

# IMPORTANCE OF CITIES IN TRANSITION TO CIRCULAR ECONOMY

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## **Abstract**

The increasing pressure of excessive and inefficient use of natural resources on the ecosystem has revealed that the linear economy understanding is not sustainable. It is clear that there is a need for a structural change in resource flows. It is thought that a more sustainable economic order will be formed in case of transition to a circular economy. The circular economy phenomenon is constantly increasing at national and local level and various visions and strategies are developed in this direction. On the other hand, it can be evaluated that developing a uniform strategy will not be efficient due to the different characteristics of cities. It can be argued that cities and regions should prepare a roadmap for the transition, considering their own qualities and potentials. In this process, first, defining the stakeholders, establishing a circular economy vision with the support of the stakeholders and making strategic planning to achieve this vision constitute the main steps of this process. In this framework, it should be considered that local governments are local units with institutional capacity to organize related activities effectively. Especially developing relations between stakeholders and providing sustainable and efficient participation, ensuring circular economy awareness at the local level, carrying out various incentive programs are critical tasks that local governments should undertake. With this study, while evaluating the general framework of the circular economy, it is aimed to gain a holistic perspective to the subject by examining the circular economy applications in three cities of European Community.

**Keywords:** Circular Economy, Linear Economy, Business Models, Local Authorities, Cities.

**JEL classification:** A1, L5, Q5,

## **1. INTRODUCTION**

With the Industrial Revolution, there was a paradigm shift in production and consumption, and industrialization increased the migration to cities in an unprecedented way. According to the United Nations (UN) data, the ratio of the population living in cities to the total population increased from 14% to 54% between 1900 and 2015, and it is estimated that this ratio will increase to 66% by 2050 (Hodkinson, Galal and Martin, 2018: 6). In the globalization process, increasing supply and competition gave the consumer a chance to choose between alternatives, while it created increased unplanned consumption behaviors. Only between 1900

and 2015, the use of natural resources increased 12 times, and the increase in the period 1970-2015 (from 26.7 billion tons to 84.4 billion tons) was three times. This volume is expected to reach 184 billion tons by 2050 (Hodkinson et al., 2018: 6). With each passing day, the decrease in production costs and the increase in the global circulation rate of products, depending on technological innovations, cause significant damage to natural resources and the environment. While environmental negativities such as climate changes and global warming increase their momentum day by day, there is no approach yet to replace the traditional economic approach focused on continuous growth. In recent years, there have been many interdisciplinary conceptualization efforts based on the concept of sustainability (for example, biomimicry, eco-design, green production, sharing economy). Among these concepts, one of the most studied recently is the approach to the circular economy. The concept of "circularity" means rethinking value chains and processes of production and consumption. "Circularity" implies that an output generated during production and seen as waste may be an input for another production. The main aim is to make products and goods last longer through better design; to produce goods and services using secondary and reusable materials and renewable energy while reducing emissions from production/use, and to switch to conscious and sustainable production patterns and consumption habits.

Abandoning the linear economy phenomenon and ensuring the transition to a circular one will undoubtedly significantly reduce the negative effects of the traditional understanding of production and consumption. However, achieving this transformation requires an important planning and implementation process. At this point, cities have strategic importance. While it is often understood that the circular economy potential in cities is limited to municipal waste recycling, it is more than that. Because it is estimated that more than 60% of energy use and more than 70% of global carbon emissions currently belong to cities. Considering the use of resources and the volume formed of waste generation, cities should be at the center of strategies in the transition to a circular economy. However, the relevant transition cannot be carried out by individual institutions. To achieve this, a collaborative approach of public institutions, private sector, non-governmental organizations and citizens is required. Citizens will be able to contribute to the process by demanding changes in their current consumption habits, by developing innovative solutions that will respond to the changes in demand in the private sector, and by making policies and regulations that will provide the necessary infrastructure and incentives. Since cities have a key role in the transition to a circular economy, the development of similar models by other cities by examining good practices will undoubtedly accelerate the transformation process. For this purpose, in this study, some basic approaches in the European Union were discussed and at the end of the study, the situation of three cities in Europe was tried to be summarized.

