates examples for circular transitions indicators. The first module, entitled "Close the Loop", refers to the material flows when closing the loop using three universal indicators. The first is the percent material circularity, the average between inflow and outflow circularity based on the proportion of potential and actual circularity.

The second metric in this category is the water circulation percentage, which follows almost the same logic as before: the sum of the circular water inflow and outflow is divided by 2. Finally, the renewable energy percentage is the division of the annual renewable energy consumption and the total energy multiplied by 100%. The second step during the circularity

transition is to optimize the loop after it is closed. This category is defined by four indicators, the first of which is the percentage of critical material, which reflects the inflow of material considered critical. The second metric in this category is % recovery type, which focuses on the outflow side and takes into account how effective the companies' outflow recovery is. Third, the actual lifespan is calculated by dividing the actual lifespan of the product by the average actual lifespan of the product. Finally, the on-site water cycle reflects how often the company uses the average amount of water on-site before it drains away and leaves the company.

The third module consists of optional indicators referring to the added business value. The circular material productivity highlights the effectiveness of a company in decoupling linear consumption model and economic performance, calculating as a division of revenue and total mass of linear inflow. The second metric in this category is CTI revenue, which can be calculated for a product or the entire company. In the first case, the before-mentioned material circularity value is multiplied by the revenue, while the company-level CTI revenue is the sum of product-level CTI revenues.

Finally, the impact of the circular loop is based on the GHG emissions and their decrease, plus the natural impact refers to the land-use patterns associated with the company.

5. Table Circular Transition Indicators

Close the Loop	Optimize the Loop	Value the Loop	Impact of the Loop
% material circularity	% critical material	circular material productivity	GHG impact
% water circularity	% recovery type	CTI revenue	nature impact
% renewable energy	actual lifetime		
	onsite water circulation		

Source: WBCSD (2023)

3.2.3 ReSOLVE Famework

The Ellen MacArthur Foundation developed the ReSOLVE framework to describe and assess circularity principles regarding the built environment (Iyer-Raniga, 2019). The framework is based on the action side of the circular economy, providing an easy-to-adopt system for decision-makers on every level of cities and companies. The acronym encodes a six-step approach: regenerate, share, optimize, loop, virtualize, and exchange. The first step, regeneration, refers to the extending use of renewable energy sources instead of fossil fuels. At the same time, ecosystem-based thinking has a crucial role in enhancing natural capital and increasing the resilience of ecosystems in order to respect the Earth's ecological boundaries. Sharing contributes to maximizing asset utilization to minimize waste and duplication. Since

the sharing economy basically overlaps with the circular economy, car-sharing solutions, libraries, second-hand markets, or repairing activities can be found within the category. Optimizing refers to the effective maintenance of systems through decreasing resource use by removing waste energy and materials, such as precision farming or reverse logistics. The loop stage focuses on the reuse of inorganic materials by closing the loops of goods and putting them back into the economy. Virtualize refers to the promotion of replacing physical products and services with virtual ones; thus, multipurpose products can be developed and sold; moreover, direct material use is also decreasing. Finally, Exchange reflects to the need for new business models, using alternative materials and resources, developing advanced technology, etc. Table 5 highlights principles and examples of the ReSOLVE framework.

