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INTEGRATED ACTION PLAN

CLUJ METROPOLITAN AREA
2025

INTERCOMMUNITY DEVELOPMENT ASSOCIATION
CMA
CLUJ METROPOLITAN AREA

The launch of the Integrated Action Plan for the Circular Economy of the Cluj Metropolitan Area represents a huge step forward for the green transition. By joining the "Mission 100 Climate-Neutral Cities by 2030," Cluj has long been committed to sustainable transition: we are investing in urban mobility, energy efficiency, and digitalization to create a healthier environment and a regenerative economy.

Through this ambitious plan, we are ensuring that circular economy objectives become a habit in the lives of communities in the metropolitan area. We consider international collaborations, such as those carried out within the LET'S GO CIRCULAR! network, to be essential elements that allow us to bring European best practices, advanced expertise, and innovative tools to Cluj-Napoca.

As mayor, I reaffirm the full support of the institution I lead and invite the entire metropolitan community: local authorities, the business community, universities, and citizens to actively participate in the implementation of this plan. Together, we can transform the Cluj Metropolitan Area into a model of a circular, competitive, and sustainable economy for the entire region.

Mayor of Cluj-Napoca**,**

Emil Boc

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ABBREVIATIONS

AI – Artificial Intelligence

BBU – Babeș-Bolyai University

CCRI – Circular Cities and Regions Initiative

CE – Circular Economy

CEAPs – Circular Economy Action Plans

CMA – Cluj Metropolitan Area

CMUR – Circular Material Use Rate

CO_2 – Carbon dioxide

EU – European Union

GDP – Gross Domestic Product

GHG – Greenhouse Gas

GIS – Geographic Information System

Gt – Gigatons

IAP – Integrated Action Plan

IoT – Internet of Things

IRCEM – Institute for Research in Circular Economy and Environment "Ernest Lupan" *(Institutul pentru Cercetări în Economie Circulară şi Mediu "Ernest Lupan")*

IT – Information Technology

LGC! – LET'S GO CIRCULAR!

NGOs – Non-Governmental Organizations

NZC – NetZeroCities

OECD – Organization for Economic Co-operation and Development

QR – Quick-Response

R&D – Research and Development

R&D&I – Research and Development and Innovation

RMC – Raw Material Consumption

SDGs – Sustainable Development Goals

SME – Small and Medium-sized Enterprises

TUCN – Technical University of Cluj-Napoca

ULGs – URBACT Local Groups

UN – United Nations

WEEE – Waste from Electrical and Electronic Equipment

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INTRODUCTION

URBACT is a European Territorial Cooperation program, initially launched in 2002, fostering sustainable integrated urban development in cities across Europe. It enables cities to work together to develop new and sustainable solutions to major urban challenges, through networking, sharing knowledge, and building capacities for practitioner [1,2].

Acknowledging the importance of Circularity for a sustainable, just, green and productive transition of cities and thus for reaching the goal of a climate-neutral EU by 2050, LET'S GO CIRCULAR! will focus on the elaboration of Integrated Circular Economy Action Plans (CEAPs) for urban areas and discuss relevant issues related to a sound Circular Transition of cities and the activation of the transformative power of cities for the common good [3].

LET'S GO CIRCULAR! network, funded by URBACT, paves the way for a sustainable, just transition and productive transition of cities towards a circular economy. Ten partner cities: Munich (Germany)-lead partner, Oulu (Finland), Cluj Metropolitan Area (Romania), Granada (Spain), Riga (Latvia), Malmö (Sweden), E-Nova Lisbon (Portugal), Guimaraes (Portugal), Tirana (Albania), Kapodistriaki Development S.A. (Greece) together with their stakeholders are developing integrated approaches for urban areas. LET'S GO CIRCULAR! address all issues relevant to a holistic strategy for circular urban ecosystems, promoting innovative solutions. The concept of scale 10 R (from REFUSE to RECOVER) serves as a basic principle for action planning[3].

At the city level, an URBACT **Integrated Action Plan (IAP)** defines concrete actions to respond to local policy challenges. IAPs are participatory and future-oriented, ensuring clear governance structures, funding strategies, and monitoring mechanisms to support implementation beyond the project’s lifecycle.

In the Cluj Metropolitan Area, an URBACT Local Group (ULG) was formed to co-design the IAP. It brings together municipalities, academia, NGOs, businesses, and civic initiatives, including:

- Cluj-Napoca City Hall
- Babeș-Bolyai University – Faculty of Environmental Science and Engineering
- "Ernest Lupan" Institute for Research in Circular Economy and Environment
- Transylvania IT Cluster
- Transylvania Energy Cluster
- Agro Transylvania Cluster

- Clujul Sustenabil (Sustainable Cluj)
- Food Bank Cluj (Banca pentru Alimente Cluj)
- Urbannect
- Green Partners
- Florești City Hall

Through URBACT guidance and transnational exchange, local stakeholders have agreed on a collective vision and strategic objectives to pave the way toward circularity in the Metropolitan Area.

Our vision**: Cluj Metropolitan Area metabolism features a high degree of information, awareness and adoption of circular economy practices at the level of public administration, local institutions, business environment and citizens.**

Our mission: **To move toward climate neutrality by 2050, the Cluj Metropolitan Area aims to improve energy efficiency for at least 40,000 apartments, and invest in public areas around apartment blocks, to reduce car usage and make transport by foot, bike and public transport more attractive.**

Our strategic goals by 2030 are as follows:

- **Reduce the metropolitan material footprint by 20% compared to initial calculation through efficient resource use, sustainable production and consumption, and integrated territorial planning.**
- **Achieve a 20% circular material use rate by strengthening reuse, recycling, and industrial symbiosis within key metropolitan sectors.**
- **Increase raw material productivity by 20%, enhancing economic value per unit of resource used through innovation, eco-design, and industrial collaboration.**
- **Reduce total waste generation per capita by 20%, ensuring efficient collection, reuse, and prevention across all communities.**
- **Create an inclusive, digital, and participatory circular ecosystem that connects governance, education, business, and citizens in a shared transition.**

By combining participatory processes, stakeholder engagement, and European-level collaboration, the Cluj Metropolitan Area is paving the way toward a resilient and circular urban future.

PART I: CIRCULAR ECONOMY AT GLOBAL, EUROPEAN AND REGIONAL LEVEL

1. The definition of circular economy (CE)

The circular economy (CE) is an industrial system designed to be restorative and regenerative, moving away from the traditional concept of products having an "end of life." Its goal is to eliminate waste through conscious design that prioritizes disassembly and reuse [4]. Instead of the linear "extraction-production-consumption-disposal," which often neglects the pollution generated [5], model, the CE promotes regenerative growth: it preserves the value of products and resources, minimizes waste, and promotes reuse, recycling, and sustainable design [6].

The transition to CE offers significant benefits, including environmental protection through reduced resource use, reduced greenhouse gas emissions, and improved product design that minimizes impact. It offers a solution to excessive packaging waste, reduces dependence on raw materials, and increases economic stability. The transition could create up to 700,000 jobs in the EU by 2030, boosting competitiveness and innovation while providing more sustainable and cost-effective products. The EU aims to create a climate-neutral economy by 2050 and is introducing legislation to encourage sustainability [7].

Figure 1. The CE model [7]

CE is based on three key principles [8] (see figure 2.), defined by the Ellen MacArthur Foundation, which is a charity committed to creating a CE [9]:

Figure 2. The 3 key principles of CE

Also, unlike the linear economy, which follows the pattern of "extraction-production-consumption-waste disposal" and relies on large quantities of cheap, easily accessible materials and energy, the circular economy applies the 10R-strategies [10,11]:

- R0 – **Refusal**: Refers to the refusal to purchase new products that have no significant uses or value.
- R1 – **Rethink**: Refers to increasing the utilization rate of an underutilized product.
- R2 – **Reduce**: Refers to increasing efficiency in the production or use of the product, consuming fewer natural resources.
- R3 – **Reuse:** Refers to any operation by which products or components that have not become waste are used again for the same purpose for which they were designed.
- R4 – **Repair:** Refers to the repair or maintenance of a defective product so that it can be used at its original level of functionality.
- R5 – **Refurbishment:** Refers to the restoration of an old product and its updating.
- R6 – **Reconditioning:** Refers to the incorporation of parts of the discarded product into another product that has the same function.
- R7 – **Reorientation:** Refers to the incorporation of the discarded product or parts of it into a new product with a different function.
- R8 – **Recycling:** Refers to any recovery operation whereby waste is transformed into products, materials, or substances to fulfil their original function or for other purposes.
- R9 – **Regeneration:** Refers to shifting attention towards renewable materials and energies, so that the ecosystem could regenerate and natural resources can be recovered in the biosphere.
- R10 – **Recovery:** Incineration of materials/waste and the recovery of energy and materials.

2. The global and EU context of circularity

The circular economy is increasingly recognized as a factor in promoting sustainable development and achieving the 2030 Agenda for Sustainable Development. By rethinking business models, designing products for durability, recyclability, and reusability, it supports more responsible consumption and production, directly contributing to the achievement of Sustainable Development Goal (SDG) 12 [12]. Beyond SDG 12, the circular economy also plays a crucial role in advancing 10 other goals form the 17 SDGs [13] (see figure 3.).

Figure 3. SDGs in which CE plays a key role (including SDG 12)

It contributes to SDG 2 through reduced food waste and regenerative agriculture; SDG 6 via improved water management and pollution control; and SDG 7 by advancing energy efficiency and renewables. It drives SDG 8 and SDG 9 by creating green jobs and fostering cleaner industries. Circular practices also enhance SDG 11 through waste reduction and smart urban design, while supporting SDG 13 by cutting emissions. Additionally, it protects ecosystems through SDG 14 and SDG 15, and strengthens global collaboration under SDG 17 to scale sustainable solutions.

The global population, currently 8.1 billion [14], is projected to reach 8.6 billion by 2030 and 9.8 billion by 2050 [15]. The economy consumes 100 billion tons of materials annually, and by 2050, material extraction and consumption are expected to double, threatening Earth's life-support systems [16]. Without urgent action, virgin material use could reach 190 billion tons by 2060 [17].

The UN has warned that without effective material management, climate change, economic instability, and ecological crises could lead to social collapse [18]. The solution lies in the circular economy, which takes a systemic approach to the wise use of resources. Its goal is to reduce material consumption, extend the life of products, and prioritize sustainable, regenerative resources. With this model, we can preserve the Earth's ecological balance and the well-being of future generations [16].

According to the 2023 Circularity Gap Report [16], that the global economy is becoming less circular: today, only 7.2% of materials are returned to the cycle, compared to 9.1% five years ago. This decline is due to the increasing use of new materials and the accumulation of durable

goods, buildings, and infrastructure, which makes it increasingly difficult to close the loop on materials.

- Biomass (e.g., food crops, natural fibers, and wood), accounts for about 27% of total material consumption, or 25 billion tons per year, but only 21.2% of this can be considered sustainable. Over-exploitation of biomass contributes to deforestation, biodiversity loss, and the degradation of carbon sinks. Non-renewable materials, such as metals and minerals, account for approximately 15% of total extraction. Metal ore extraction has increased more than three and a half times over the past 50 years, driven by construction, manufacturing, and the energy transition. Meanwhile, non-metallic minerals such as sand, gravel, and cement have seen the fastest growth and now account for nearly half of all extracted materials, causing significant environmental damage and pollution.
- Fossil fuels, which account for 14.6% of global material consumption, are by their nature non-circular, as their combustion produces emissions that cannot be recovered. Their consumption has increased 2.6-fold over the past 50 years, reaching 15.5 billion tons per year, and they remain one of the main causes of greenhouse gas emissions and climate change.
- In addition, approximately 38% of global materials are locked up in long-term stocks, such as roads, buildings, and vehicles. Since the beginning of the 21st century, these stocks have grown more than 23-fold, with much of this growth occurring in developing regions. In 2018 alone, 43.6 billion tons were added to these stocks, while only 12 billion tons were removed, limiting the amount of materials available for recycling.

Overall, the report highlights the urgent need to reduce material consumption, improve recycling systems, and transition to a truly circular economy that operates within the planet's ecological limits.

In addition, in the EU, in December 2015, the European Commission adopted the document entitled "Closing the Loop – An EU Action Plan for the Circular Economy," which represents a significant step forward in supporting the EU's transition to a circular economy. The plan aimed to "close the loop" of product lifecycles through recycling, reuse, and efficient resource use, introducing 54 measures covering production, consumption, waste management, and secondary raw materials. It identified five priority areas with the highest circular potential: plastics, the food supply chain, critical raw materials, construction and demolition, and biomass/bio-based products, and also proposed updates to EU fertilizer laws to promote sustainable agriculture [19].

To support the transition, the Commission suggested revisions to major EU waste directives, including those on packaging, landfills, end-of-life vehicles, batteries and accumulators, and waste electrical and electronic equipment (WEEE). Furthermore, building on this, in 2018, the Commission adopted additional initiatives, notably the EU Strategy for Plastics in a Circular Economy, which aims to make all plastic packaging recyclable by 2030. It also introduced a framework for monitoring progress, a report on critical raw materials, and measures to align chemicals, products, and waste policies, further advancing the EU's shift toward a fully circular economy [20,21].

Also, on March 11, 2020, the European Commission adopted the Circular Economy Action Plan (CEAP) [22], a key component of the European Green Deal and a cornerstone of the EU's strategy for sustainable growth. The plan aims to reduce pressure on natural resources, promote sustainable development and job creation, and help achieve climate neutrality by 2050 while addressing biodiversity loss. Covering the entire product life cycle, the CEAP focuses on better product design, sustainable consumption, and keeping resources in the EU economy for as long as possible to minimize waste. It includes both legislative and non-legislative measures, targeting areas where coordinated EU-level action can deliver the greatest environmental and economic impact [23].

Together, these initiatives represent a strategic, long-term effort to reduce waste, conserve resources, promote sustainable growth and advance the circular economy across the EU.

According to the Eurostat [24], in 2024, the EU's Raw Material Consumption (RMC), or material footprint was 14.1 tons per capita, which corresponds to a total of approximately 6.3 billion tons, showing no significant change compared to 2023. This figure represents the total amount of raw materials needed to produce the goods and services used by EU residents.

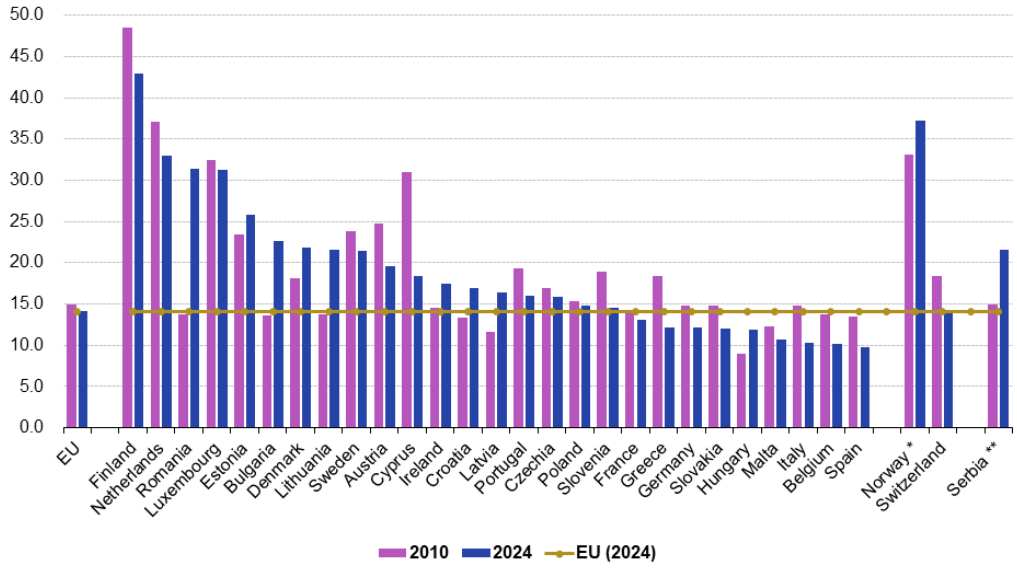


Figure 4. RMC in EU countries (2010 and 2024)[25]

Furthermore, in 2024, nine EU countries had a Raw Material Consumption (RMC) below the EU average of 14.1 tons per capita, while 21 countries exceeded it (see figure 3.). Finland, the Netherlands, and Romania recorded the highest material footprints (31–43 tons per capita), whereas Spain had the lowest at 10 tons per capita. Since 2010, 19 countries have reduced their material footprints—five by more than 25%—while 11 have experienced an increase. Romania's footprint more than doubled, in contrast to Cyprus, which reduced its RMC by over a third. Overall, most Mediterranean countries showed notable decreases, whereas Luxembourg and Poland saw little change compared to 2010 [24].