## **2. CIRCULAR ECONOMY**

Long before the environmental degradation, which started to be experienced due to production and consumption patterns, took its current form, some researchers

and non-governmental organizations, which took into account the environmental effects of production, developed an environmental design philosophy (such as industrial metabolism, industrial symbiosis) and focused on the use of resources suitable for recycling in product design and made efforts to spread it. However, especially with the negative effects of global warming being felt in daily life, it has been understood that radical measures should be taken and alternatives other than the current linear economy based on the buy-use-dispose logic should be evaluated. Although different proposals have been put forward in this area, it can be said that the circular economy approach, which was tried to be conceptualized by the Ellen McArthur Foundation, has gained wide acceptance. The Foundation expressed the circular economy under three main headings. These are: (a) maintaining the highest possible value from input materials in production processes and end products (maintaining value), (b) limited primary resources with improved waste collection, resource recycling, energy recovery by incineration and use of renewable energy sources. It is to be used efficiently and less (resource optimization) and (c) to take negative externalities seriously (system efficiency) while minimizing the losses in the production of consumption activities that are essential for humanity (Hodkinson et al., 2018: 9).

The concept of circular economy, which started to take place in the literature since the 1970s, represents an approach that focuses on zero waste, where nothing goes to waste. 114 definitions of circular economy (CE) in different sources were examined by Kirchherr et al. (2017: 221-225) under 17 dimensions and the CE was defined by researchers as an economic system which aims to achieve sustainable development via innovative business models that transform current end of life approach. Ellen MacArthur Foundation (2013) defines CE as an industrial system that is restorative or regenerative where major purpose is to create effective flow of production inputs. Ekin et al. (2019:14) emphasizes low environmental impacts, high resource efficiency and waste prevention of CE. According to Sauve et al. (2016:48-56) CE achieves to internalize environmental externalities via closed-loop material flows. Mitchell (2015) define CE as an alternative to linear economy where it is possible to keep resources in use for as long as possible and gain maximum value. Preston (2012) argues that CE transforms waste of conventional economy to valuable input. European Commission (2015) define CE as an economy where materials and resources keep its existence in economy for as long as possible.

Kirchherr et al. (2017: 224-225) summarized the circular economy under three main objectives. These main objectives and related actions are: smarter product use and production (refuse, rethink, reduce), extending the life of products and product components (reuse, repair, refurbish, remanufacture, repurpose), beneficial use of materials (recycle, recover). Strategies aimed at smarter product use and production refer to consumption and production patterns aimed at minimizing the use of raw materials and resources and reducing waste generation. Extending the life of products and product components will help reduce the consumption of raw materials and resources so that resources can be kept more in the loop, extending the life of products and their parts (e.g. reuse, repair, re-plating, remanufacturing). The

beneficial use of materials, on the other hand, represents the lowest category in terms of circular economy and refers to strategies that are currently widely used but showing the least results in terms of solving the environmental problems we face.

Various estimations are made regarding the economic gains that will be achieved in case of the transition to the circular economy. For example, in a study of the European Parliament (2017), it is stated that products developed based on eco-design will save 332 Euros per year for each consumer and the environmental footprint of the product can be reduced by up to 80%. Doranova et al. (2019), on the other hand, states that producing durable goods in a way that can be repaired and lasted longer according to circular economy principles will save 380 billion USD initially and 630 billion USD in full adaptation in Europe alone. In addition, the wastes generated in the construction sector, which is one of the key sectors of the circular economy, will have a recyclability rate of close to 90% if they are produced with sustainable resources. Another study (Parker et al., 2015) focused on the remanufacturing sector and states that the remanufactured (refurbished) product market was at the level of 43 billion USD in 2011 and created an employment of 180,000 people.

## **2.1. ROLE AND IMPORTANCE OF CITIES IN TRANSITION TO CIRCULAR ECONOMY**

Cities have significant potential for the transition to a circular economy, given the current resource flows and the intensity of production and consumption. Hodkinson et al. (2018: 9) state that cities are ideal environments to test the circular economy, as more than 80% of global production is produced in cities. According to them, in an ecosystem where the logistics and reverse logistics industry is developed, new opportunities and new business models will emerge for the circular economy.