6. Table Principles and examples of the ReSOLVE framework

ReSOLVE principles	Main outcome	Example
Regenerate	Regenerating and restoring natural capital	Net zero strategies, closed loop systems, permaculture.
	Restoring natural ecosystems and increasing resilience	Flexible designs, sharing economy
Share	Maximize asset utilization	Spaces between buildings used for urban agriculture, shared vehicles, shared and flexible working spaces, avoiding 'dead' cities and buildings.
	Open source sharing of assets	Increase life span of existing assets, maximise use and support standardization where possible.
	Reusing assets	Using IT to put the demand and supply on the same platform so trade is encouraged. Support local economies and supply chains.
Optimise	Optimising system performance	Eliminating the use of primary materials in buildings. Components and materials may be reused or repurposed.
	Prolonging asset life span	Support the development of mixed-use buildings, adaptable floor plates, integrated smart services, passive design, durable materials, monitoring ongoing building performance.
	Decreasing resource usage	Supportive procurement policies.
	Implementing reverse logistics	Long term planning and integration of operational considerations at the design and construction phase.
Loop	Prioritizing loops	Modular construction approaches.
	Remanufacturing and refurbishing products and components	Remanufacture of machinery used in demolition or specialized equipment in buildings.
	Recycling materials	Engaging with manufacturers to support material recovery, for instance reusing rather than recycling.
Virtualise	Displacing resource use with virtual use	Using smart technology for reducing time and energy (and attendant emissions) when there is a maintenance issue associated with a building.
	Replacing physical products and services with virtual services	Use of BIM in design, construction and operation of buildings. Transparency in the use of materials.
	Delivering services remotely	Operational policies need to be considered.
Exchange	Selecting resources and technology widely	New business models of leasing, performance-based models and flexible use of design.
	Replacing with renewable energy and material sources	Low energy use buildings.

ReSOLVE principles	Main outcome	Example
	Using alternative material inputs	Good design and planning policies.
	Replacing traditional solutions with advanced technology	Innovative thinking and planning.

Source: Iyer-Raniga (2019)

3.2.4 EBRD Green Cities

According to the official website of European Bank for Reconstruction and Development (EBRD) Green Cities the initiative acknowledges that:

- EBRD regions are home to vibrant and diverse cities that span across central Europe to Central Asia, the Western Balkans and the southern and eastern Mediterranean region.

- The organization is committed to furthering progress towards 'market-oriented economies and the promotion of private and entrepreneurial initiative' in its regions. This has been its guiding principle since the beginning of the 1990s, when it was established to create a new post- Cold War era.

- Cities in the EBRD regions face numerous challenges, including insufficient infrastructure investment, demographic changes, poor air quality and historical legacies of high energy and carbon intensity.

- Many cities in these regions are also particularly vulnerable to the impacts of climate change, with increased heat stress and extreme weather events.

- Solid waste management is another pressing issue, with recycling almost negligible compared to the EU average of 39 per cent and far short of the EU target of 50 per cent of municipal solid waste recycling by 2020.

To address these challenges, the EBRD developed EBRD Green Cities, with the aim of building a better and more sustainable future for cities and their residents. The programme has three central components:

- Green City Action Plans (GCAPs): Assessing and prioritising environmental challenges, and developing an action plan to tackle these challenges through policy interventions and sustainable infrastructure investments.

- Sustainable infrastructure investment: Facilitating and stimulating public or private green investments in: water and wastewater, urban transport, district energy, energy

efficiency in buildings, solid waste and other interventions that improve the city's adaptation and resilience to climate shocks.

- Capacity-building: Providing technical support to city administrators and local stakeholders to ensure that infrastructure investments and policy measures identified in GCAPs can be developed, implemented and monitored effectively. (ebrdgreencities.com, online)

EBRD Green Cities aims to: 1. Preserve the quality of environmental assets (air, water, land and biodiversity) and use these resources sustainably; 2. Mitigate and adapt to the risks of climate change; 3. Ensure that environmental policies and developments contribute to the social and economic well-being of residents. (ebrdgreencities.com, online)

3.2.5 City Loops | Measuring City Circularity

City Loops is a Horizon 2020 project involving seven European cities Apeldoorn, Bodø, Mikkeli, Porto, Seville, Høje-Taastrup and Roskilde, to pilot a series of demonstration actions to close the loop of two of the most important waste streams in Europe: Construction and Demolition Waste, and Bio-waste. Their ultimate aim is to become circular cities in which no resource goes to waste, driving the transition to the circular economy. This project has developed a comprehensive indicator set for circular cities, including guidance on how to measure them. This work led to the development of an evaluation framework based on a series of circularity and sustainability indicators. Indicators are grouped into three layers: Urban context; Economic activities, Material flows and stocks.

In CityLoops a key step for circular planning and decision making is understanding the material and energy flows, entering, being consumed, transformed or stocked in and leaving cities, or in other words, the urban metabolism. This includes measuring material, waste, water, and energy flows and stocks in cities and getting an idea about the infrastructures, actors and companies that facilitate those. Gathering and visualising this data helps to identify where and how to intervene and which loops to close.