In contrast, the EU's CMUR, between 2010 and 2023, only slightly increased from 10.7% to 11.8% (1.1% increase), indicating that the economy remains largely linear. This modest increase is mainly due to enhanced recycling efforts to meet the EU's 22.4% target by 2030, while overall material consumption has stayed stable. Non-metallic minerals make up over half of the EU's material use, but their CMUR has declined since 2010. In contrast, the CMUR for biomass, metals, and fossil-based materials has grown, though unevenly: by 2023, it reached around 25% for metals but only just above 3% for fossil materials, reflecting that metals are recyclable, whereas fossil fuels are burned and non-reusable [26].

Circular Economy strategies aim to extend product lifespans and preserve material value, reducing resource use and environmental impact. However, to double the EU's CMUR from 11.8% in 2023 to 22.4% by 2030, the EU would need an annual increase of over 1.5 percentage points—twice the rate achieved in the past decade. Given rising material demand, especially in OECD countries, the EU is not currently on track to meet this goal [26].

In 2023, CMUR across EU countries (see figure 4.), varied widely, from 30.6% in the Netherlands to only 1.3% in Romania, reflecting major differences in recycling infrastructure and material use. The Netherlands and Italy stand out, with over 20% of their materials coming from recycled sources. Notably, the Netherlands has already exceeded the EU's 2030 target by more than seven percentage points, demonstrating that the goal is achievable.

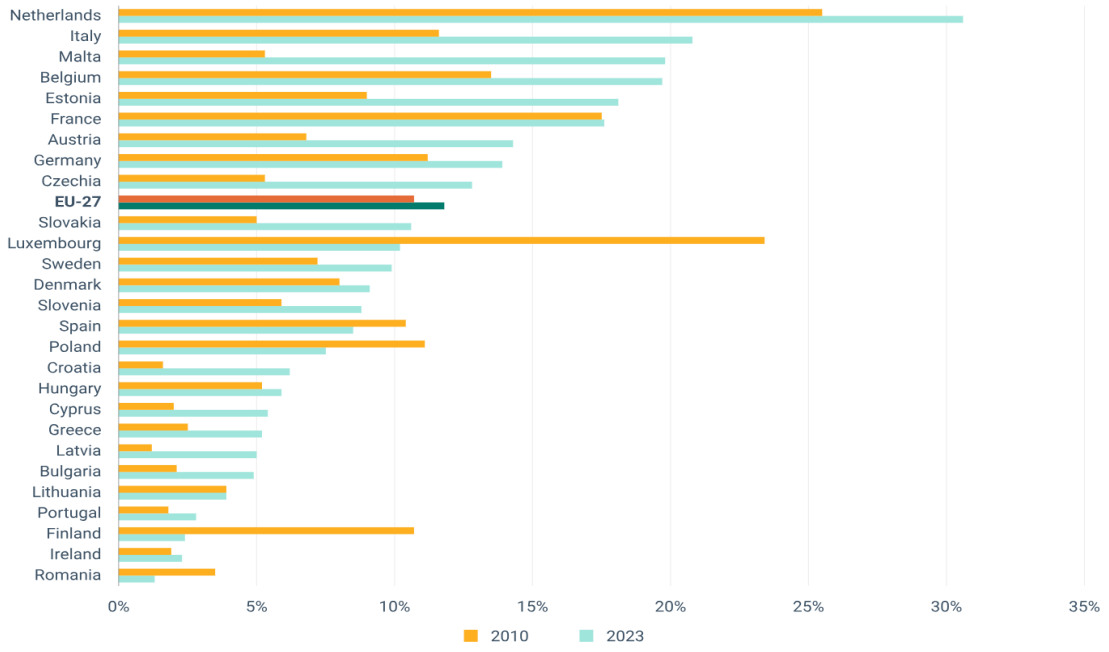


Figure 5. Circular material use rate by EU country [26]

In addition, since 2010, 22 of the 27 EU countries have improved their CMUR values. Significant absolute increases of more than five percentage points were recorded in Malta, Italy, Estonia, Austria, the Czech Republic, Belgium, and Slovakia. In relative terms, Latvia, Croatia, and Malta have more than tripled their CMUR values, although they started from a low base. In contrast, Finland, Romania, Luxembourg, and Poland have seen significant declines.

3. Circularity in cities and regions

The circular economy is a means of achieving environmental, social, and economic goals. It promotes efficient resource use, waste reduction, and job creation, while also addressing inequalities. Although it is often motivated by environmental considerations, its social and economic benefits are receiving increasing attention, especially in cities and regions [12].

Cities are the world's main centers of population and consumption. By 2050, 70% of the global population will live in urban areas, with Europe expected to reach 84% urbanization [27]. Currently, cities account for 70% of food consumption, 75% of energy use, and 70% of greenhouse gas emissions, and these figures are expected to rise. Economically, cities drive

growth, generating over 80% of global GDP, and their dense populations, infrastructure, and economic activity give them strong potential to foster sustainable growth through improved productivity and innovation [28–30].

In cities and regions, the circular economy drives a shift in economic planning, aiming to minimize waste and maximize resource efficiency across the value chain. Essential services like water, waste, and energy are optimized through resource reuse and recovery. Urban infrastructure is also designed to avoid locking cities into linear systems, incorporating solutions such as district heating and smart grids to support circular practices [12].

Key drivers for adopting CE in cities and regions are:

- **Climate change:** Cities generate 70–75% of energy use and GHG emissions and produce 80% of global GDP, with urban populations expected to exceed 70% globally by 2050, increasing energy and infrastructure demands. The EU Green Deal aims for at least 50% emissions reduction by 2030 and climate neutrality by 2050, while CE strategies in sectors like steel, plastics, aluminium, cement, and food could cut 9.3 billion tons of GHGs by 2050 [28,31–34]. Material management in OECD countries could contribute up to 50 Gt CO_2 equivalent by 2060, with global material use expected to nearly double by then. CE measures—eco-design, reuse, and reduced material use—are crucial, especially in urban areas and the built environment, where cities fund over half of climate policy expenditures, though investment averages only 0.4% of GDP [35,36].
- **Waste management**: In the EU, municipal waste accounts for ~10% of total waste, averaging 515 kg per capita in 2022 (Romania 303 kg per capita), with urban areas generating more than rural [37–39]. Municipal waste is expected to rise 5.3% by 2035, while landfilling has declined from 61% in 1995 to 22% in 2023, thanks to bans, taxes, and recycling investments [38,40,41]. Recycling rates are improving: in 2022, overall recycling reached 44%, with packaging at 65%, municipal waste 49%, and e-waste 32%, though rates vary widely across countries[42]. Biodegradable, recyclable, and bio-based materials, used in sectors like construction, aerospace, and packaging, can further reduce emissions, though EU innovation lags behind China, Japan, and Korea [43].
- **Households save costs through energy efficiency, repair, and reuse:** Is critical amid rising prices for housing, energy, transport, and food [44]. Household energy use accounts for 26% of the EU total, with efficiency measures offering significant savings [45]. However, increasing single-person households (37.1% in 2024) can reduce material efficiency [46].

- **The global smart cities market is rapidly growing**: It is projected to exceed $1 trillion by 2027, with massive investments in the US [47,48] Technologies like IoT, AI, blockchain, big data, cloud computing, and 3D printing support the circular economy by improving resource management, waste reduction, and industrial efficiency, potentially reducing emissions by over 20%. Despite these benefits, digitalization also brings sustainability challenges, including higher resource use and electronic waste [49,50].

Also, the new CEAP, adopted by the European Commission in March 2020, outlines specific measures for the period 2020-2022, with a particular focus on cities and regions, which play a decisive role in the transition. Local initiatives such as the European Urban Initiative, the Smart Cities Challenge and the Circular Cities and Regions Initiative (CCRI) provide tailored support [51,52]. Funded under Horizon 2020 and Horizon Europe, the CCRI offers knowledge exchange, technical guidance, and financial support for circular economy projects, assisting stakeholders, including local authorities, businesses, research institutes, and civil society, throughout the entire project lifecycle and promoting circular practices across European cities and regions.

PART II. CLUJ METROPOLITAN AREA: CIRCULARITY AND DEFINITION OF THE POLICY CHALLENGE

4. The state of Circular Economy

Considering the EU's ambitious goals, Romania faces significant challenges in adopting a circular economy, with a circular material use rate of just 1.3% in 2023, far below leading EU countries like the Netherlands (30.6%) and Italy (over 20%) [26], and a municipal waste recycling rate of only 12%. Despite this, the national government has committed to sustainable development through a circular economy strategy within its recovery and resilience plan, aiming to transform linear resource use into a sustainable cycle [53].

Cluj-Napoca stands out as a leader in Romania’s circular transition. With a proactive, multi-stakeholder governance model and strong EU connections, the city can implement localized and effective strategies, overcoming systemic barriers elsewhere [54]. This dynamic allows Cluj-Napoca to be a "first mover," hosting green startups, national CE initiatives, and the CIRCULARIO regional tour, demonstrating pioneering circular economy solutions that can guide future national reforms [53].

The Cluj Metropolitan Area association is organized around Cluj-Napoca (see figure 6.), Romania's second largest city and Transylvania's most significant urban center, considered the country's most innovative and dynamically developing region, which also serves as informal capital. The city and its peri-urban area are in northwestern Romania, relatively close to the Hungarian border [55]. The total an area of the metropolitan area is 1.364 square kilometers, and total population of the metropolitan area is 420.839 [56], of whom 286.598 live in Cluj-Napoca [57].

Figure 6. Cluj Metropolitan Area (Cluj-Napoca and the 19 communes) [55]

In terms of transport infrastructure, Cluj Metropolitan Area has strong transport connections, including access to the European highway network, a modernized railway line to the western border, and the Cluj-Napoca International Airport, Romania's second busiest, offering direct links to many European destinations [55].

In social and economic terms, the metropolitan area reflects a contrast between traditional rural communities and a rapidly expanding, post-industrial urban economy. Over the past two decades, the city's economic performance has increased 4.5 times, earning it titles such as European Youth Capital (2015) and finalist for the European Capital of Innovation (2020). Growth is driven mainly by the service sector, especially IT and knowledge-based industries, aligning the city with advanced EU economies. However, rural areas remain underdeveloped, with limited infrastructure and persistent poverty: some villages within 15 km of the city still lack schools, pharmacies, and local businesses [55].

Cluj-Napoca has a well-defined strategic vision for sustainable development, which includes economic competitiveness, infrastructure modernization, and environmental protection [56]. A central element of this strategy is active participation in high-level European networks. Through participation in the URBACT Action Planning Network entitled Let's Go Circular! [3] , the Cluj Metropolitan Area is developing an integrated circular economy action plan, showcasing a

structured, top-down approach to urban transformation [58]. Additionally, the city's involvement in the NetZeroCities EU Mission highlights its strong commitment to climate neutrality, aiming to cut greenhouse gas emissions by at least 80% by 2030 [59]. These initiatives demonstrate that Cluj Metropolitan Area views the circular economy as part of a broader, interconnected strategy—one that integrates climate action, urban resilience, energy efficiency, and sustainable mobility. This holistic, evidence-based, and multi-level approach distinguishes Cluj Metropolitan Area as a leading model of urban sustainability and innovation in Europe [60].

The overall local challenge in the Cluj Metropolitan Area regarding the theme of the CE can be characterized by several interrelated factors:

- **Waste Management and Resource Efficiency:** Cluj Metropolitan Area faces major challenges in waste management, marked by high waste generation and low recycling rates. To address these issues, the city has launched an integrated waste management system funded by the European Union, which includes a new ecological landfill, a sorting station, and a mechanical-biological treatment facility [61]. This initiative represents a strategic shift from identifying problems to actively securing external funding for essential infrastructure, a crucial step toward a functional circular economy.

  The project aligns with national efforts such as the deposit-refund system for packaging, designed to help Romania meet EU recycling targets for PET, glass, and aluminum [62]. Moreover, the metropolitan area is striving to follow the waste hierarchy outlined in Directive 2008/98/EC [63] and regulated by Law No. 211/2011[64] , prioritizing waste prevention, reuse, recycling, and recovery over disposal.

  Despite these efforts, the transition from a linear to a circular consumption model remains incomplete, resulting in inefficient resource use and continued environmental pressure.
- **Lack of Awareness and Education:** lack of knowledge and awareness about circular economy principles is one of the main barriers to achieving a sustainable transition. For many businesses, local authorities, and citizens, the concept remains new or unclear, leading to limited understanding of its economic, environmental, and social benefits. This knowledge gap hinders progress in several ways: it slows the adoption of sustainable business models and innovation and reduces the effectiveness of public policies and local strategies. Many actors continue to rely on linear economic models, which are easier to implement but unsustainable in the long term. Moreover, low community participation weakens social support for circular initiatives, threatening their long-term viability. To overcome these challenges, education, training, and awareness-raising are essential to

build competence and engagement among businesses, policymakers, and citizens, fostering a more informed and active role in the implementation of the circular economy [65].

- **Insufficient Infrastructure:** In Cluj Metropolitan Area, the expansion of the circular economy is hindered by insufficient physical and digital infrastructure. Existing recycling systems often cannot meet increasing demand, particularly for electronic waste, special materials, and construction debris, leading to the loss of valuable secondary raw materials and the persistence of linear waste management practices [66]. At the same time, digital infrastructure, which is vital for platforms that support resource sharing, waste exchange, and material flow tracking remains underdeveloped. The Cluj-Napoca REFLOW Pilot highlights this challenge, aiming to link energy metabolism and circular practices through digital tools and education, while stressing that both technological development and public awareness must advance together [67]. Overall, enhancing material recovery, reuse, and recycling infrastructure is crucial to enable Cluj Metropolitan Area's transition toward a truly circular and sustainable urban system.

Cluj-Napoca, the core city of Cluj Metropolitan Area has taken significant steps towards climate neutrality. Climate neutrality is already one of the objectives of the IUDS 2021-2030-2050 (approved by the city council in January 2022), which includes a comprehensive package of priority projects to achieve this, including the development of infrastructure for the selective collection and recycling of household waste, the development of infrastructure for the selective collection and recycling of construction and large-scale waste, the consolidation of the integrated waste management system, and projects aimed at education, information, and awareness-raising on the circular economy [68]. The city is one of 100 mission cities that have signed a contract to achieve climate neutrality by 2030, which includes the following circular economy provisions: expansion of the "circular city" program, expansion of social innovation programs, expansion of recycling awareness programs, a package of incentives and disincentives for recycling, higher waste management taxes for those who do not recycle, and lower taxes for those who do recycle [69].

Cluj-Napoca is selected in the Mission "100 smart and climate-neutral cities by 2023" [70,71] and also "Accelerating cities transition to net zero emissions by 2030 – NetZeroCities" in which Cluj Metropolitan Area is a partner in the consortium bringing in the consortium its administrative support and also insuring that no one is left behind and that the neutrality concept and mentality is embraced by the peri-urban and rural areas of the metropolitan area of Cluj [59].

One of the key roles of the Cluj Metropolitan Area in advancing the Circular Economy is the co-design of an Integrated Circular Economy Action Plan for the entire metropolitan territory. This initiative aims to address all dimensions of a sustainable circular transition through a holistic approach that considers the urban ecosystem, while at the same time fostering the development and implementation of innovative solutions. Numerous local stakeholders are involved in the process, ensuring both institutional and community commitment. Key contributors include Cluj-Napoca City Hall, Babeș-Bolyai University, Technical University of Cluj-Napoca, the Institute for Research in Circular Economy and Environment “Ernest Lupan” – IRCEM, and sectoral clusters such as the Transylvanian Energy Cluster, the Transylvanian IT Cluster, and the Agro Transylvania Cluster. Representatives of municipalities in the metropolitan area also play an important role, alongside waste management service providers, civic platforms (e.g. “Clujul Sustenabil”, “Banca de Alimente”, “Clujul Civic”) and numerous non-governmental organizations. Special efforts are being made to involve the private sector, recognizing its crucial contribution to a successful and sustainable transition to circular practices.

5. The policy challenge

Although the municipality has up-to-date urban development documents, the principles of the circular economy have not yet been incorporated as a central pillar of urban development. In addition, existing policy instruments do not rely sufficiently on scientific evidence produced by academic institutions, Research & Development & Innovation (R&D&I) centers, and regional clusters. Although the Net Zero Cities Action Plan and the Urban Integrated Development Strategy include several measures related to the broader spectrum of the circular economy, these are predominantly limited to waste management. This narrow approach needs to be broadened towards a more integrated vision of the circular economy, in line with the direction set out in Romania's national circular economy strategy.