Can the transition to a circular economy be achieved with a decentralized approach or with different strategies on a city-by-city basis? Although the different management understandings of the countries take this question to a different level, road maps can be developed that consider local characteristics and priorities, regional development levels, instead of top-down practices throughout a country. Many variables such as different levels of development, different resources, the geographical location and characteristics of the city require each city to deal with the circular economy with a unique approach and to develop approaches and practices in this direction.

Because cities have different characteristics in terms of cyclical potential, their employment levels, production capacities and consumption intensities show significant differences. Because cities have different characteristics in terms of cyclical potential, their employment levels, production capacities and consumption intensities show significant differences. Considering the human capital capacity, understanding the circular economy concept and adapting the practices in daily life to it constitutes a separate dimension of the transformation. Creating a roadmap and defining the framework is vital in the transition to the circular economy. Thus, it is

defined which activities will be undertaken by which actors and how the demand-supply structure will be shaped. At this point, cities have a key role in developing a vision and making it sustainable.

It will not be realistic for a city to undertake the transition process to a circular economy by a single actor. Because the process is too comprehensive for a single actor in terms of raw material and human capital. However, it is vital for an actor (local governments) to fulfill the role of leadership. Such a leading role is needed to establish cooperation among stakeholders regarding the process, operate a participatory management approach and sometimes revise the vision. Because establishing a city based on a circular economy requires the awareness, ownership and support of businesses, sectors and non-governmental organizations, especially citizens. It is imperative to develop a variety of exchange relationships among citizens, between businesses and across sectors.

Local governments in cities can make quick decisions, develop approaches and practices, and have mobility in promoting circular business models. The fact that the process of creating policy changes at the national or regional level is much more time-consuming than in cities can be considered as a separate advantage. Because by operating a much more agile decision-making mechanism, cities can implement changes for the circular economy faster and test various models and mechanisms. In addition, the infrastructure facilities, inspection and regulation powers that cities already have make them privileged.

The analytical framework used by the European Union in the transition of cities to a circular economy is based on the need for cities and regions to develop unique solutions and is expressed in three dimensions (OECD, 2020b:23). These dimensions are:

- Progress level of cities/regions in transition to circular economy: advanced, ongoing, beginners,
- Tools needed to make the transition: people, policies and places,
- Role of cities/regions to promote circular economy, facilitate transition

It is also worth mentioning some of the difficulties that cities may experience. First, the support and cooperation of businesses, consumers, central authority, non-governmental organizations are needed to implement the circular economic process. Undoubtedly, it cannot be expected that all these actors will have the same level of awareness, the same expectations and the same priorities in a short time. Some leadership functions will be needed, such as providing relevant awareness, maintaining the same level of communication between stakeholders, and motivating stakeholders from time to time. In addition, when the subject is evaluated on a sectoral basis, it will be concluded that the potential of all sectors in the transition to a circular economy is not at the same level. Also, it is necessary for the efficiency of the process for cities to identify the key sectors that show the greatest potential in terms of economic, social and environmental benefits in their circular economy strategies. In summary, the current state of the city should be evaluated from a holistic perspective, priority sectors should be clarified by making sectoral

analyzes, and the variables and obstacles that will effect to ensure the transition to a circular economy should be clearly defined. Focusing only on the advantages of cities may lead to ignoring potential barriers. Hodkinson et al., (2018:19-20) express the obstacles to the transition to the circular economy under four headings. These are: financial, institutional, social and technical barriers.

**Financial barriers:** It covers the costs of the transformation (investment, planning, R&D, infrastructure, digital structure, human resources, supplier management, etc.) required for the shift to a circular economy. Although various financial incentives are offered by central or local governments, uncertainty may prevent actors from supporting the transformation simply because of financial risks. In addition, derived consumer demand for innovative goods and services to be developed is another issue of uncertainty. Considering the gains that municipalities make from waste recycling, situations such as reuse, promoting longer-term use of products and components in the market may make the circular economy perceived as a revenue-reducing factor for local governments.