3.2.6 Cutting GHG emissions from consumption: Indicators are tools for action (c40knowledgehub.org)

C40, in collaboration with London and New York, has developed guidance on how cities can source data on urban consumption within key sectors and use actionable data indicators (ADI) to plan and measure actions designed to cut consumption-based emissions. Since Urban consumption is a key driver of the climate crisis, to inform policies on urban consumption, cities

need to monitor data in categories such as food, buildings, infrastructure, private transportation, and products such as electronics and appliances.

Actionable data indicators (ADI) are responsive tools to help cities accelerate climate action on urban consumption, used to plan and measure actions intended to reduce emissions. These indicators support understanding emissions from consumption activities and patterns in cities. ADI help cities to develop baselines and set targets for specific consumption types, and guide cities to plan and implement strategies, and measure changes related to actions and policy interventions over time. Indicators can be quantitative or qualitative and have a range of data types, availability, update frequency, and specific applicability at the city scale. Urban consumption emissions refer to the direct and lifecycle greenhouse gas (GHG) emissions of goods and services purchased by residents, tourists, commuters, businesses and government end consumers in a city.

3.2.7 The Circular City Index for Italian municipalities

At the Italian level, we can mention ENEL X circularity city index as an example of tools developed at national level (https://www.enelx.com/it/it/istituzioni/sostenibilita/open-data-pubblica-amministrazione/circular-city-index). The Circular City Index is a free tool that calculates the 'level of urban circularity' of Italian municipalities. It is based on the principle that in order to improve the sustainability of urban centres, administrations must first understand their starting conditions. Enel X developed this tool in collaboration with the University of Siena. It is unique in Italy as it is based entirely on open data and can assess the initial level of urban circularity of all Italian municipalities, balancing the diversity of the territory in terms of population and size.

The model is based on an extensive analysis of Open Data from national sources, allowing for a study of the entire Italian territory. It assesses four key areas to determine the level of circular maturity: digitalisation, environment and energy, mobility, and waste. Scores are assigned for each policy and infrastructure implementation that enables the territory to transition towards urban circularity. These scores are defined based on comparisons with national and European regulations or guidelines.

Unlike many sustainability studies that concentrate on cities with populations over 100,000 (where only a quarter of Italy's population resides), the Circular City Index is applicable to all municipalities, regardless of their size. This makes it simple for administrations to identify successful cases and compare them with their own situation, allowing them to replicate proven solutions and apply them to areas that require improvement.

3.3 Solutions identified by NiCE partners

During the needs assessment of the target groups, sustainable consumption patterns and supporting business models that play a role in the circular development of cities/ towns have been assessed on urban level in NiCE pilot settlements. Partners have collected alltogether hundreds of innovative solutions, circular offers which have analysed afterwards. Figure 2 indicates the most important solutions identified. An important result of the analysis is that besides businesses, municipalities, municipal institutions, public service companies, NGOs and living labs all can support the enhancement of circular lifestyle in cities, towns.