The **barriers** that have been identified so far are listed in Figure 7.:

Figure 7. Identified barriers in implementing CE

In collaboration with local stakeholders, several specific needs related to the circular economy have been identified. The analysis reveals a significant knowledge gap within the local ecosystem regarding circular economy (CE) principles. Moreover, the transition from a linear to a circular model is insufficiently supported by incentives, infrastructure, and awareness-raising measures. The following barriers and needs have been highlighted:

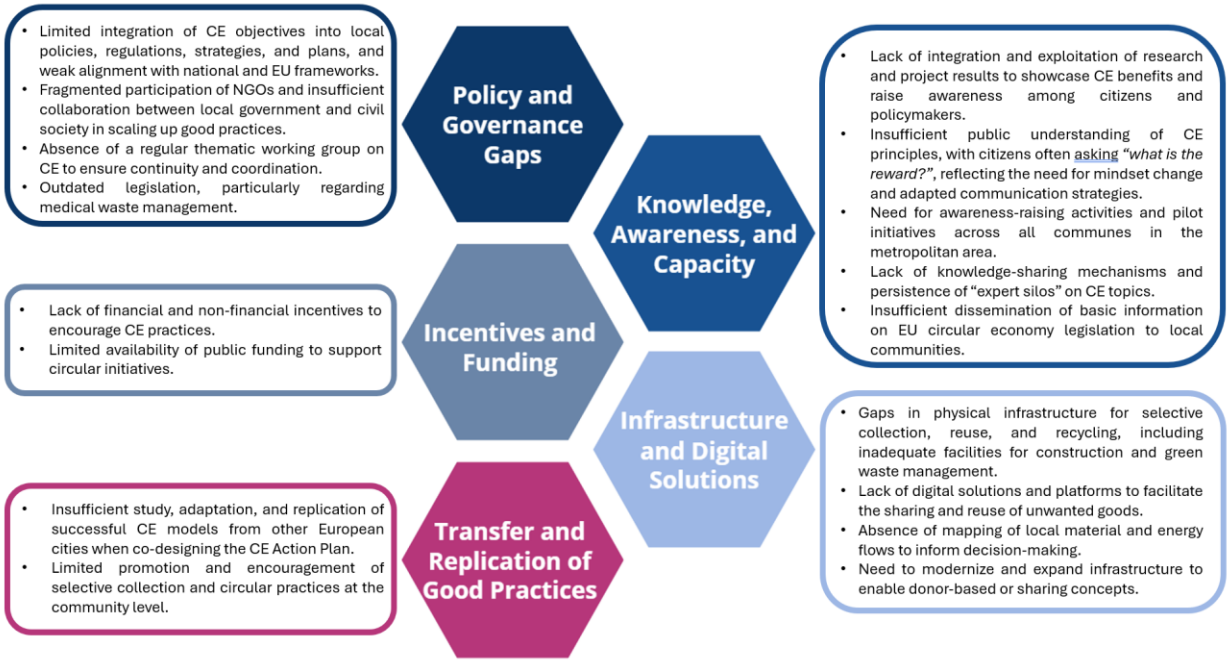


Figure 8. Identified barriers from the stakeholder collaboration

6. Our vision and mission

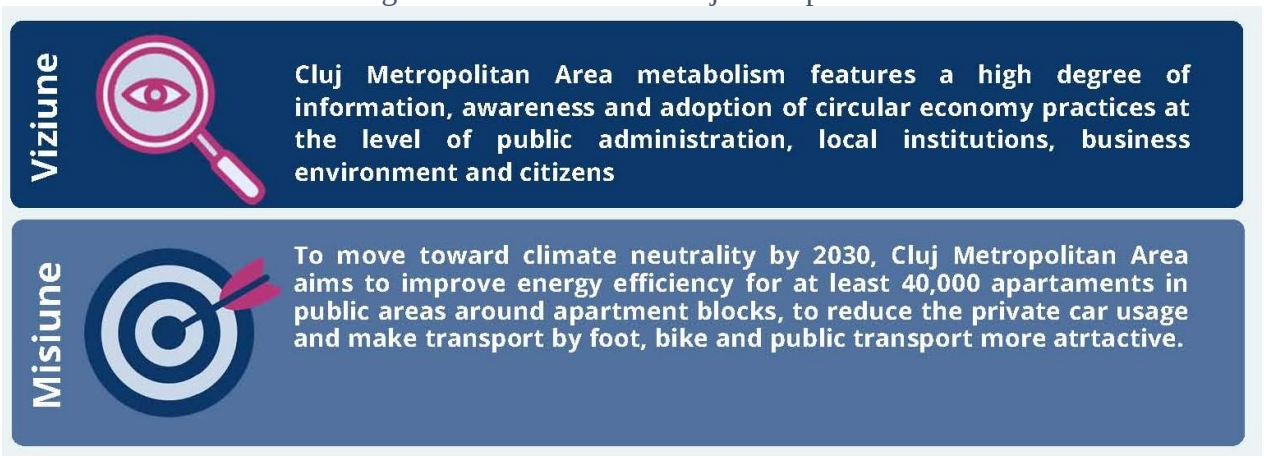


Figure 9. Vision and mission of Cluj Metropolitan Area

7. The Methodological Framework

The methodology applied to this Integrated Action Plan combines local participation with transnational knowledge exchange, ensuring that the process is rooted in the realities of the community on the one hand, and consistent with broader strategic goals on the other. The approach is based on the principles of integration, participation, co-creation, and adaptability, which together provide a solid foundation for developing a metropolitan circular economy strategy.

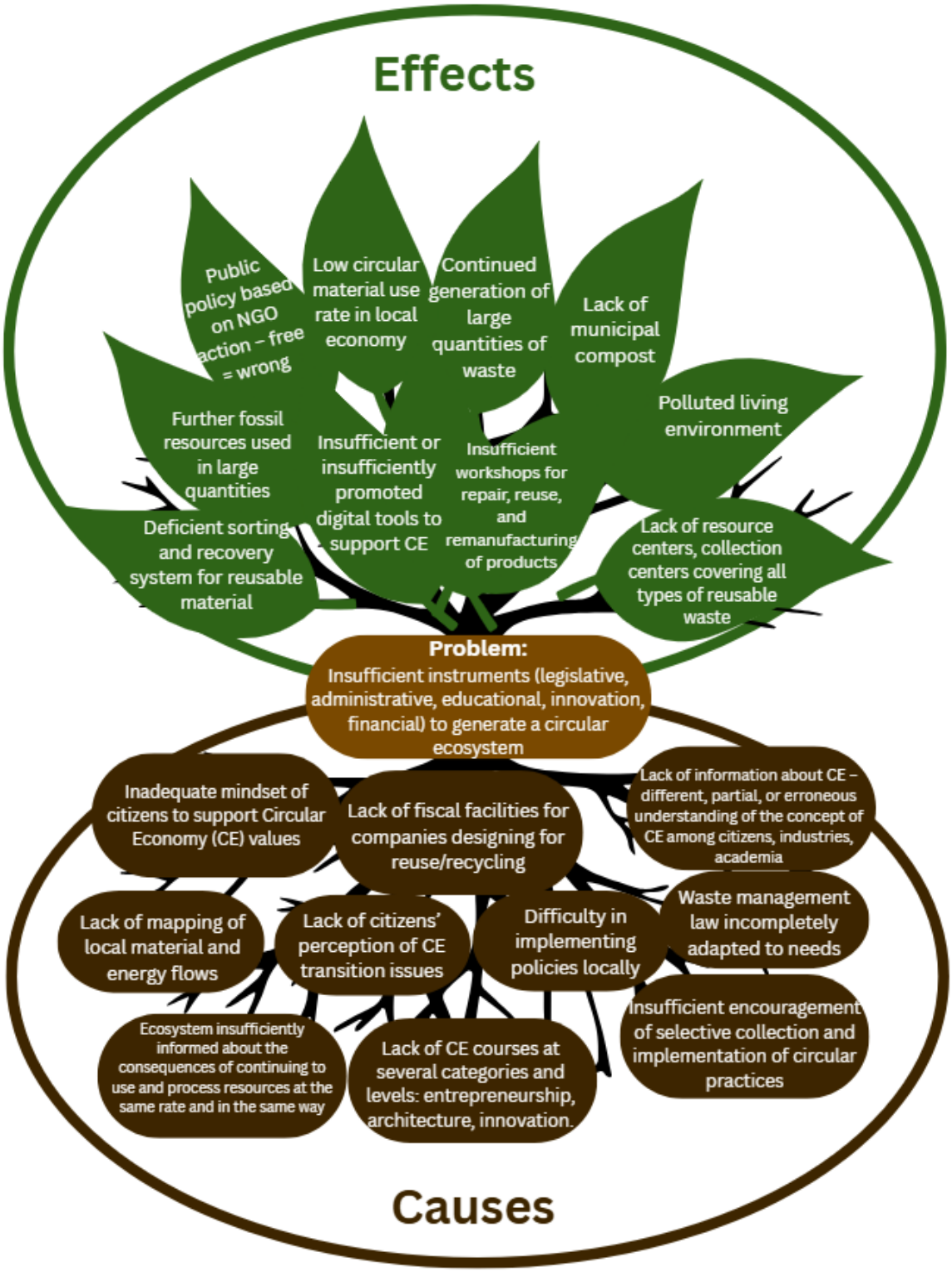
Starting from a bottom-up approach, the process began at the local level, where the URBACT Local Group (ULG) brought together representatives of the public administration, elected officials from 19 municipalities, community actors, non-governmental organizations, academia, and the private sector. In this environment, stakeholders identified local needs and barriers to implementation, creating a shared evidence-based database that reflects the specific challenges of the area. These early discussions not only defined the starting point for the Integrated Action Plan (IAP), but also the conditions for a participatory and inclusive process.

At the same time, with a top-down approach, the project also benefited from URBACT transnational exchanges, where topics, best practices, and intervention strategies were examined in collaboration with partner cities. The knowledge gained at these meetings was transferred to the local level by the ULG coordinator and members, enabling communities to adapt best practices to their own contexts. The dual movement of identifying needs from the bottom up and transferring knowledge from the top down created a dynamic interaction, ensuring that the strategy remained both locally relevant and internationally informed.

A key element of the methodology was the co-creation process, in which interaction between ULG stakeholders and coordinators facilitated the joint development of an integrated action plan.

This process was supported by specific communication tools, such as an online collaboration platform and a WhatsApp group, which enabled continuous dialogue and the sharing of ideas. In addition, the active participation of selected ULG members in transnational meetings created direct channels for knowledge transfer, enabling local actors to bring new perspectives to the metropolitan debate

The action plan for the circular economy was developed in a clear sequence. The first step was the problem-solving phase, during which local challenges and their root causes were systematically mapped using the URBACT "Problem Tree" tool (see figure 10). This was followed by a joint brainstorming phase, during which stakeholders formulated a vision for the city's circular economy, agreed on strategic objectives, and identified key priority areas and lines of action. Operational objectives were then assigned to each area of intervention and specific measures were defined for each area. Finally, these proposals were consolidated into a coherent integrated action plan linking the strategic visions to specific measures, responsible actors, and expected results.


Effects
Public policy based on NGO action – free = wrong
Low circular material use rate in local economy
Continued generation of large quantities of waste
Lack of municipal compost
Polluted living environment
Further fossil resources used in large quantities
Insufficient or insufficiently promoted digital tools to support CE
Insufficient workshops for repair, reuse, and remanufacturing of products
Deficient sorting and recovery system for reusable material
Lack of resource centers, collection centers covering all types of reusable waste
Problem:
Insufficient instruments (legislative, administrative, educational, innovation, financial) to generate a circular ecosystem
Inadequate mindset of citizens to support Circular Economy (CE) values
Lack of fiscal facilities for companies designing for reuse/recycling
Lack of information about CE – different, partial, or erroneous understanding of the concept of CE among citizens, industries, academia
Lack of mapping of local material and energy flows
Lack of citizens' perception of CE transition issues
Difficulty in implementing policies locally
Waste management law incompletely adapted to needs
Ecosystem insufficiently informed about the consequences of continuing to use and process resources at the same rate and in the same way
Lack of CE courses at several categories and levels: entrepreneurship, architecture, innovation.
Insufficient encouragement of selective collection and implementation of circular practices
Causes