**Technical barriers:** The current linear economy understanding supports the "planned product obsolescence" phenomenon, in which product life is deliberately reduced. This approach, which provides advantage in the market by lowering product prices and directs the consumer to buy a new product instead of a repair option when the product fails or its performance decreases, is an important obstacle to the circular economy. Because with the circular economy, it is aimed to increase the life of the product, to make reparability and upgradeability possible and economical. Apart from this, the lack of an information source that can optimize the flow of resources between businesses and sectors and enable changes slows the process. The main source of this situation is that the standards and methods related to resource exchanges have not been fully developed yet.

**Institutional barriers:** A mental transformation will not be easy, especially when it comes to such an internalized linear economy. In addition to the profitability of current business models and production processes, the risks and uncertainties that are believed to carry the transformation also affect the willingness of the relevant actors to transition to the circular economy. In addition, legal regulations based on linear economy (competition policies, producer's responsibility, waste regulations, etc.), development of business models and innovative approaches that will support the circular economy are sometimes hindered. Another obstacle at the institutional level is that the process of transformation is not handled with a participatory approach. Situations such as the fact that the subject is undertaken only by certain units of the relevant units and that the society is not adequately informed can be considered as obstacles to the process.

**Social barriers:** Uncertainty and risks, insufficient awareness, businesses being closed to innovation, and profitability of existing business models can create resistance to transformation. From the point of view of consumers, alternatives offered by the circular economy such as re-use instead of taking ownership of a product, renting instead of buying, sharing, etc. may be evaluated by consumers as a negative for their social status. This can create resistance to the transformation.

## 2.2. TRANSITION PHASES OF CITIES TO CIRCULAR ECONOMY

Although there is no single approach or formula that can be used in the transition of cities to a circular economy, Byström (2018:6) presents an approach consisting of three stages and 15 steps (Table.1).

*Table.1 The 15 Circular Steps for Cities*

PLAN	1. Characterize and analyses local context and resource flows, and identify idle assets
	2. Conceptualize options and priorities among sectors with circular potential
	3. Craft a circular vision and strategy with clear circular goals and targets
ACT	4. Close loops by connecting waste/residue/water/heat generators with off takers
	5. Consider options for extending use and life of idle assets and products
	6. Construct and procure circular buildings, energy and mobility systems
	7. Conduct circular experimentation – address urban problems with circular solutions
	8. Catalyze circular developments through regulation, incentives and financing
	9. Create markets and demand for circular products and services – be a launching customer
MOBILISE - MONITOR	10. Capitalize on new ICT tools supporting circular business models
	11. Coach and educate citizens, businesses, civil society and media
	12. Confront and challenge linear inertia, stressing linear risks/highlighting circular opportunities
	13. Connect and facilitate cooperation among circular stakeholders
	14. Contact and learn from circular pioneers and champions
	15. Communicate on circular progress based on monitoring

*Source: Byström (2018:10)*

According to the author, at the planning stage, the city administration should analyze the future potential of the current linear economy and the circular economy together with the relevant stakeholders and prepare a roadmap for the transition to the circular economy. In the second step, action must be taken. Considering the current potential of the city, the vision for the transition to the circular economy and the strategies to support this vision begin to be implemented with the support of stakeholders. The third and final stage is the process of monitoring the applications.

### 2.2.1. PLANNING

The first stage for the transition of cities to circular economy should be the planning of the process. Detailed data should be collected on issues such as the current economic structure of a city, its industrial profile, the flow of resources, and the management of waste. All resource flows can be mapped with the study referred to as “urban metabolism” in the literature. A detailed inventory of all active or inactive resources of the city should be created. It would be a right approach to establish a priority order among sectors with cyclical potential, which are defined depending on the characteristic structure of the city. Otherwise, a city that focuses on all sectors at the same time may have insufficient resources to manage the process. In particular, it would be reasonable for the city to set out with a few large-scale sectors that can be described as relative superiority, which are well-known, as cities generally focus primarily on sectors such as construction, food, trade, tourism, and

textile. It is vital for local governments to lead the transformation process to a circular economy and to identify stakeholders and ensure communication and coordination among them. In order to achieve this, it is necessary to present a vision for the cyclical transition, define the strategies that will enable this vision to be achieved, and which practices should be implemented in order to reach the strategic goals. The participation and support of all stakeholders in the preparation process of this strategic plan should be ensured, awareness-raising efforts should be carried out throughout the society, and environments and opportunities should be provided to encourage cooperation.