2. Figure Providers and types of circular lifestyle offers
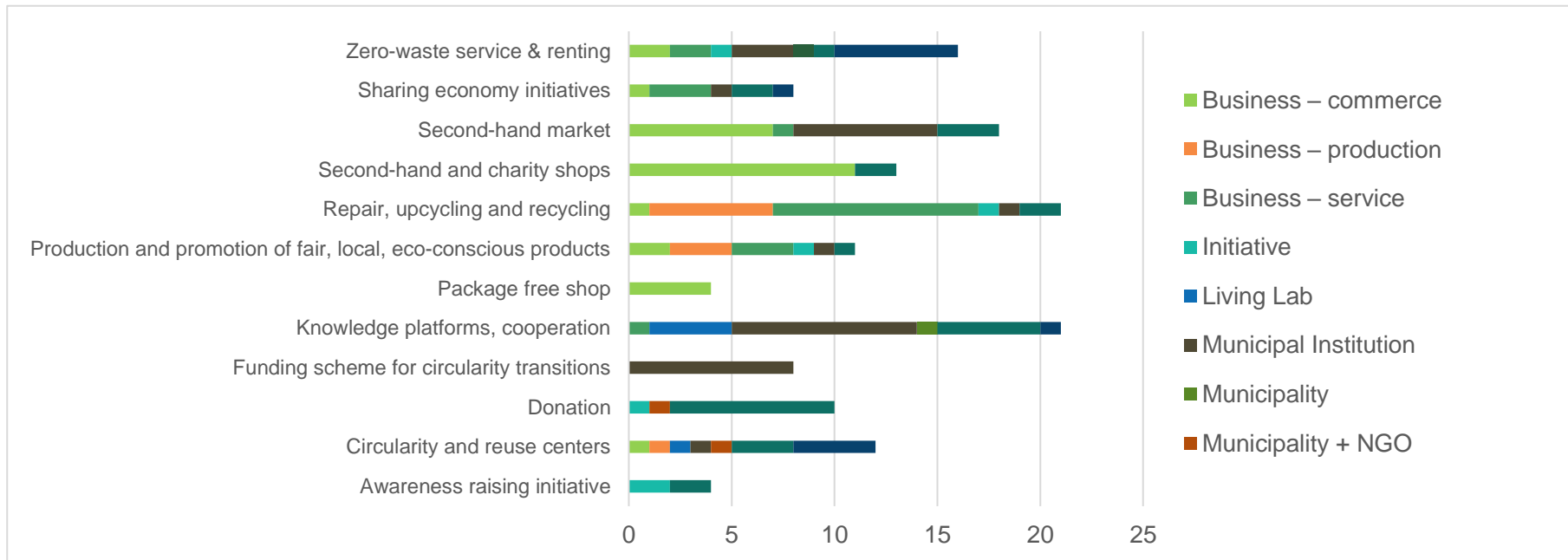
Source: own compilation

The solutions identified by NiCE partners have been grouped according to the 7R model representing the Value Retention Options in Circular Economy. Table 7 indicates the solutions collected which cover all value retention options from refuse to re-cycle.

7. Table Inventory of innovative solutions for the enhancement of circular lifestyle

#	Category	Elements
R0	Refuse	Living labs in the field of sustainable consumption, broader sustainability topics
		Awareness raising initiatives including festivals, events & educational activities
R1	Reduce	Zero-waste services: renting, zero-waste cemetery
		Sharing economy initiatives
		Shop of fair products
		Shop of local products
		Local products' markets
		Local producers
		Package free shops
		Community gardens
		Circularity knowledge hubs, materials for local people, visitors of events, websites
		Funding schemes for circularity transitions (replacement of old electronic equipment, fund for gardening projects, improved waste collection, composting)
R2	Re-sell/ Re-use	Online communities in the city for re-sell and re-use
		Online e-shops with second-hand products
		Businesses build on re-use of products (for e.g. sale of water in returnable bottles, reusable cups for coffee to-go, shared between cafés
		Second-hand shops
		Chairty shops
		Second-hand markets
		Donation infrastructure
		Pop-up stores with second-hand products
		Reuse centres
		Circularity centres with diverse portfolio
		Funding schemes for circularity transitions (fund for natural water collection for gardening)
R3	Repair	Repair cafés
		Repair service providers
		Awareness raising initiatives including festivals, events promoting repair & educational activities
		Online communities for exchanging repair ideas
R4	Re-furbish	Repair cafés
		Circularity centres with diverse portfolio
		Service providers for re-furbishing
		Online communities for exchanging ideas
R5	Re-manufacture	Service providers
		Circularity centres with diverse portfolio
		Online communities for exchanging ideas
R6		Repair cafés

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#	Category	Elements
	Re-purpose (Re-Think)	Circularity centres with diverse portfolio
		Service providers for re-purposing
		Online communities for exchanging ideas
		Awareness raising initiatives including festivals, events & educational activities
R7	Re-cycle	Encouraging municipal waste collection system
		Awareness raising initiatives including festivals, events & educational activities
		Circularity knowledge hubs, materials for local people, visitors of events, websites about re-cycling
		Waste collection services for recycling for different materials (besides paper, plastic and glass, textile waste, food waste, electronic devices)
		Collection yards
		Yearly waste collection of larger products

Source: own compilation

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