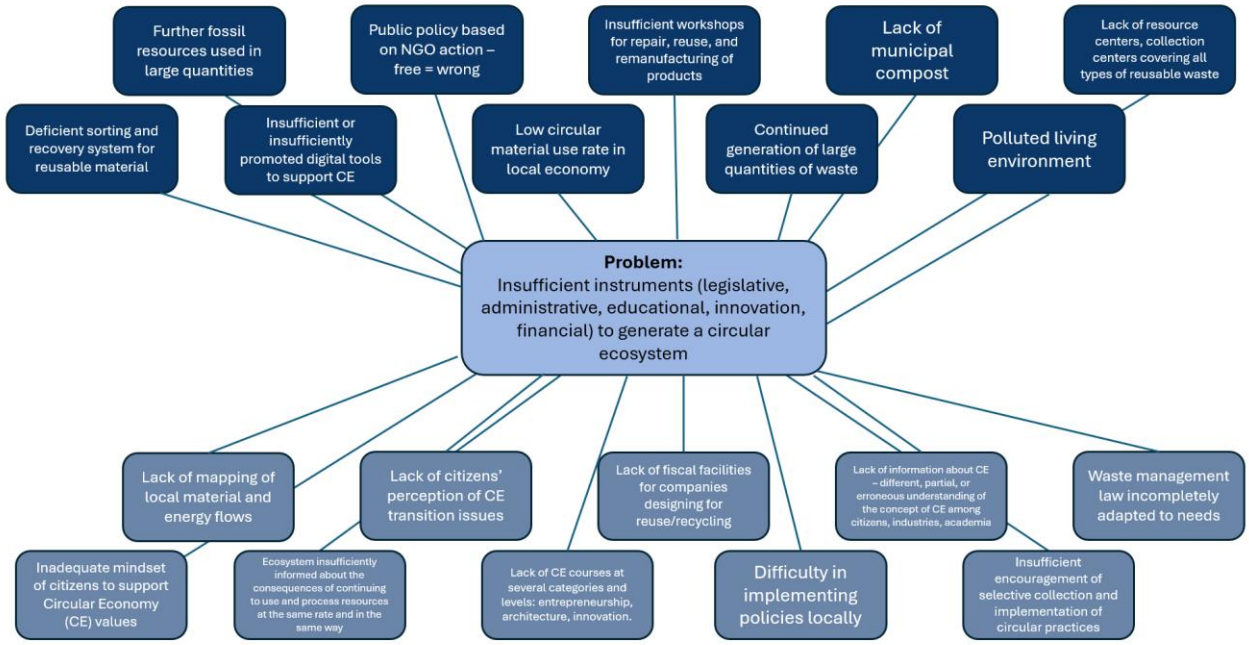


Figure 10. Problem Tree

PART III. OVERALL LOGIC AND INTEGRATED APPROACH

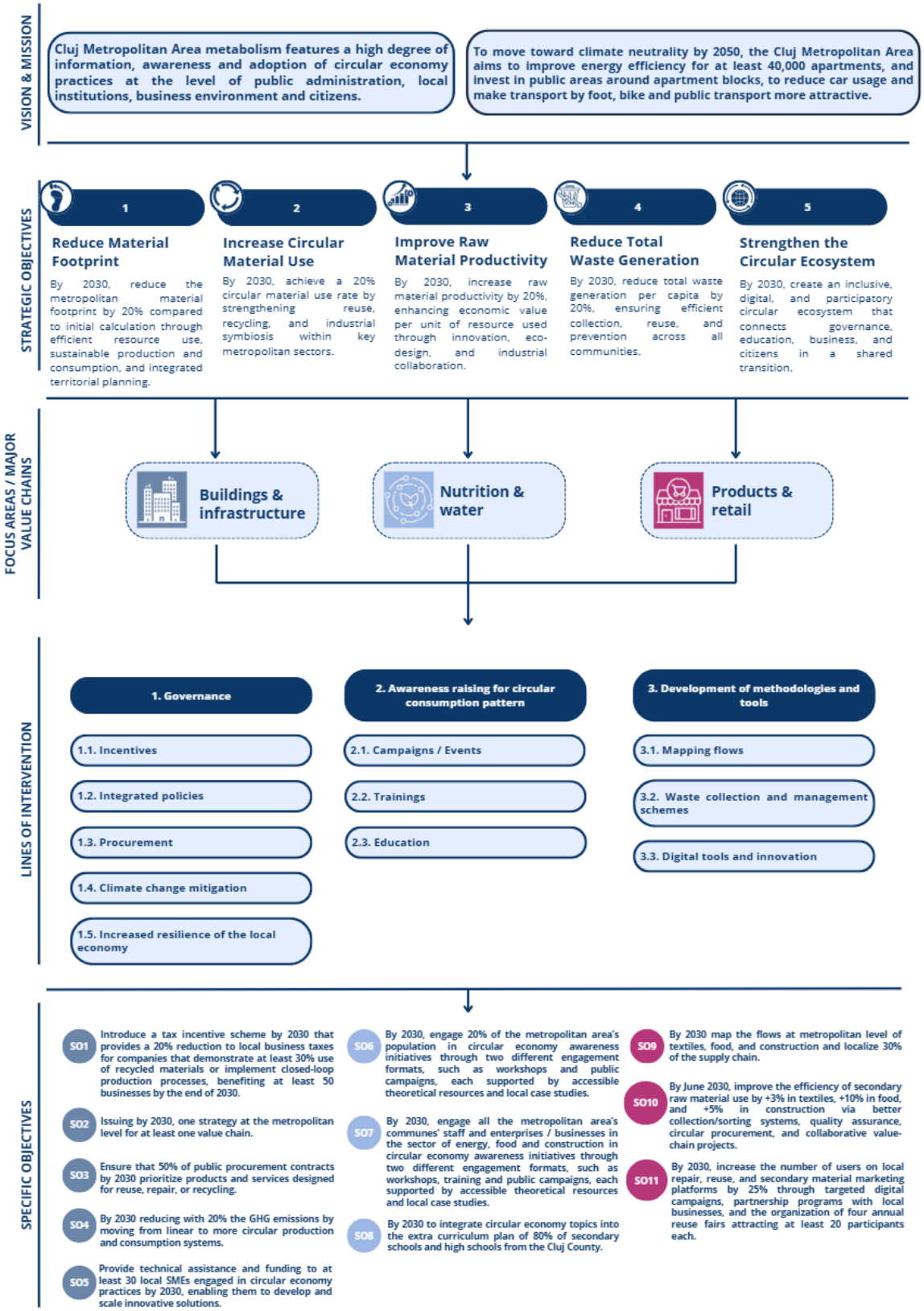


Figure 11. Overall logic and integrated approach

To pursue its vision, Cluj Metropolitan Area has set key goals along five cross-sectoral indicators: Reduce Material Footprint, Increase Circular Material Use, Improve Raw Material Productivity, Reduce Total Waste Generation and Strengthen the Circular Ecosystem. These five indicators (see in figure 12) are regarded as key measures for assessing the progress of a circular ecosystem. They are already being adopted and monitored in several cases at both European and national levels and are strategically tracked by other European cities and regions as part of their circular economy initiatives, which is why these indicators were chosen as the basis for the metropolitan area's strategic objectives.

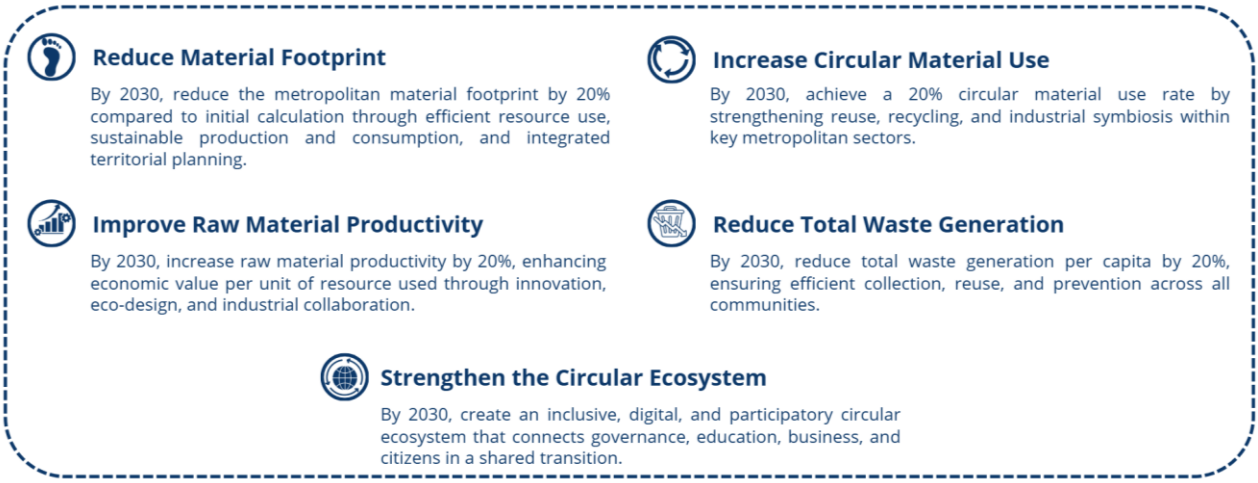


Figure 12. Our strategic objectives

The Reduce Material Footprint (RMC) refers to the total of all materials used in the manufacturing of products and services with the inclusion of raw material equivalents for imports. By 2030, the Cluj Metropolitan Area aims to cut its material footprint by 20% compared to initial levels. This will be achieved through efficient resource use, sustainable production and consumption, and coordinated territorial planning.

The second strategic objective is to achieve a 20% CMUR by 2030 by strengthening reuse, recycling, and industrial symbiosis. This includes setting up repair and reuse satellites, increasing the use of secondary raw materials in all sectors, and making sure 50% of public procurement includes circular criteria. The result will be stronger local supply chains and greater resource circulation.

Also, Cluj Metropolitan Area plans to boost raw material productivity by 20% by 2030, enhancing the economic value of each resource through innovation and collaboration. Another goal is to reduce the region's per capita waste generation by 20% by 2030 through waste prevention, recycling, and efficient waste collection. Initiatives include food donation schemes,

greywater recycling, and expanding the OSER network to reduce the amount of waste going to landfill. Promoting zero-waste schools and institutions will also strengthen the community.

Finally, strengthening the circular ecosystem: By 2030, the Cluj Metropolitan Area aims to create an inclusive, digital, and participatory circular ecosystem that brings together government, education, business, and citizens. This includes public engagement campaigns, circular education programs, a circular data space, and a metropolitan circular economy cluster. The result will be informed communities and a strong foundation for climate-neutral, circular development.

The 20% targets were chosen in line with the EU Climate and Energy Package (the "20-20-20" targets), which has demonstrated the effectiveness of clear and measurable percentage targets in promoting improvements in environmental and resource efficiency. Applying a similar 20% ambition to the above indicators in the Cluj Metropolitan Area ensures that the targets are ambitious but achievable, providing a coherent and easily communicable framework that responds to the growth pressures of the metropolitan area while promoting a circular and resource-efficient economy.

8. Summary of actions

The actions selected for the Integrated Action Plan on Circular Economy in the Cluj Metropolitan Area arise from the urgent need to transform the economy and the urban and peri-urban environment in line with the principles of sustainability and efficiency. All measures have been designed to strengthen a sustainable and resilient metropolitan ecosystem capable of responding to today's challenges. Together, the proposed measures promote more efficient use of resources, encourage the development of products with minimal environmental impact, and ensure transparency and accountability in the use of public funds. At the same time, they support the growth of the local economy and sustainable suppliers, promote solidarity and local support networks, and encourage the sharing of practices that benefit both the environment and household savings. They also contribute to the protection of cultural heritage, the reduction of resource consumption, the development of innovative solutions to environmental problems, the promotion of a culture of repair, and the promotion of open innovation tailored to the needs of the community.

Table 1. Summary of Actions and Activities

No	Title of the action	Short description
1	**Integrating circular economy principles into the value chain**	Integration of circular economy principles across the value chain through the development of a Circular Product Passport Toolkit for SMEs, enabling material tracking, product transparency, and sustainable design to support circular business models.
2	**Sustainable procurement in public institutions**	Implement a sustainable public procurement system in schools and other public institutions, focusing on the purchase of products that respect the principles of the circular economy.
3	**Re-use of food through donations to children's homes, old people's homes, animal shelters, etc.).**	Implement a system to collect surplus food from hypermarkets to feed instead of throwing food away.
4	**Creation of an urban center for reusable resources (OSER)**	Creation of an urban second-hand resource and material exchange center for the reuse of resources at municipal level.
5	**Repair and reconversion of existing buildings**	Implementation of a program for the repair and reconversion of existing buildings to enhance sustainability and reduce the ecological footprint.

No	Title of the action	Short description
6	**Introducing a circularity challenge at Innovation Camp (Innovation pipeline)**	Organize an annual Circular Innovation Camp dedicated to circularity, where participants develop innovative solutions to environmental and sustainability challenges.
7	**Inform and educate citizens about the circular economy**	Create public awareness and education campaigns (including basic information of CE legislation, using multiple interactive, theoretical and practical tools, including education by example, to attract citizens to adopt circular practices.
8	**Creating a data space for circularity**	Develop a "dataspace" for circular economy where companies and organizations can share data on material use and resource management.
9	**Introducing circular economy (CE) themes in the educational extra curriculum plan**	Development and implementation of an optional circular education text/workbook for middle and high school to increase students' awareness and knowledge of sustainability and circular economy principles and implement during the ”green week”.
10	**Reducing greenhouse gas (GHG) emissions through water management**	Implement graywater and stormwater management and purification systems using Phyto-purification technologies in urban and rural communities.
No	**Title of the sub-activity**	**Short description**
1	**Development of a Circular Product Passport Toolkit for SMEs**	Integration of circular economy principles across the value chain through the development of a Circular Product Passport Toolkit for SMEs
2	**Integrating circular economy principles by organizing "Sustainable Design Week"**	Organize a "Sustainable Design Week" and standardize circular design principles for local and international companies, thus ensuring the integration of these principles into products and production processes.
3	**Circular Procurement Guidelines & Criteria**	Establish standards and best practices to integrate circular economy principles into public and private procurement processes.
4	**Capacity-building for Procurement Officers**	Improve the skills and knowledge of procurement professionals to implement sustainable and circular procurement strategies.
5	**Circular Tax Incentives for Businesses**	Creating a system for rewarding and promoting the companies that design products for reuse and recycling, supporting sustainable practices and reducing environmental impact.

No	Title of the action	Short description
6	**Circular Public Food Procurement Pilot**	Testing sustainable procurement practices to integrate local, surplus, and circular food into public institutions.
7	**Local Food Surplus Platform (digital + logistics)**	Integration of digital and logistics system for redistributing surplus food from producers and retailers to local communities.
9	**Feasibility & Co-creation of OSER + Maker corner**	Exploring and co-designing an open space for repair, reuse, and creative making.
10	**Pop-up OSER + Repair Cafés + Reuse Market Days**	Temporary events offer repair services, craft workshops, and a market for recycled goods.
11	**Permanent OSER Hub with Integrated Repair**	A dedicated, long-term facility that combines repair services, recycling initiatives and community engagement.
12	**Metropolitan OSER & Repair Satellite Network**	A network of repair and recycling centers operating in the metropolitan area, with the aim of improving accessibility and circular practices.
13	**Develop Circular Building Retrofit Guidelines**	Creating practical guidelines for sustainable, circular retrofitting of existing buildings.
14	**Pilot Green Reconversion of Public Buildings (e.g., schools, cultural centers)**	Testing eco-friendly and circular renovation strategies in public facilities.
15	**Support Scheme for SMEs Renovating with CE Principles**	Financial and technical support for small businesses adopting circular economy practices in renovations.
16	**Annual Circular Innovation Challenge (CIC)**	A yearly competition to showcase and reward innovative circular solutions.
17	**Circular Sandbox Program – Living Lab Incubator**	Development of an open innovation space where citizens, students and entrepreneurs can create, repair and reuse materials and products according to the principles of the circular economy.
18	**Integration of CE Design in Startup Accelerators & Incubators**	Integration of circular economy principles into support programs for new businesses.
19	**Establishment of a "Circular Design Council" with bi-annual**	Create governance and advisory body driving circular design strategies, supported by foresight labs.

No	Title of the action	Short description
	foresight labs	
20	**Launch "Prototype to Market" Circular Innovation Program**	Launch the "Prototype to Market" program that supports innovators in developing, testing, and scaling circular solutions from prototype to market launch.
21	**CE Awareness Caravan (Metropolitan Tour)**	Launch a "traveling" information campaign that brings ideas, presentations, and workshops on the circular economy to different parts of the city.
22	**Education Campaign – "Sharing is Smart"**	Promoting sharing economy practices through educational outreach.
23	**"Green Food for All" public campaign and community workshops**	Raising awareness and providing hands-on experience with sustainable, local, and circular food practices.
24	**Awareness Campaign – "Smart Water, Low Emissions"**	Encouraging water-efficient and low-carbon practices among citizens and organizations.
25	**Concept & Stakeholder Architecture Design**	Developing a general framework, roles, and cooperation model among stakeholders necessary for implementing circular economy initiatives.
26	**Build and Pilot the CE Data Platform**	Developing a digital platform to collect, analyze, and share circular economy data.
27	**Engage & Grow User Base via CE Data Literacy Campaigns**	Empowering citizens and organizations to understand and utilize circular economy data
28	**Launch of a Metropolitan CE Procurement Observatory & Monitoring Dashboard**	Tracking and analyzing sustainable procurement practices at the city level.
29	**Launch Cluj Sharing Map & Digital Platform**	Creation of an interactive city-wide map and platform connecting residents to sharing and reuse opportunities.
30	**CE Digital Learning Hub for Citizens**	Create an online platform offering courses and resources to enhance circular economy knowledge.
31	**Launch of a Circular Design Open-Source Resource Library**	Provide accessible tools, guidelines, and best practices for circular design.

No	Title of the action	Short description
32	**Develop CE Educational Workbook and Teaching Toolkit**	Provide a practical resource to support teachers in integrating circular economy concepts into formal and non-formal education.
33	**Train-the-Trainers Program for CE Educators**	Build educators' capacity to teach circular economy principles through interactive methods and innovative learning approaches.
34	**Annual CE Student Challenge and "Circular School" Label**	Implementation of the annual CE Student Challenge and "Circular School" Label to promote circular economy education by engaging students in sustainability projects and recognizing schools committed to circular practices.
35	**Youth for Circularity Campaign in High Schools**	Organizing campaigns to determine a shift from determining status by the material accumulation to valuable experiences generated by sustainable choices.
36	**Phyto-purification Pilot Sites in Urban and Rural Public Spaces**	Implementation of phytoremediation projects in degraded urban areas and rural public spaces, using plants for soil purification and green regeneration.
37	**Technical Assistance Program for SMEs and Households on Water Reuse**	Implementation of the Technical Assistance Program for SMEs and Households on Water Reuse to support sustainable water management by promoting efficient reuse practices and innovative solutions for businesses and households.

9. Pilot actions

The pilot actions under the LET’S GO CICULAR! project aim to demonstrate practical approaches to achieving sustainable, net-zero emission metropolitan areas. Each pilot activity is designed to test innovative solutions, raise awareness, and foster collaboration between citizens, businesses, and local authorities. By implementing these measures in real life, the project aims to provide concrete insights, showcase best practices, and inspire scalable strategies that can be replicated in metropolitan areas and beyond.

These pilot initiatives serve as a learning platform on the one hand and as a catalyst for behavioral change on the other, ensuring that knowledge is translated into measurable impacts. Each measure is designed to have clear objectives, interactive participation, evaluation of results, and continuous improvement based on participant feedback.

9.1. LET’S GO CIRCULAR! and “Blueprint for Net-Zero – Block Neighborhood” Metropolitan Caravan.

As part of the city’s commitment to sustainable urban development, the Metropolitan Caravan was launched to bring the principles and practices of the circular economy closer to citizens in Cluj-Napoca’s metropolitan area. This pilot activity was designed to raise awareness, engage communities, and stimulate dialogue between residents, businesses, and local authorities, while directly supporting the broader goals of the "Blueprint for Net-Zero – Block Neighborhoods" project.

Action Title: Enhancing Knowledge and Interest in Circular Economy

Scope and Objectives:

The primary goal of this action was to enhance knowledge and interest in circular economy practices among citizens from four major communes within the metropolitan area of Cluj. Specific objectives included:

- Educating participants on circular economy principles, such as waste reduction, resource efficiency, and sustainable consumption.
- Encouraging community engagement and dialogue around sustainable urban living.
- Stimulating collaboration between residents, businesses, and local authorities to identify practical solutions for circular practices.

Structure of the Action:

1. **Overview of the Metropolitan Caravan:**
   - **Description:** The Metropolitan Caravan consisted of a series of interactive events focusing on sustainability and circular economy practices.
   - **Context:** This initiative is part of the NZC Pilot project "Blueprint for Net-Zero Apartment-Block Neighborhoods," led by the City of Cluj-Napoca, aimed at demonstrating sustainable urban living at the neighborhood level.
2. **Timeline:**
   - **Duration:** December 2024 – March 2025
   - **Schedule:** Four main "stops" were organized across the metropolitan area, each featuring training sessions and debates.
3. **Event Structure:** Each of the four parts of the event consisted of:

   Part 1: Training Sessions:
   - Expert-led sessions covering topics such as waste reduction, resource efficiency, eco-design, and sustainable consumption.