In Amsterdam, which is one of the best examples of the transition of cities to the circular economy, the city government has determined seven principles for the transition to the circular economy. These principles can be used to develop a vision and action roadmap for circularity in cities (Circle Economy et al., 2016). The relevant principles are:

1. Closed loop - all materials enter an endless loop (technical or biological).
2. Reduced emissions - all energy comes from renewable sources.
3. Value production - resources are used to generate value (financial or other).
4. Modular design - modular and flexible design of products and production chains increases the adaptability of systems.
5. Innovative business models – new business models for production, distribution and consumption enable goods to be used as services rather than as property.
6. Region-oriented reverse logistics - logistics systems turn into a more region-oriented structure with reverse logistics capabilities.
7. Improvement of natural systems – human activities contribute positively to ecosystems, ecosystem services and rebuilding “natural capital”.

### **2.2.2. ACTION**

After the planning phase, in which the resource flows are clearly defined, it is necessary to close the loops by taking these resource flows into account, and to define the receivers for secondary resources. It is important to reuse the wastes-residues, which can be considered as inputs within and between sectors, and the heat generated for production purposes (keep it in the cycle). Another alternative for keeping the resources in the economic system for a longer period is the definition of new alternative usage areas and the development of designs that will extend the life of the product. The dissemination of innovative business models, their adoption by the society and moving away from the habits of the linear economy are critical to the achievement of the circular economy. Switching to repairable product designs and establishing reverse logistics networks that will enable remanufacturing will accelerate this process. In addition, the continuous increase in the rate of urbanization causes the existing building stock in cities to become insufficient, and the increase in the number of aging buildings keeps the construction sector in a dynamic and growing structure. The selection of reusable materials to be used in new

constructions, the use of renewable energy sources, the evaluation of the waste generated in demolished buildings will be important steps towards the transition to a circular economy. Since each city has distinctive features such as its own infrastructure, cultural values and geographical features, it will not be efficient and realistic to create a uniform action plan for all cities in the transition to circular economy. Cities should consider the circular economy as a dynamic process with their unique values and processes, develop incentive mechanisms and environments, and show flexibility to revise planning when necessary. In order to develop innovative concepts, business models and approaches, an ecosystem should be designed where ideas can be tested. In this context, new regulations, incentives, financial supports and awareness studies to be developed under the leadership of local governments can accelerate the process. Public procurement can also serve to provide a sectoral revival in the circular economy. Adding criteria that support the circular economy to the purchase specifications of the assets that local governments will need in their service processes can be used to provide the first move in the transition to the circular economy. Another issue that local government should consider is the active use of information technologies (internet of things [IOT], smart cities, smart grids) in the transition to circular economy. In particular, it would be beneficial for local governments to offer various infrastructure opportunities by using information technologies in the first stage to support innovative business models that support the circular economy (for example: renting instead of buying ownership, sharing economy). Instead of using individual vehicles in transportation, car sharing, offering bicycle and electric scooter rental units, and establishing an equipment bank based on short-term rental to be used in home and workplace renovations can be considered as good examples. These business models can be evaluated at different levels as business-to-business (b2b), business-to-consumer (b2c) and inter-consumer (c2c). Based on these business models, local governments should develop approaches that will support cyclical processes, that are suitable for city characteristics, and that establish networks between stakeholders.

### **2.2.3. MONITORING**

Following the planning and implementation stages, it is important to monitor the planning-realization harmony so that the relevant actions are more effective, to ensure the efficiency of the transition to the circular economy. It is necessary to benefit from different actors to involve the media and non-governmental organizations, especially educational and research institutions, and to raise awareness throughout the society. The transition of the demand-side people to consumption patterns that consider the circular economy approaches will encourage and even force businesses to make the necessary changes on the supply-side. Citizens' contribution to the process is of great importance, as businesses' commitments or habits to the current linear economy can create a resistance to ensuring circularity. In this context, the long-term gains of the circular economy along with the short and long-term risks of the current linear approach should be clearly explained to all stakeholders.