   Part 2: Interactive Practice:
   - Hands-on activities such as smart-sorting games and repair corners to make learning engaging and practical.

Figure 13. CE training in Apahida

Part 3: Debates and Feedback
   - Open floor discussions for participants to share ideas, concerns, and local challenges related to circular economy practices.
   - Q&A sessions with experts and brainstorming on potential solutions for community-level implementation.

4. **Pre- and Post-Training Assessments:**
   - Participants completed simple surveys (via Mentimeter) before and after each session, measuring knowledge gained and informing continuous improvement of content.
   - Adjustments included adding more local case-study visuals and demonstrations to strengthen practical relevance.

Figure 14. Answers through Mentimeter during Metropolitan Caravan

5. **Target Audience:**
   - Citizens of the four communes within the metropolitan area
   - Local businesses interested in sustainable practices
   - Authorities and representatives from local government
6. **Promotion and Outreach:** To raise awareness and attract participants, use multiple channels such as social media, community forums, and partnerships with local authorities.
7. **Early Results:**
   - **Attendance:** Averaged 60 residents per stop.
   - **Knowledge Gain:** Post-training surveys revealed a 40% increase in self-declared understanding of circular economy principles.
   - **Engagement:** Strong interest in neighborhood-scale reuse initiatives.
   - **Feedback:** Participants requested more concrete, local examples: leading trainers to integrate additional case studies and hands-on demos in later sessions.
   - **Impact:** Data collected feeds directly into the metropolitan awareness strategy and informs the design of future capacity-building workshops for SMEs.

8. **Expected Outcomes**
    - Increased awareness and understanding of circular economy among metropolitan residents.
    - Strengthened dialogue between citizens, businesses, and authorities on sustainable urban living.
    - Foundation for a long-term metropolitan awareness and capacity-building strategy.
9. **Evaluation:** The overall effectiveness of the training has been measured through participant feedback utilizing digital solutions or a debate at the end of the training session. An analysis of the interest of the participants has been carried out so that the information about the training has been refined each time, bringing more practical examples and descriptive images so that the CE concept to be better understood and the audience maintains its interest in the subject until the end.

Conclusion: The Metropolitan Caravan successfully translated abstract circular economy principles into accessible, engaging, and practical learning experiences for peri-urban communities. By combining expert knowledge with interactive practice and open dialogue, the pilot activity-built capacity sparked new local initiatives and contributed directly to shaping the metropolitan awareness strategy. This engagement marks an important step toward creating a more sustainable, participatory, and conscious community in the Cluj metropolitan area, fully aligned with the objectives of the Net-Zero Block Neighborhoods project.

9.2. One day per week a vegetarian menu of four is served in the City of Cluj-Napoca Canteen

Sustainable change relies on both institutional action and citizen behavior. This pilot activity tested the capacity of Cluj-Napoca's residents to accept and adapt to environmentally friendly practices through an accessible, everyday habit: food choice. By introducing **"Vegetarian Fridays"** at the City's municipal canteen, the activity explored how citizens respond to low-carbon menu options, while simultaneously generating valuable data for public institutions and future procurement strategies.

Action Proposal: Understanding Citizen Acceptance and Adaptation to Environmentally Friendly Practices

Purpose: The activity's primary goal was to assess community acceptance of sustainable dietary practices and identify both opportunities and barriers to behavior change. More specifically, it aimed to:

- Evaluate citizens' openness to vegetarian meals in a public canteen setting.
- Raise awareness of the environmental and health benefits of reduced meat consumption.
- Test low-cost nudging strategies to promote climate-friendly food choices.
- Provide actionable insights for public food procurement and menu planning.

Implementation of the activity:

This pilot activity will take place at the City of Cluj-Napoca Canteen, with a focus on enhancing the awareness and acceptance of vegetarian food consumption as an environmentally friendly practice. The activity will be implemented weekly, specifically targeting Fridays, which align with traditional vegetarian eating habits among Orthodox citizens.

1. **Location:** City of Cluj-Napoca Canteen, "Memo 10"
2. **Frequency and Duration:**
   - One Friday per week, during May 2025.
   - The pilot ran for **one to three consecutive Fridays**, each featuring a full vegetarian menu.
3. **Activity Structure:**
   - Ahead-of-time Outreach: Visually appealing posters displayed four days in advance invited patrons to scan a QR code linking to a short survey. The survey gathered information on food preferences, awareness of diet-related environmental impacts, and willingness to try vegetarian meals.
   - On-site Nudge: Posters and flyers remained visible during the pilot days, highlighting carbon footprint facts and the health co-benefits of vegetarian diets.
   - Menu Offering: Each Friday, the canteen offers a four-dish vegetarian menu, designed to be appealing, nutritious, and accessible.
   - Real-time Feedback: The QR-linked survey (5–6 questions) collected citizen feedback, while kitchen staff tracked actual uptake of vegetarian menu options.
4. **Survey Questions (Examples):**
   - How aware are you of the environmental benefits of a vegetarian diet?
   - How likely are you to choose vegetarian options more frequently?
   - What factors influence your decision to eat vegetarian food?
   - What would encourage you to adopt more plant-based meals?
5. **Goals and Expected Outcomes**

- **Gather Data:** Collect quantitative and qualitative data to produce the city’s first hard data set on consumer openness to plant-based meals in a public-sector canteen.
- **Identify Barriers:** Detect cultural, social, or practical obstacles to vegetarian food acceptance.
- **Increase Awareness:** Enhance the community's awareness of environmentally friendly practices and their importance.
- **Inform Future Initiatives:**
    - Utilize the feedback to support future menu planning and ingredient procurement at Memo 10 and other municipal facilities.
    - Feed into the emerging circular procurement guidelines for public food services across the metropolitan area

6. **Evaluation**
    - **Quantitative:** Uptake rates of vegetarian dishes and survey responses measuring awareness, willingness, and behavior change.
    - **Qualitative:** Participant feedback on perceived benefits and challenges.
    - **Institutional Use:** Data directly informs the city’s awareness strategies and procurement policies, ensuring alignment with both citizen expectations and sustainability goals.
7. **Conclusion:** The “Vegetarian Fridays” pilot demonstrated a practical way to test citizen acceptance of environmentally friendly practices through dietary change. By combining outreach, nudging strategies, and real-time data collection, the activity not only engaged citizens in sustainable behavior but also provided the municipality with critical insights into community readiness for change. These findings will guide future menu design, procurement strategies, and broader efforts to embed circular economy principles into public food services across Cluj’s metropolitan area.

In summary, these two pilot projects play a strategic role, even if modestly. Caravan provides basic knowledge and initiates dialogue in communities that need to sort, recycle, and repair more if Cluj Metropolitan Area is to achieve its circular economy goals. The "Vegetarian Fridays" program tests a specific behavioral change that reduces the city's consumption-based emissions and based on survey results, identifies the drivers and barriers to wider change. Together, they provide evidence, momentum, and local stories that the metropolitan coalition can translate into larger interventions and policy tools on the path to net-zero emissions and a truly circular Cluj Metropolitan Area.

9.3. Awareness and information video “Proper separate waste collection”:

In this video, we provide a comprehensive and practical overview of how residents can correctly separate and collect their waste, following the principles of responsible waste management. The material explains, step by step, which types of waste should be placed in each dedicated container, how to prepare recyclables before disposal, and why proper separation at the source is essential for increasing recycling rates and reducing the amount of waste sent to landfill.

The video also introduces the audience to the existing waste management infrastructure available across the Cluj Metropolitan Area. Viewers can see examples of the different types of collection points already implemented, such as the color-coded street containers. By visually presenting the infrastructure, we aim to make it easier for residents to understand how the system works and how accessible it already is.

Our goal with this pilot activity is not only to inform, but also to educate and empower the population. The video emphasizes the environmental and community benefits of correct waste separation, raising awareness about the positive impact each household can have through consistent and responsible behavior.

Ultimately, the message we want to communicate is clear: every person plays an important role, and small daily actions, such as placing waste in the right container, contribute to a cleaner, healthier, and more sustainable Cluj Metropolitan Area. Through this initiative, we encourage residents to pay closer attention to how they collect their waste and to actively participate in improving the quality of the environment we all share.

10. Prioritized Actions for Advancing Circular Economy in the Cluj Metropolitan Area

The priorities of the measures included in the Integrated Action Plan for the Cluj Metropolitan Area were determined using a structured, multi-criteria methodology, which was developed based on the best practices of partner cities such as Oulu and Riga. This approach ensured that decisions were based on facts and reflected the views of a wide range of stakeholders, striking a balance between ambition and feasibility.

1. **Stakeholder engagement (ULG process):**
    - A series of workshops and consultations were organized with representatives from public institutions, academia, the business sector, and civil society.

- These sessions enabled a shared understanding of metropolitan challenges and opportunities and allowed participants to score and discuss the proposed actions collectively.

2. **Selection criteria:** Each proposed action was assessed against a set of five criteria designed to reflect both local priorities and transnational standards:

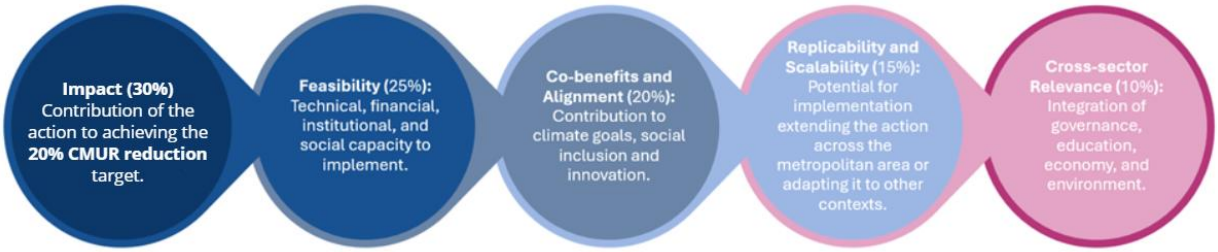


Figure 15. Selection criteria

3. **Scoring mechanism:**
   - Actions were scored on a **scale of 1 to 5** for each criterion.
   - Weighted averages were applied according to the distribution listed above, ensuring that high-impact and feasible measures received proportionally higher priority.
4. **Consensus and Validation:**
   - Preliminary prioritization results were discussed and refined during ULG meetings.
   - The draft prioritization was subsequently validated through a peer-review process with the LGC! network, aligning the Cluj approach with transnational methodologies while reflecting local realities.
5. **Outcome:** The expected outcome is a robust, transparent, and consensus-based priority framework that identifies the most effective, feasible, and scalable measures for the Cluj Metropolitan Area. This priority list will serve as the basis for the implementation, monitoring, and future expansion of the integrated action plan.

The list below presents the priority actions identified in the Integrated Action Plan for the Cluj Metropolitan Area. These actions have been ranked according to their strategic importance, expected impact, feasibility, and alignment with metropolitan sustainability goals. Each measure contributes to the overall objective of integrating the principles of the circular economy (CE) into the economic, social, and institutional sectors by 2030.

Table 2. Priority actions identified in the Integrated Action Plan

Priority rank	Title of action	Specific objective (SO)	Key stakeholders
1	Integrating CE principles into the value chain	SO5, SO6, SO7	Cluj Metropolitan Area, Municipality of Cluj-Napoca, Technical University of Cluj-Napoca: Engineering of materials department, Construction design department, Arts and Design University – Architecture and fashion design departments, NGOs, SMEs, Ministry of Education, Cluj Metropolitan Area, etc.
2	Sustainable procurement in public institutions	SO1, SO3, SO7, SO10	Cluj Metropolitan Area, Municipality of Cluj-Napoca-Purchase and HR departments, Public sector, IRCEM, Babes Bolyai University – Faculty of Environmental Science and Engineering, IT Cluster, National Agency for public procurement, Purchase department of the Cluj Metropolitan Area Municipalities, NGOs, SMEs, etc.
3	Re-use of food through donations to children's homes, nursing homes, animal shelters	SO2, SO10, SO11	Cluj Metropolitan Area, Municipality of Cluj-Napoca, Cluj Metropolitan Area, Food sector, School inspectorate, local producers, "Clujul Sustenabil", National Waste Agency, Collecting system in hypermarkets, Food Bank, Agro Cluster Transylvania, administrative department of large retailers, NGOs, SMEs, etc.

Priority rank	Title of action	Specific objective (SO)	Key stakeholders
4	Creation of an urban center for reusable resources	SO4, SO5, SO7, SO10	Cluj Metropolitan Area, Municipality of Cluj-Napoca – Public domain department, SMEs, Citizens, IRCEM, NGOs, TUCN, Ministry on Environment, Cluj Metropolitan Area Municipalities, Urban Resource center, etc.
5	Repair and reconversion of existing buildings	SO4, SO5	Cluj Metropolitan Area, Municipality of Cluj-Napoca - Technical Department, Investment Department, private construction companies, TUCN - Construction Faculty, Romanian Architects Organization, Ministry of development, public works and administration, Metropolitan Area Municipalities – Technical department, designers and architects, Specialized consultancy, Cluj City Council - technical department, NGOs, SMEs, etc.
6	Introduce a circularity challenge at Innovation Camp	SO4, SO6, SO7	Municipality of Cluj-Napoca, Cluj Metropolitan Area, Clusters (IT, Agro, Energy), IRCEM, volunteers, BBU, Ministry of Environment, Metropolitan Area Municipalities, NGOs, SMEs, etc.
7	Inform and educate citizens about the circular economy	SO4, SO6, SO7	Cluj Metropolitan Area, Municipality of Cluj-Napoca, Agro Transylvania Cluster, Transylvania Energy Cluster,

Priority rank	Title of action	Specific objective (SO)	Key stakeholders
			Universities, NGOs, County School Inspectorate, IRCEM, Cluj Metropolitan Area Municipalities
8	Creating a data space for circularity	SO5, SO9, SO11	Cluj Metropolitan Area, Municipality of Cluj-Napoca, Department of Public Services; IT Cluster, TUCN, Waste operator, SMEs, Ministry of Research, Innovation and Digitalization, City Planning, NGOs, etc.
9	Introduce circular economy themes in the educational extra-curriculum plan	SO6, SO7, SO8	Cluj Metropolitan Area, Municipality of Cluj-Napoca, County School Inspectorate, IRCEM, BBU, training centers, Students council, local media, Education Ministry, City County Education Directorate, Edu-Cluster, "Clujul Sustenabil", NGOs, SMEs, etc.
10	Reducing greenhouse gas (GHG) emissions through water management	SO4	Cluj Metropolitan Area, Municipality of Cluj-Napoca, Someş Water Company, SMEs, Environmental NGOs, media, youth organizations, Ministry of Environment, Regional Environmental Agency, Cluj Metropolitan Area, etc.

The following section includes a detailed presentation of the priority actions:

Action 1: Integrating CE principles into the value chain

Table 3. Detailed presentation of Action 1.

Link to specific objective	SO5, SO6 and SO7
Short description	Integration of circular economy principles across the value chain through the development of a Circular Product Passport Toolkit for SMEs and organizing "Sustainable Design Week", enabling material tracking, product transparency, and sustainable design to support circular business models.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan, National Strategy for Circular Economy
Output	Standardized circular design principles
Timescale	2026-2027
Rough cost estimation	€60,000
Indicator	Number of SMEs using CE design/passport tools
Estimated impact on sustainability	Make the community aware and responsible in compliance of CE principles.
Cross-cutting topics addressed	Awareness raising, involvement of the CE experts, SMEs, Industry, students.
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca, Technical University of Cluj-Napoca: Engineering of materials department, Construction design

	department, Arts and Design University – Architecture and fashion design departments, NGOs, SMEs, Ministry of Education, Cluj Metropolitan Area, etc.

Action 2: Sustainable procurement in public institutions

Table 4. Detailed presentation of Action 2.

Link to specific objective	SO1, SO3, SO7 and SO10
Short description	Implementation of a sustainable public procurement system in public institutions, focused on purchasing products aligned with circular economy principles, supported by guidelines, training for procurement officers, tax incentives, and a pilot for circular food procurement.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	More circular public procurement system public institutions. 50% of public procurement contracts prioritize products and services designed for reuse, repair, or recycling.
Timescale	2026-2028
Rough cost estimation	€130,000
Indicator	Percentage of public procurement contracts with circular criteria
Estimated impact on sustainability	Increase demand for sustainable products and services in the public sector**.**
Cross-cutting topics addressed	Business development, sustainable development, good governance.
Status of the action	New action

Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca-Purchase and HR departments, Public sector, IRCEM, Babes Bolyai University – Faculty of Environmental Science and Engineering, IT Cluster, National Agency for public procurement, Purchase department of the Cluj Metropolitan Area Municipalities, NGOs, SMEs, etc.

Action 3: Re-use of food through donations to children's homes, nursing homes, animal shelters

Table 5. Detailed presentation of Action 3.

Link to specific objective	SO2, SO10 and SO11
Short description	Implementation of a food surplus collection system, enabling the reuse of edible surplus through donations to children's homes, nursing homes, and shelters, supported by a local digital and logistics platform for managing food redistribution.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	Metropolitan Food Reuse Platform (digital + logistics) operational; ≥60 active donors and ≥40 beneficiary institutions on boarded .
Timescale	2026
Rough cost estimation	€30,000
Indicator	No of Tons of edible surplus redistributed to social institutions
Estimated impact on sustainability	Reducing food waste and supporting children's homes, nursing homes, animal shelters

Cross-cutting topics addressed	Food waste management, awareness raising, effective public services.
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca, Cluj Metropolitan Area, Food sector, School inspectorate, local producers, "Clujul Sustenabil", National Waste Agency, Collecting system in hypermarkets, Food Bank, Agro Cluster Transylvania, administrative department of large retailers, NGOs, SMEs, etc.

Action 4: Creation of an urban center for reusable resources (OSER)

Table 6. Detailed presentation of Action 4.

Link to specific objective	SO4, SO5, SO7 and SO10
Short description	Creations of an urban center for reusable resources (OSER) to promote resource reuse at the municipal level. The initiative includes feasibility studies and co-creation of the OSER with a Maker Corner, pop-up repair cafés and reuse market days, followed by the development of a permanent OSER hub with integrated repair facilities and a metropolitan network of OSER and repair satellites.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area 2030 Climate Action Plan, National Strategy for Circular Economy
Output	An urban center of second-hand resources at the municipal level.
Timescale	2026-2030

Rough cost estimation	€1,590,000
Indicator	Tons of materials diverted for reuse via the OSER network
Estimated impact on sustainability	Reducing the waste of resources and promoting the circular economy at the urban level.
Cross-cutting topics addressed	Awareness raising, effective public services, good governance, waste management.
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca – Public domain department SMEs, Citizens, IRCEM, NGOs, TUCN, Ministry of Environment, Cluj Metropolitan Area Municipalities, Urban Resource center, etc.

Action 5: Repair and reconversion of existing buildings

Table 7. Detailed presentation of Action 5.

Link to specific objective	SO4 and SO5
Short description	Implementation of a program for the repair and reconversion of existing buildings to enhance sustainability and reduce the ecological footprint. The program includes developing Circular Building Retrofit Guidelines, conducting a pilot green reconversion of public buildings, and establishing an SME support scheme for circular renovation projects.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy

Output	A program of repair and conversion of existing buildings
Timescale	2026-2030
Rough cost estimation	€535,000
Indicator	Number of buildings repaired/reconverted using circular guidelines
Estimated impact on sustainability	Optimizing the use of resources and reducing the need for new construction, reducing the quantity of waste generated by the demolition.
Cross-cutting topics addressed	Sustainable development, waste management in construction.
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca - Technical Department, Cluj Metropolitan Area, Investment Department, private construction companies, TUCN - Construction Faculty, Romanian Architects Organization, Ministry of development, public works and administration, Metropolitan Area municipalities –Technical department, designers and architects, Specialized consultancy, Cluj City Council - technical department, NGOs, SMEs, etc.

Action 6: Introduce a circularity challenge at Innovation Camp (Innovation pipeline)

Table 8. Detailed presentation of Action 6.

Link to specific objective	SO4, SO6 and SO7
Short description	Organization of an annual Circular Innovation Camp, where participants address environmental and sustainability

	challenges through innovative, circular solutions. The initiative includes an Annual Circular Innovation Challenge, a Circular Sandbox Living Lab, integration of circular design in accelerators and incubators, establishment of a Circular Design Council and Foresight Labs, and a "Prototype-to-Market" program supporting the commercialization of circular innovations.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	Innovative solutions for environmental and sustainability challenges.
Timescale	2026-2030
Rough cost estimation	€335,000
Indicator	Number of circular innovation prototypes developed through the camp
Estimated impact on sustainability	Increase innovation and engagement in the circular economy.
Cross-cutting topics addressed	Sustainable development, innovative solutions.
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca, Cluj Metropolitan Area, Clusters (IT, Agro, Energy), IRCEM, volunteers, BBU, Ministry of Environment, Metropolitan Area Municipalities, NGOs, SMEs, etc.

Action 7: Inform and educate citizens about the circular economy

Table 9. Detailed presentation of Action 7.

Link to specific objective	SO4, SO6 and SO7
Short description	Creating public awareness and education campaigns, using multiple interactive, theoretical and practical tools, to attract citizens to adopt circular practices.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	Educated citizens about the circular economy.
Timescale	2026-2028
Rough cost estimation	€135,000
Indicator	Number of citizens reached by circular economy awareness activities
Estimated impact on sustainability	Increase public awareness of the benefits and importance of the circular economy.
Cross-cutting topics addressed	Awareness raising, citizens, students, local administration.
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca, Agro Transylvania Cluster, Transylvania Energy Cluster, Universities, County School Inspectorate, IRCEM, Cluj Metropolitan Area Municipalities, NGOs, SMEs, etc.

Action 8: Creating a Data Space for Circularity

Table 10. Detailed presentation of Action 8.

Link to specific objective	SO5, SO9 and SO11
Short description	Developing a 'dataspace' for the circular economy, where companies and organizations can share data on material use and resource management.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	A 'dataspace' platform for circular economy
Timescale	2026-2030
Rough cost estimation	€280,000
Indicator	Number of active users on the circularity data space
Estimated impact on sustainability	Create a transparent and collaborative environment for the circulation and use of data related to the circular economy.
Cross-cutting topics addressed	Awareness raising, effective public services, private companies (repairs)
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca, Department of Public Services; IT Cluster, TUCN, Waste operator, Ministry of Research, Innovation and Digitalization, City Planning, NGOs, SMEs, etc.

Action 9: Introduce CE themes in the extra-curriculum plan

Table 11. Detailed presentation of Action 9.

Link to specific objective	SO6, SO7 and SO8
Short description	Development and implementation of an optional circular economy workbook and teaching toolkit for middle and high schools to enhance students' understanding of sustainability and circular principles, introduced during the "Green Week." The program includes train-the-trainer sessions for educators, an annual Circular Economy Student Challenge with a "Circular School" label, and the Youth for Circularity initiative for high school engagement.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	An optional circular education text/workbook for middle and high school.
Timescale	2026-2030
Rough cost estimation	€95,000
Indicator	Number of schools implementing the circular economy extra-curriculum
Estimated impact on sustainability	Bring added value to the education system Increasing the degree of discernment of young people in their capacity as future consumers.
Cross-cutting topics addressed	Environmental Sustainability, Education
Status of the action	New action
Rough risk estimation	Medium
Action owner	Cluj Metropolitan Area

Key stakeholders	Municipality of Cluj-Napoca, County School Inspectorate, IRCEM, BBU, training centers, Students council, local media, Education Ministry, City County Education Directorate, Edu-Cluster, "Clujul Sustenabil", NGOs, SMEs, etc.

Action 10: Reducing GHG through water management

Table 12. Detailed presentation of Action 10.

Link to specific objective	SO4
Short description	Implementation of gray water and stormwater management systems using phyto-purification technologies in urban and rural communities to reduce greenhouse gas emissions. The initiative includes establishing pilot phyto-purification sites and providing technical assistance for water reuse to SMEs and households.
Relevant strategies, policies, development programs	UIDS of Cluj Metropolitan Area, 2030 Climate Action Plan National Strategy for Circular Economy
Output	Water recycling at home and in local businesses.
Timescale	2026-2029
Rough cost estimation	€140,000
Indicator	Cubic meters of water reused via gray/storm water systems
Estimated impact on sustainability	Reduction of GHG emissions and efficient use of water resources.
Cross-cutting topics addressed	Awareness raising, public water services.
Status of the action	New action
Rough risk estimation	Medium

Action owner	Cluj Metropolitan Area
Key stakeholders	Municipality of Cluj-Napoca, Someş Water Company, SMEs, Environmental NGOs, media, youth organizations, Ministry of Environment, Regional Environmental Agency, Cluj Metropolitan Area, etc.

PART IV: DETAILED PRESENTATION OF THE ACTIONS

Table 13. Detailed presentation of the Actions and Activities

Action 1. Integrating CE principles into the value chain	**Integration of circular economy principles across the value chain through the development of a Circular Product Passport Toolkit for SMEs and organize "Sustainable Design Week", enabling material tracking, product transparency, and sustainable design to support circular business models.**					
Sub-activity	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
1.1: Development of a Circular Product Passport Toolkit for SMEs	2026–2027	€30,000 (consultancy, design, platform, tests)	Horizon Europe, ERDF, Nat. SME	Low SME uptake	CMA, UTCN (Materials/Construction), Arts & Design Univ., IT Cluster, IRCEM, SMEs, NGOs, etc.	Toolkit + 10 pilot passports
1.2: Organize a "Sustainable Design Week"	2026–2027	€30,000 (consultancy, design, development)	Horizon Europe, ERDF, Nat. SME	Low stakeholder engagement	CMA, UTCN (Materials/Construction), Arts & Design Univ., IT Cluster, IRCEM, SMEs,	Product and prototype development

					NGOs, etc.	
Action 2. Sustainable procurement in public institutions	**Implementation of a sustainable public procurement system in public institutions, focused on purchasing products aligned with circular economy principles, supported by guidelines, training for procurement officers, tax incentives, and a pilot for circular food procurement.**					
Sub-activity	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
2.1: Circular Procurement Guidelines & Criteria	2026–2027	€35,000 (expert consultancy, working groups, guide design and dissemination)	National budget, ERDF technical assistance funds	Institutional inertia	IRCEM, Municipality of Cluj-Napoca, National Agency for Public Procurement, local councils, SMEs, NGOs, etc.	Guidelines adopted by ≥10 institutions
2.2: Capacity-building for Procurement Officers	2026–2028	€40,000 (trainers, materials, venues)	ESF+, Erasmus+, local HR development budgets	Staff turnover	ULG (incl. IRCEM, BBU), HR depts., SMEs, NGOs, etc.	≥150 staff trained; improved monitoring
2.3: Circular Tax Incentives for	2026 – 2027	€30,000 (legal, consultation)	Local budget, TA (URBACT)	Bureaucratic resistance	Municipality, business associations, fiscal	Local policy drafted; ready

Businesses					experts, IRCEM, SMEs, NGOs, etc.	for pilot
2.4: Circular Public Food Procurement Pilot	2026 – 2027	€25,000 (training, local sourcing)	ERDF, Erasmus+, Local budget, EU Green Deal funds	Rigid procedures	Cluj-Napoca Municipality, School Inspectorate, local producers, SMEs, NGOs, etc.	3 pilots serve sustainable menus weekly

Action 3. Re-use of food through donations (children's homes, nursing homes, shelters)	**Implementation of a food surplus collection system, enabling the reuse of edible surplus through donations to children's homes, nursing homes, and shelters, supported by a local digital and logistics platform for managing food redistribution.**					
Sub-activity	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
3.1: Local Food Surplus Platform (digital + logistics)	2026	€30,000 (platform, staff, logistics)	URBACT, local funds, retail partners	Low private engagement	Food Bank, Agro Cluster, major retailers, SMEs,	Platform live; redistribution started;

					NGOs, etc.	Metropolitan Food Reuse Platform (digital + logistics) operational; ≥60 active donors and ≥40 beneficiary institutions on boarded.

Action 4. Creation of an urban center for reusable resources (OSER)	**Creations of an urban center for reusable resources (OSER) to promote resource reuse at the municipal level. The initiative includes feasibility studies and co-creation of the OSER with a Maker Corner, pop-up repair cafés and reuse market days, followed by the development of a permanent OSER hub with integrated repair facilities and a metropolitan network of OSER and repair satellites.**					
Sub-activities	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource**	**Risks**	**Key Stakeholders**	**Outputs**

			allocation program			
4.1: Feasibility & Co-creation of OSER + Maker corner	2026	€45,000 (consultants, venues, facilitation, design)	URBACT, local budget, ERDF feasibility funds	Stakeholder misalignment of visions	Municipality of Cluj-Napoca, IRCEM, BBU, TUCN, UAD, UrbanNect, SMEs, NGOs, etc.	Feasibility + co-created concept & roadmap
4.2: Pop-up OSER + Repair Cafés + Reuse Market Days	2026 – 2027	€55,000 (space, staff, tools, signage)	City Innovation Fund, Horizon Europe pilots	Logistics, volunteer gaps	Local SMEs, Florești Municipality, schools, repair cafés, waste operators, NGOs, etc.	Proof-of-concept; flows monitored
4.3: Permanent OSER Hub with Integrated Repair	2026 – 2030	€1,350,000 (renovation, equipment, staff, digital tools)	ERDF, City Budget, Just Transition Mechanism	Permits, funding delays	Municipality of Cluj-Napoca, Ministry of Environment, EU funding bodies, technical universities, SMEs, NGOs, etc.	Operational hub; tracked reuse (t/yr)
4.4: Metropolitan OSER & Repair Satellite Network	2027–2030	€140,000 (equipment, logistics, trainers)	ESF+, Interreg, ERDF/PNRR, CSR	Local facilitator gaps	CMA, commune mayors, repair SMEs, NGOs, etc.	3 micro-hubs; ≥500 residents engaged

Action 5. Repair and reconversion of existing buildings	**Implementation of a program for the repair and reconversion of existing buildings to enhance sustainability and reduce the ecological footprint. The program includes developing Circular Building Retrofit Guidelines, conducting a pilot green reconversion of public buildings, and establishing an SME support scheme for circular renovation projects.**					
Sub-activities	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
5.1: Develop Circular Building Retrofit Guidelines	2026	€35,000 (experts, workshops)	ERDF, Technical Assistance Programs, local budget	Norm misalignment	City Hall, architects, builders, TUCN, IRCEM, SMEs, NGOs, etc.	Guidelines adopted by City Council
5.2: Pilot Green Reconversion of Public Buildings (e.g., schools, cultural centers)	2026–2028	€200,000 (design, works, monitoring)	ERDF, National Recovery and Resilience Plan, Green Deal	Permits, higher CAPEX	City Hall, energy agencies, builders, design teams, SMEs, NGOs, etc.	2–3 pilots; LCA/CO_2 & reuse data
5.3: Support Scheme for SMEs Renovating	2027–2030	€300,000 (grants + advisory)	Just Transition Mechanism, ESF+,	Low uptake	SMEs, banks, consultants, CMA,	30 SMEs supported;

with CE Principles			local budget		NGOs, etc.	replication toolkit

Action 6. Introducing a circularity challenge at Innovation Camp (Innovation pipeline)	**Organization of an annual Circular Innovation Camp, where participants address environmental and sustainability challenges through innovative, circular solutions. The initiative includes an Annual Circular Innovation Challenge, a Circular Sandbox Living Lab, integration of circular design in accelerators and incubators, establishment of a Circular Design Council and Foresight Labs, and a "Prototype-to-Market" program supporting the commercialization of circular innovations.**					
Sub-activities	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
6.1: Annual Circular Innovation Challenge (CIC)	2026–2030	€25,000/yr (venue, mentors, awards)	Horizon Europe, EIT, Erasmus+, local	Participation, continuity	Municipality, Transylvania IT Cluster, BBU, IRCEM, private sponsors, SMEs, NGOs, etc.	10+ ideas/yr; ≥2 implemented/yr
6.2: Circular Sandbox Program – Living Lab	2026–2029	€60,000 (coord., pilots, co-	EIT UM, URBACT, City Fund	Legal/technical barriers	IRCEM, Local institutions (schools,	≥6 solutions prototyped

Incubator		funding)			markets), city departments, BBU, TUCN, UAD, SMEs, NGOs, etc.	
6.3: Integration of CE Design in Startup Accelerators & Incubators	2026–2029	€40,000 (curricula, mentors, proto-funds)	EIT CE, Startup Plus, local	Fragmented ecosystem	Transylvania IT Cluster, Business Incubators, BBU, TUCN, UAD, Cluj Metropolitan Area, IRCEM, Clujul Sustenabil, SMEs, NGOs, etc.	CE in 3 programs; 50 start-ups trained
6.4: Establishment of a "Circular Design Council" with bi-annual foresight labs	2027–2030	€35,000 (coord., events)	ERDF, URBACT+, local	Fragmented commitment	CMA, City, TUCN, UAD, BBU, clusters, SMEs, NGOs, etc.	Functioning council; 6 foresight labs
6.5: Launch "Prototype to Market" Circular Innovation Program	2028–2030	€75,000 (mini-grants, mentors, demos)	EIT CE, Startup Plus, JTF	Scalability risks	Business support orgs, Transylvania Start-Up ecosystem, CE mentors, SMEs,	≥5 prototypes/yr; 5 to pilot prod.