One of the most important functions of local governments in the transition to circular economy is to organize networks that will provide communication and cooperation between stakeholders and make them functional. Local governments can project the possibilities of industrial symbiosis, define various waste-based exchange relations between enterprises, and make the stakeholders an active part of this strategy within the framework of participatory management approach. Identifying and disseminating the best practices for the circular economy across the city will also be in place to increase the motivation of the stakeholders. Cities can be expected to seek existence of the following factors so that they can evaluate where they are in the transition to a circular economy (U4SSC, 2020: 15-16): an innovation ecosystem, strategies and policies, regulations and law, collaborations and partnerships, public-private partnerships, awareness of the city stakeholders, broad stakeholders, stakeholders participation, financial framework, incentives, circularity based public procurement plans, R&D programs, academic programs, skill-building programs, certificate programs for circularity-related practice, trusted agents.

### **2.3. EXAMPLES OF TRANSITION TO CIRCULAR ECONOMY**

In this part of the study, real examples of the phenomenon of “transition to circular economy in cities”, whose theoretical framework was tried to be defined in the previous pages, are given. For this, sample applications in three European Union member countries (Spain-Valladolid, Netherlands-Groningen, Sweden-Umea) were examined. First, the circular economy approach at the national level was expressed, and then the developments in the city were summarized.

#### **2.3.1. SPAIN**

The “Spanish Circular Economy Strategy 2030” was developed in 2018. This strategy plan has been introduced by the Ministries of Agriculture and Fisheries, Food and Environment, Economy-Industry and Competition. The inter-ministerial commission consisting of nine ministries, the presidential economic office, the autonomous communities and the Spanish Federation of Municipalities and Provinces (FEMP) contributed to the preparation of the relevant plan. This strategic plan has a long-term vision to be supported by short-term action plans and includes the necessary arrangements to complete the planned transformation by 2030. The projected cost of this transformation is €630 million for four thematic areas (production and design, consumption, waste management, secondary materials and water reuse) and three horizontal areas (awareness and participation, research and development, employment and education). FEMP has developed a Circular Economy Local Strategy Model to support the process. This non-binding study is a guide that aims to ensure circularity and sustainability in different sectors. In Spain, where there are more than 8131 municipalities, each municipality is expected to develop its own programs according to its own capabilities and expectations. With this guide prepared by FEMP, four strategic work axes (use of natural resources, water consumption management, sustainability of urban areas, healthy habits and spaces) and horizontal areas (sustainable and innovative public procurement,

development and implementation of new digital technologies, communication and awareness) are proposed to municipalities (OECD, 2020a:18).

### **2.3.1.1. CIRCULAR ECONOMY INITIATIVES IN VALLADOLID**

Valladolid, the capital of the Autonomous Region of Castile and Leon, is the thirteenth most populous city in Spain and the largest city in northwestern Spain. In Valladolid, activities for the circular economy are carried out by the Ministry of Innovation, Economic Development, Employment and Trade and its unit, the Agency for Innovation and Economic Development. The agency is focused on reducing waste through creating new jobs and increasing innovation. With the grants provided by the municipality, projects for the circular economy are financed. In 2017 and 2018, 40% to 85% of the total cost of the projects was financed with an incentive of 960.000 Euros (corresponding to 0.17% of the city's annual budget) for 61 projects. 61 projects benefiting from municipal grants focused on the following sectors (OECD, 2020b:24):

- Energy (e.g. portable solar kit; use of hydrogen as an alternative fuel)
- Waste (e.g. selective waste collection system; secondary materials exchange platform)
- Water (e.g. reuse of rainwater in public institutions; network of water dispensers)
- Construction