					NGOs, etc.	

Action 7. Inform and educate citizens about the circular economy	**Creating public awareness and education campaigns, using multiple interactive, theoretical and practical tools, to attract citizens to adopt circular practices.**					
Sub-activities	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
7.1: CE Awareness Caravan (Metropolitan Tour	2026–2027	€45,000 (van, materials, facilitators)	ERDF, Horizon, NGF, URBACT, Erasmus+, local	Weather, turnout	Cluj Metropolitan Area, Florești & Apahida town halls, IRCEM, SMEs, NGOs, etc.	19 events; ≥3,000 citizens
7.2: CE Basics Training for Public Staff & Local Entrepreneurs	2026–2028	€30,000 (curricula, trainers)	ESF+, Horizon, ERDF, URBACT	Turnover, SME engagement	ULG members, clusters, IRCEM, vocational schools, SMEs, NGOs, etc.	100 trained
7.3: Education Campaign – "Sharing	2026–2027	€20,000 (media, animation)	Erasmus+, URBACT comms, donors	Message fatigue	Schools, youth councils, local media,	50+ events; 2,000+ reached

is Smart"					influencers, SMEs, NGOs, etc.	
7.4: "Green Food for All" public campaign and community workshops	2026	€15,000 (materials, facilitators)	ERDF, Erasmus+, local, EGD, URBACT	Low turnout	IRCEM, Food Bank Cluj, "Clujul Sustenabil", influencers, school communities, SMEs, NGOs, etc.	≥500 citizens; food waste literacy
7.5: Awareness Campaign – "Smart Water, Low Emissions"	2026–2028	€25,000 (media, printing, trainers)	URBACT, Erasmus+, Local Env. Fund	Rural reach limits	Environmental NGOs, media, youth councils, water experts, SMEs, etc.	5,000+ reached; 20+ schools use materials

Action 8. Creating a Data Space for Circularity	**Creating public awareness and education campaigns, using multiple interactive, theoretical and practical tools, to attract citizens to adopt circular practices.**					
Sub-activities	**Start – End**	**Funds and other**	**Funding, financing**	**Risks**	**Key Stakeholders**	**Outputs**

	date	**resources needed**	**and resource allocation program**			
8.1: Concept & Stakeholder Architecture Design	2026	€30,000 (consultancy, workshops)	Horizon, Digital Europe, URBACT	Interoperability	Municipality, IT Cluster, IRCEM, waste operators, SMEs, NGOs, etc.	Governance & architecture; pilot roadmap
8.2: Build and Pilot the CE Data Platform	2026–2028	€80,000 (dev, UX, integration)	ERDF, JTF, PPP	Complexity, data entry	IT Cluster, TUCN, BBU, UAD, Municipality, repair/reuse SMEs, NGOs, etc.	MVP live; 100+ users
8.3: Engage & Grow User Base via CE Data Literacy Campaigns	2028–2030	€20,000 (training, promo)	Digital Europe, local, SME funds	Low motivation	Hubs, clusters, students, schools, SMEs, NGOs, etc.	5 trainings/yr; +15% users/yr
8.4: Launch of a Metropolitan CE Procurement Observatory & Monitoring	2026–2030	€55,000 (dashboards, data ops)	Horizon, URBACT cap., regional	Data gaps	IT Cluster, CMA, local procurement departments, SMEs, NGOs, etc.	Live KPIs; annual reports

Dashboard						
8.5: Launch Cluj Sharing Map & Digital Platform	2026–2028	€45,000 (IT dev, data, maintenance)	Horizon, DIH, IT cluster	Data accuracy	Transylvania IT Cluster, IRCEM, Clujul Sustenabil, municipalities, SMEs, NGOs, etc.	Map used by 5,000+ residents
8.6: CE Digital Learning Hub for Citizens	2027–2030	€35,000 (content, hosting)	Horizon, Digital Europe, local	Low traffic	Transylvania IT Cluster, IRCEM, Communication teams, SMEs, NGOs, etc.	Hub online; 2,000+ visits/yr
8.7: Launch of a Circular Design Open-Source Resource Library	2026 – ongoing	€15,000 – website, translations, content creation	Interreg Europe, Erasmus+, local budget	Lack of contributions, platform not maintained	TUCN, UAD, IRCEM, students, SMEs, NGOs, etc.	≥30 downloadable resources

Action 9. Introduce CE themes in the extra-curriculum plan	**Development and implementation of an optional circular economy workbook and teaching toolkit for middle and high schools to enhance students' understanding of sustainability and circular principles, introduced during the "Green Week." The program includes train-the-trainer sessions for educators, an annual Circular Economy**

	Student Challenge with a "Circular School" label, and the Youth for Circularity initiative for high school engagement.					
Sub-activities	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
9.1: Develop CE Educational Workbook and Teaching Toolkit	2026	€25,000 (content, design, print)	Erasmus+, MoE, local	Validation delays	County Inspectorate, BBU, IRCEM, SMEs, NGOs, etc.	Workbook (print+digital); ≥10 schools
9.2: Train-the-Trainers Program for CE Educators	2026–2028	€30,000 (training, cert.)	ESF+, Erasmus+, teacher budget	Low teacher time	Teacher training centers, educational NGOs, local councils, SMEs, NGOs, etc.	100+ trained; CE trainers county-level
9.3: Annual CE Student Challenge and "Circular School" Label	2027–2030	€20,000 (events, awards)	Local gov., sponsors, Erasmus+	Continuity risks	Inspectorate, students, media, SMEs, NGOs, etc.	30+ schools/yr; ≥5 labels/yr
9.4: Youth for Circularity Campaign	2026–2029	€20,000 (media, rewards,	Erasmus+, local edu budgets, sponsors	Scheduling, uneven	Inspectorate, CE educators, SMEs,	Debates, contests,

in High Schools		materials)		participation	NGOs, etc.	school labels

Action 10. Reducing GHG through water management	**Implementation of gray water and storm water management systems using phyto-purification technologies in urban and rural communities to reduce greenhouse gas emissions. The initiative includes establishing pilot phyto-purification sites and providing technical assistance for water reuse to SMEs and households.**					
Sub-activities	**Start – End date**	**Funds and other resources needed**	**Funding, financing and resource allocation program**	**Risks**	**Key Stakeholders**	**Outputs**
10.1: Phyto-purification Pilot Sites in Urban and Rural Public Spaces	2026–2027	€100,000 (landscaping, systems, permits)	ERDF, Nat. Env. Fund, NRRP	Permits, maintenance	City Hall, Someș Water Company, schools, SMEs, NGOs, etc.	≥1 public demo site; open visits
10.2: Technical Assistance Program for SMEs and Households on Water Reuse	2026–2029	€40,000 (toolkit, consultants)	JTF, LIFE+, local	Low adoption, regulations	CMA, SME associations, plumbers, engineers, NGOs, etc.	100 SMEs/households supported

PART V: IMPLEMENTATION FRAMEWORK

11. Financial plan

To ensure a coherent and realistic implementation of the Integrated Action Plan for the Cluj Metropolitan Area, a multi-source financing strategy will be adopted. Actions will be supported through a combination of European Structural and Investment Funds (ESIF), national budget allocations, private sector contributions, and local government funds. The primary EU instruments targeted include the European Regional Development Fund (ERDF), the European Social Fund Plus (ESF+), the Horizon Europe Programme, and Interreg URBACT+.

Table 14. Financial Overview Table

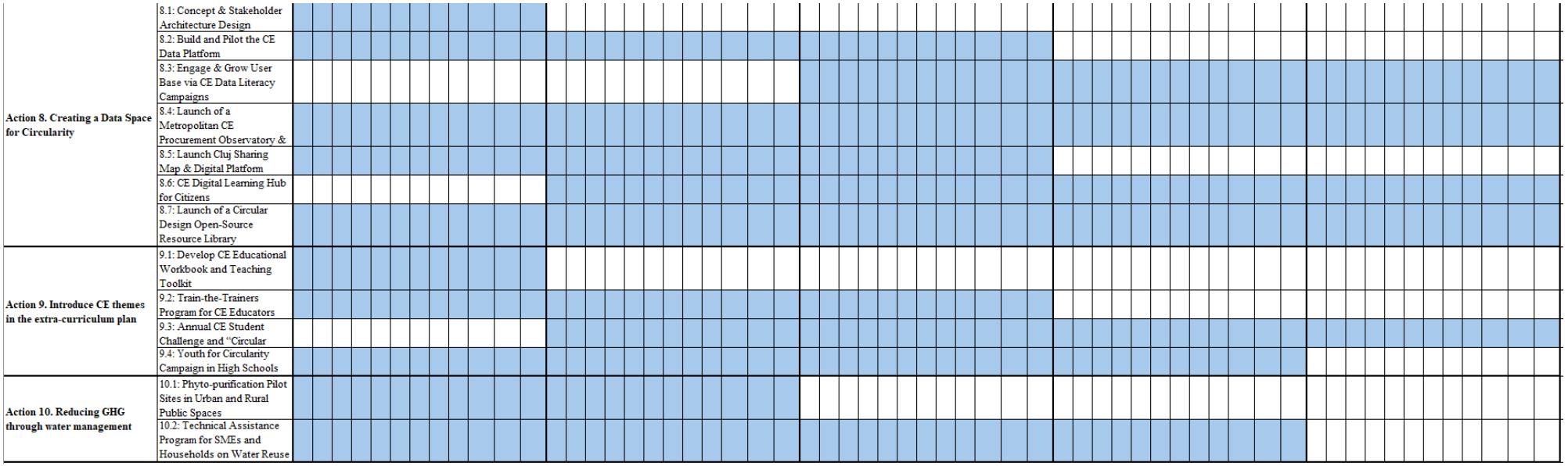
Action	**Missing Funds (EUR)**	**Missing Assets**	**Funding, Financing and Resource Allocation Programme**
1. Integrating CE principles into the value chain	€60,000	Prototyping lab access, software licenses	Horizon Europe, ERDF Innovation Stream, National SME
2. Sustainable procurement in public institutions	€130,000	Procurement monitoring dashboard, training tools	ESF+, ERDF Technical Assistance, National Digitalization Fund, Erasmus+, EU Green Deal Funds, Local Budget, TA (URBACT)
3. Re-use of food through donations (children's homes, nursing homes, shelters)	€30,000	Digital food surplus platform, logistics, staff	URBACT, local funds, retail partners
4. Creation of urban resource center (OSER)	€1,590,000	Refurbishment infrastructure, renovation equipment, digital tools, venues	URBACT, local budget, Just Transition Fund, ERDF Urban Renewal Funds, City Innovation fund, Horizon Europe pilots, Interreg, PNRR, CSR, ESF+

Action	Missing Funds (EUR)	Missing Assets	Funding, Financing and Resource Allocation Programme
5. Repair and reconversion of existing buildings	€535,000	Design, workshops, monitoring, grants	ERDF, TA, local budget, National Recovery and Resilience Plan (NRRP), Green Deal, ESF+, Just Transition Mechanism
6. Introduce a circularity challenge at Innovation Camp (Innovation pipeline)	€335,000	Venue, mentors, awards, coordination, pilots, proto-funds, mini-grants	Horizon Europe, ERDF, EIT, URBACT, Erasmus+, Startup Plus, JTF, URBACT+, local budget, City Fund, EIT UM, EIT, CE
7. Inform and educate citizens about the circular economy	€135,000	Materials, van, facilitators, trainers, media, animation, printing	ERDF, Horizon, NGF, URBACT, Erasmus+, local budget, donors, EGD, Local Env. Fund
8. Creating a Data Space for Circularity	€280,000	IT development, consultancy, data, hosting, workshops, maintenance, website, content creation, promo, training, dashboards	Horizon, Digital Europe, URBACT, ERDF, JTF, PPP, local budget, SME funds, regional budget, IT cluster, DIH, Interreg Europe, Erasmus+
9. Introduce CE themes in the extra-curriculum plan	€95,000	Design, print, content, training, media, materials, events, rewards	Erasmus+, MoE, local budget, ESF+, teacher budget, local government, sponsors
10. Reducing GHG through water management	€140,000	Landscaping, systems, permits, toolkit, consultants	ERDF, Nat. Env. Fund, NRRP, JTF, LIFE+, local

Additional funding will be pursued via the PNRR (National Recovery and Resilience Plan), local business sponsorships, and community co-financing for specific pilots (e.g. resource repair cafés, circular innovation camps).

12.Time Plan (Gantt)

Action	Sub-activity	2026												2027												2028												2029												2030											
		Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4		
		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
Action 1. Integrating CE principles into the value chain	1.1: Development of a Circular Product Passport Toolkit for SMEs																																																									
	1.2: Organize "Sustainable Design Week"																																																								
Action 2. Sustainable procurement in public institutions	2.1: Circular Procurement Guidelines & Criteria																																																								
	2.2: Capacity-building for Procurement Officers																																																								
	2.3: Circular Tax Incentives for Businesses																																																								
	2.4: Circular Public Food Procurement Pilot																																																								
Action 3. Re-use of food through donations (children's homes, nursing homes, shelters)	3.1: Local Food Surplus Platform (digital + logistics)																																																								
Action 4. Creation of an urban center for reusable resources (OSER)	4.1: Feasibility & Co-creation of OSER + Maker corner																																																								
	4.2: Pop-up OSER + Repair Cafés + Reuse Market Days																																																								
	4.3: Permanent OSER Hub with Integrated Repair																																																								
	4.4: Metropolitan OSER & Repair Satellite Network																																																								
Action 5. Repair and reconversion of existing buildings	5.1: Develop Circular Building Retrofit Guidelines																																																								
	5.2: Pilot Green Reconversion of Public Buildings (e.g., schools, cultural centers)																																																								
	5.3: Support Scheme for SMEs Renovating with CE Principles																																																								
Action 6. Introducing a circularity challenge at Innovation Camp (Innovation pipeline)	6.1: Annual Circular Innovation Challenge (CIC)																																																								
	6.2: Circular Sandbox Program – Living Lab Incubator																																																								
	6.3: Integration of CE Design in Startup Accelerators &																																																								
	6.4: Establishment of a "Circular Design Council" with bi-annual foresight labs																																																								
	6.5: Launch "Prototype to Market" Circular Innovation Program																																																								
Action 7. Inform and educate citizens about the circular economy	7.1: CE Awareness Caravan (Metropolitan Tour)																																																								
	7.2: CE Basics Training for Public Staff & Local Entrepreneurs																																																								
	7.3: Education Campaign – "Sharing is Smart"																																																								
	7.4: "Green Food for All" public campaign and community workshops																																																								
	7.5: Awareness Campaign – "Smart Water, Low Emissions"																																																								



13. Risk Mitigation Plan

Table 15. Risk Mitigation Plan

Risk	Type	Probability	Mitigation Plan
Delayed uptake by SMEs for circular value chain tools	Operational	Medium	Targeted awareness and voucher-based incentives; integration with existing incubators
Resistance to procurement reform in institutions	Institutional	High	High-level policy advocacy; co-creation workshops; support from National Agency for Public Procurement
Low citizen participation in sharing	Social/Engagement	Medium	Gamification, local influencers, integration into school & community

and reuse actions			campaigns
Gaps in data for monitoring indicators	Technical	Medium	Capacity-building for data entry; simplified interfaces; ongoing validation with pilot municipalities

14. Monitoring Framework

Monitoring progress will rely on a mix of quantitative indicators aligned with strategic and operational objectives. Baselines will be defined in 2025, with annual reviews.

Table 16. Strategic Objective and Specific Objectives Monitoring

Category	Objective	Result Indicator	Calculation Formula	Baseline (2025)	Target (2030)	Data Sources	Key stakeholder
SO1	Introduce a tax incentive scheme for circular businesses	Businesses benefiting from CE tax incentives (number)	Count of businesses granted 20% local tax reduction meeting ≥30% recycled input or closed-loop processes	0	≥50	Local Tax Authority records, CMA SME registry, ULG reports	Cluj Metropolitan Area, Municipal Tax Dept., IRCEM, SMEs, NGOs, etc.
SO2	Issue one metropolitan value-chain strategy	Metropolitan value-chain strategy adopted (Y/N)	Binary (1 if approved and published; 0 otherwise)	No	Yes (≥1 strategy)	CMA Council decisions, Official Gazette, Policy repository	Cluj Metropolitan Area, Municipality of Cluj-Napoca, SMEs, NGOs, etc.

Category	Objective	Result Indicator	Calculation Formula	Baseline (2025)	Target (2030)	Data Sources	Key stakeholder
SO3	Ensure 50% of public procurement has circular criteria	Public contracts including circular criteria (%)	(Contracts with reuse/repair/recycling criteria ÷ Total public contracts) × 100	0%	50%	e-Procurement system, procurement audit samples	Municipal Procurement Units, National Agency for Public Procurement, CMA, SMEs, NGOs, etc.
SO4	Reduce GHG by 20% via circularity	GHG reduction from circular actions (%)	[(GHG_baseline – GHG_current) ÷ GHG_baseline] × 100	0% reduction (index 100)	20% reduction (index 72)	CMA GHG Inventory, sectoral MRV reports, Someș Water Co.	Cluj Metropolitan Area, Municipality of Cluj-Napoca, Regional Environmental Agency, SMEs, NGOs, etc.
SO5	Provide technical assistance to at least 30 SMEs	Local SMEs supported for CE (number)	Count of SMEs receiving technical assistance and/or funding	0	≥30	Program beneficiary lists, grant databases	CMA, Clusters (IT/Agro/Energy), IRCEM, SMEs, NGOs, etc.
SO6	Engage 20% of the population from metropolitan area in CE initiatives	CE event participation rate (%)	(Participants in CE campaigns/workshops ÷ Total CMA population) × 100	0%	20%	ULG reports, event registrations, surveys	IRCEM, Municipalities, CMA, SMEs, NGOs, etc.

Category	Objective	Result Indicator	Calculation Formula	Baseline (2025)	Target (2030)	Data Sources	Key stakeholder
SO7	Engage all communes' staff and key sectors in circular economy	Trained staff & enterprises coverage (%)	(Staff and firms trained ÷ Total staff & firms targeted in energy/food/construction) × 100	0%	100% of communes ; ≥2 formats per entity	Training registers, HR logs, attendance sheets	CMA, County School Inspectorate, Clusters, IRCEM, SMEs, NGOs, etc.
SO8	Integrate circular economy topics in 80% of secondary & high schools	Schools implementing CE extracurricular (%)	(Schools with CE workbook/toolkit in 'Green Week' ÷ Total secondary & high schools) × 100	0%	80%	County School Inspectorate records, Ministry of Education reports	County School Inspectorate, CMA, Municipality of Cluj-Napoca, IRCEM, SMEs, NGOs, etc.
SO9	Map textile/food/construction flows; localize 30% of supply chain	Supply-chain localization in target sectors (%)	(Localized nodes in CMA ÷ Total mapped nodes) × 100 (weighted average)	0%	30%	Material flow analysis, sector surveys, cluster data	CMA, Clusters, Universities (BBU/TUCN), City Planning, SMEs, NGOs, etc.
SO10	Increase secondary raw material use for textiles, food,	Increase in secondary raw material (SRM) use	[(SRM_use_2030 – SRM_use_2025) ÷ SRM_use_2025] × 100,	0% increase (baseline = 2025)	+3% (textiles), +10% (food),	Waste & SRM market stats, National Waste Agency,	CMA, Municipal Waste Operator, National Waste Agency,

Category	Objective	Result Indicator	Calculation Formula	Baseline (2025)	Target (2030)	Data Sources	Key stakeholder
	and construction	by sector (%)	by sector		+5% (construction)	municipal operators	municipalities, SMEs, NGOs, etc.
SO11	Grow platform users by 25% and run repair/reuse/secondary-market fairs/year	Active users on repair/reuse/secondary-market platforms (%)	[(Active users_2030 – Active users_2025) ÷ Active users_2025] × 100	0% growth (baseline = 2025 users)	+25% users; ≥4 reuse fairs/year with ≥20 participants each	Platform analytics, fair attendance logs	CMA, Municipality of Cluj-Napoca (Public Services), IT Cluster, SMEs, NGOs, etc.

Action Output Monitoring:

Table 17. Action Output Monitoring

Action	Output Indicator	Calculation Formula	Baseline	Target (2030)	Data Source	Key Stakeholders
Action 1	Number of SMEs using CE design tools	Count	0%	10 SMEs	Toolkit platform stats	Cluj Metropolitan Area (CMA), IRCEM, SMEs, NGOs, etc.

Action	Output Indicator	Calculation Formula	Baseline	Target (2030)	Data Source	Key Stakeholders
Action 2	Public contracts with circular criteria (%)	(Contracts with CE criteria ÷ Total contracts) × 100	0%	50%	e-Procurement system, procurement audits	CMA, Municipal Procurement Units, National Agency for Public Procurement, SMEs, NGOs, etc.
Action 3	Edible surplus redistributed (t/year)	Sum of redistributed tons per year	0	600 t/year	Surplus platform logs, weigh tickets	CMA, Food Bank, Large retailers, Local producers, SMEs, NGOs, etc.
Action 4	Resources exchanged via OSER (t/year)	Tons/year recorded in OSER inventory	0	30 t/year	OSER digital inventory	Cluj-Napoca Municipality, CMA, OSER Hub, SMEs, NGOs, etc.
Action 5	Buildings repaired/reconverted using circular guidelines (no.)	Count of buildings completed under guidelines	0	30 buildings	Building permits, Technical Department records	Municipality Technical Dept., TUCN, Architects' Order, Private contractors, SMEs, NGOs, etc.
Action 6	Circular innovation prototypes developed (no.)	Count	0	50 prototypes	Innovation Camp/Incubator reports/ Transfer center	CMA, Clusters (IT/Agro /Energy Clusters), Universities, Research organizations, SMEs, NGOs, etc.

Action	Output Indicator	Calculation Formula	Baseline	Target (2030)	Data Source	Key Stakeholders
Action 7	Citizens reached by CE awareness activities (no.)	Unique participants counted across events	0	100,000 citizens	Event registrations, survey panels	IRCEM, Municipalities, Schools/Universities, SMEs, NGOs, etc.
Action 8	Active users on the Circularity Data Space (no.)	Monthly active users (MAU) count	0	1,500 users	Platform analytics	IT Cluster, CMA, Public Services, SMEs, NGOs, etc.
Action 9	Schools implementing CE extra-curriculum (%)	(Schools with CE module ÷ Total schools) × 100	0%	80%	County School Inspectorate records	Inspectorate, Ministry of Education, CMA, IRCEM, SMEs, NGOs, etc.
Action 10	Gray/storm water reused (m^3/year)	Metered m^3 reused per year	0	150,000 m^3/year	Utility meters, Someș Water reports	Someș Water Co., CMA, Municipalities, SMEs, NGOs, etc.

CONCLUSIONS

The Cluj Metropolitan Area Integrated Action Plan (IAP) represents a decisive step towards incorporating the principles of the circular economy into the region's development model. The IAP provides a clear and participatory roadmap to move toward climate neutrality by 2050. It aims to reduce material use in metropolitan areas by 20% by 2030, achieve a 20% circular material use rate, increase raw material productivity by 20% and reduce per capita waste generation by 20%. Through integrated planning, innovation, and collaboration, the IAP seeks to build an inclusive and digital circular ecosystem that connects government, education, business, and citizens in a shared transition towards sustainability.

During the process, local stakeholders (from local governments and universities to clusters, non-governmental organizations, and businesses) jointly developed a plan that links strategic direction with operational measures. The methodology combined bottom-up participation with top-down guidance, ensuring that the plan was firmly rooted in the realities of local communities while also aligning with European Union goals such as the European Green Deal, the Circular Economy Action Plan, and the NetZeroCities mission.

The process has provided important lessons that reinforce the credibility and replicability of the plan. First, the pilot initiatives Metropolitan Caravan and Vegetarian Fridays proved that it is more effective to start small, test community acceptance, and translate abstract concepts into manageable, understandable practices. They showed that awareness and behavioral change are achievable, but only when they are associated with clear, practical experiences. Secondly, the work of the ULG confirmed the value of broad stakeholder participation, where local authorities, universities, clusters, non-governmental organizations, and businesses jointly developed measures that were relevant and feasible. This inclusive approach built trust and ownership, laying the foundation for smoother implementation. Third, the monitoring framework emphasized that transparency and evidence-based monitoring are essential for maintaining accountability and adjusting measures based on new knowledge.

At the same time, the challenges have revealed further priorities: commitment needs to be strengthened in peri-urban and rural areas, where awareness and infrastructure are still weaker, and cross-sectoral cooperation needs to be consolidated, ensuring that the circular economy is not limited to waste management but is integrated into value chains, procurement, education, and business models.

Building on these lessons, the IAP puts together a balanced portfolio of governance reforms, technical measures, awareness raising, and infrastructure development. Its implementation requires:

- **Governance and coordination** between local governments and sectors, ensuring policy coherence.
- **Sustainable financing mechanisms**, leveraging EU funds, national programs, and private investment.
- **Effective monitoring and accountability**, with clear indicators to track progress toward climate neutrality and circular economy goals.
- **Continuous education and awareness raising**, promoting a common understanding of circular practices among citizens, schools, and businesses.
- **Scalability and replicability**, transforming pilot initiatives into general practices that adapt to different contexts in metropolitan areas.

In conclusion, this IAP is a commitment to systemic change. It positions the region as a national leader in the transition to a circular economy and a European frontrunner in climate-neutral development. The cooperation process has already strengthened institutional trust and created a platform for innovation. And we just need to make sure that this shared vision for the future translates into lasting, measurable results. Through the joint efforts of local governments, academia, businesses, and citizens can work together to make the Cluj Metropolitan Area a living example of how the CE and climate neutrality are not abstract ideals, but practical, achievable goals that improve quality of life, promote economic resilience, and protect the environment for future generations.

Acknowledgement message

The development of the Integrated Action Plan for the Cluj Metropolitan Area would not have been possible without the dedication, expertise, and collaboration of a wide range of partners and stakeholders. We are grateful to the members of the URBACT Local Group, including representatives of local authorities, universities, research institutes, clusters, NGOs, and businesses, who shaped the vision and measures of the plan through their active participation and constructive engagement.

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Finally, we would like to express our gratitude to the residents of the Cluj Metropolitan Area who participated in the pilot projects and awareness-raising campaigns. Their openness, feedback, and enthusiasm were the clearest reminder that the transition to a circular and climate-neutral future is only possible if institutions and communities move forward together.

Names of local coordinator and political supporter

Logos of all cities

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ANNEX – The list of all actions agreed upon in the ULG

No	Title of the action	Short description
1	**Encouraging Sharing**	Develop policies to incentivize the sharing of resources and tools at community level and create online platforms that facilitate sharing.
2	**Sustainable procurement in public institutions**	Implement a sustainable public procurement system in schools and other public institutions, focusing on the purchase of products that respect the principles of the circular economy.
3	**Reducing greenhouse gas (GHG) emissions through water management**	Implement graywater and stormwater management and purification systems using Phyto-purification technologies in urban and rural communities.
4	**Re-use of food through donations to children's homes, old people's homes, animal shelters, etc.).**	Implement a system to collect surplus food from hypermarkets to feed instead of throwing food away.
5	**Urban phytoremediation project**	Implementation of phytoremediation projects in degraded urban areas, using plants for soil purification and green regeneration.
6	**Creation of an urban center for reusable resources (OSER)**	Creation of an urban second-hand resource and material exchange center for the reuse of resources at municipal level.
7	**Create resource repair centers**	Encouraging the collection of resources and the creation of local repair centers where citizens can bring broken goods to be repaired and reused.
8	**Integrating circular economy principles into the value chain**	Organize a "Sustainable Design Week" and standardize circular design principles for local and international companies, thus ensuring the integration of these principles into products and production processes.
9	**Promoting the 10Rs in raw materials management**	Harness the 10Rs (Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover) at all stages of the product life cycle, with a focus on raw materials.
10	**Repair and reconversion of existing buildings**	Implement a program to repair and convert existing buildings for sustainable purposes, thereby reducing the ecological footprint.
11	**Creating a Living Lab and Maker Space for circular economy**	Development of an open innovation space where citizens, students and entrepreneurs can create, repair and reuse materials and products according to the principles of the circular economy.
12	**Introducing a circularity challenge at Innovation Camp**	Organize an annual Innovation Camp dedicated to circularity, where participants develop innovative solutions to environmental and sustainability challenges.

13	**Introducing circular economy (CE) themes in the educational extra curriculum plan**	Development and implementation of an optional circular education text/workbook for middle and high school to increase students' awareness and knowledge of sustainability and circular economy principles and implement during the ”green week”.
14	**Inform and educate citizens about the circular economy**	Create public awareness and education campaigns (including basic information of CE legislation, using multiple interactive, theoretical and practical tools, including education by example, to attract citizens to adopt circular practices. Introducing the annual professional training plan of the key departments of public and private entities (procurement, purchasing, design & innovation, administration) in order that the employees understand and apply CE practices.
15	**Creating a data space for circularity**	Develop a "dataspace" for circular economy where companies and organizations can share data on material use and resource management.
16	**Flows mapping and localization of supply chains in key local sectors of activity**	Visualizing and analyzing the movement of materials, energy, resources and generation of waste trough processes belonging to the key local activities with the purpose of redirecting the sourcing, production, distribution, and consumption of goods and services to local areas.
17	**Updated taxation policy for secondary raw material use**	Creating a taxation policy that encourages the development of secondary raw material market that establishes high taxes for entities and citizens that do not use secondary goods: textiles, construction materials and food and low taxes for the ones that use.
18	**Interactive GIS waste map on City Hall website**	An interactive GIS waste map on the City Hall/ Couty Council/CMA website allows users access waste management data geographically, like collection routes, recycling centers for different types of material collected, offering an accessible way to understand waste services in the Cluj Metropolitan Area
19	**Implement economically feasible, subsidized CE solutions tailored as a public service**	Implement cost-effective, subsidized circular economy solutions designed as public services to promote sustainable resource use and reduce waste.
20	**Reward and promote the companies that design for reuse/recycling (Tax policies for companies)**	Creating a system for rewarding and promoting the companies that design products for reuse and recycling, supporting sustainable practices and reducing environmental impact.
21	**Implementation of a webinar on composting for citizens and courses for dry composting in**	Organizing a webinar to teach the citizens the composting types, techniques and utility and for a wider spread of the practice courses for dry composting to be organized in schools

	schools	
22	**Education - change of mindset (only the accumulation of new products gives us status, makes us feel good)**	Organizing campaigns to determine a shift from determining status by the material accumulation to valuable experiences generated by sustainable choices.
23	**EC courses in universities, at several categories and levels like entrepreneurship, architecture, innovation to be adapted to CE priorities**	Adopting circular economy principles in university departments such as entrepreneurship, architecture and innovation so that they are aligned with CE priorities through curriculum development, teacher training and collaboration with industry experts.
24	**Enrichment of the information offered on CE, its insufficiency generating different, partial or erroneous understanding of the concept of CE at the level of citizens, industries, etc.**	To eliminate misunderstanding of the CE concept, there is a need to update information on CE by conducting research, creating clear educational materials and disseminating precise and inclusive content through various channels.
25	**Clear list of top 10 problems perceived by citizens related to the transition to circularity**	Through questionnaires promoted through multiple channels, a list of 10 challenges perceived by citizens as being related to the implementation of the circular economy in households, businesses, industry, etc. will be made, facilitating the finding of solutions and ways to manage them.
26	**Conducting an updated analysis of citizen's attitudes towards the environment**	Carrying out an analysis through suitable means to determine citizens preoccupations regarding the environment serving as a start point for actions promoting environment protection.
27	**Increasing the sustainability of schools through projects/plans**	Together with students, co-create plans or co-implement projects to increase the school's sustainability
28	**Establishing non-formal education centers to train sustainable**	Setting up and promoting community-based non-formal education centers, through which tailored training programs on sustainable practices for different age groups are facilitated.

	practices to all age groups.	
29	**For or social profit it is necessary to set up collection centers for reusable products (rental, exchange, purchase)**	Setting up collection centers in accessible locations, obtaining the necessary permits and providing facilities for renting, exchanging or purchasing reusables, then promoting their use in the community.
30	**The lessons learned, recommendations and analyzes from the previous CE pilot projects implemented locally to be reflected in context mapping when implementing the CE Action plan.**	Collecting information and data from local CE pilots to identify the main lessons learned and incorporating these findings during the implementation of CE actions to apply best practices and address identified challenges to improve overall implementation.

Acknowledgement message

This Action Plan results from a collaborative effort made possible by the active involvement, expertise, and dedication of numerous individuals and organizations.

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Together, we are laying the groundwork for a more circular, inclusive, and resilient metropolitan area.

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INTEGRATED ACTION PLAN

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2025

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