With a study funded by the name “Valladolid is Circular” (Enviroo, 2019), potential of certain economic activities (agriculture, public administration, hospitality industry, education, non-metallic mineral manufacturing, metallurgy, retail sector, energy supply, real estate activities, food industry, motor vehicle and trailer manufacturing) was investigated and three main elements were taken into account: resulting added value, employment opportunity and environmental impact. As a result, agriculture was evaluated as the sector with the greatest potential in terms of the circular economy (considering its environmental impacts). Public administrations took the second place as the city's second largest employment provider. The hospitality industry took the third place with the added value it created. In the research, the suggested measures for the transition to the circular economy were determined as follows:

- Developing an innovative public procurement procedure with social and environmental sensitivity
- Encouraging businesses to implement "environmental management systems" through information and training
- Labeling of products according to circular economy criteria
- Promoting waste separation
- Identification of potential intersectoral links
- Identifying barriers to reuse and recycling
- Supporting life cycle analyzes of products and strategies to reduce carbon footprints
- Raising awareness at the social level

### **2.3.2. HOLLAND**

The Dutch National Government developed a circular economy strategy for local governments in 2016 (OECD, 2020b:20). With this national strategy plan, which aims to zero the waste level by 2050, a sustainable economy vision has been tried to be created. In this plan, it is stated that in order to zero the waste level, it is necessary to use the raw material in the best way, to replace fossil-based resources with sustainable and renewable ones, and to extend the life of the product. It is estimated that a financial value of 7.3 billion Euros and an employment volume of 54.000 people can be created in sectors that can be associated with the circular economy, and the use of 100 megatons of raw materials, which corresponds to a quarter of the annual raw material imports of the Netherlands, can be reduced. The related strategy defines five sectors as priority. These are: biomass and food, plastics, manufacturing, construction and consumer goods (OECD, 2020b:22).

#### **2.3.2.1. CIRCULAR ECONOMY INITIATIVES IN GRONINGEN**

Groningen, the capital of the province of Groningen, is the largest city in the north of the Netherlands. Founded about 950 years ago, Groningen is also known as the university city and a quarter of the population (approximately 230.000 people) consists of students. Therefore, the accommodation and catering sectors form an important part of Groningen's economy. A committee for the transition to the circular economy was formed by the Groningen City Council and commissioned for the development of a sustainable and circular vision for the city. To achieve this aim, the Board has determined three priority areas (Groningen Municipality, 2018). These are:

- Public procurement (to direct the business world to circular practices)
- Waste management (to reach the zero-waste target by 2030)
- Knowledge (development of knowledge-based networks/platforms between different sectors)

The city aims to make environmentally friendly public procurement. For this purpose, various workshops are held. In this context, the municipality, which has started to purchase, primarily stipulates that the furniture needed must be produced by renewed from furnitures at least 10 years old. Similarly, there is a demand for plastic garbage bins in the city to be produced from recycled plastic. In line with the zero-waste target until 2030; it is planned to gradually zero the 40% of currently incinerated waste. For this reason, waste generation will be prevented through the separation of wastes, and efforts are made to raise awareness of the society about the existing options for waste separation. In addition, efforts are being made to establish a "circular innovation center". Thanks to this center, it is aimed to collect reusable electrical goods, furniture, garden waste and reuse them or include them in production as raw materials. It is also planned to include a repair shop/cafe and second-hand shops at the center. Other tasks that the center is expected to undertake are the identification of stakeholders and potential customers and the involvement of designers in the process for new business models and innovative product solutions (OECD, 2020b:10-37).

*Table.2 Examples of Circular Economy Initiatives in Groningen*

<b>Goal</b>	<b>Action</b>	<b>Content</b>
Knowledge and awareness-raising	100×100×100	Awareness campaign challenging 100 households to live 100% waste-free for 100 days. Around 200 households joined. The local television channel followed the participants in a series of programmes
	Dismissed industrial area as experimentation space	Former sugar factory temporarily hosting 50 initiatives and businesses as a playground for the circular economy.
	The Food Battle	Challenge inviting inhabitants to reduce food waste food. Around 250 households joined.
Procurement	Circular IQ	An online software application for collaboration, data monitoring and analysis that uses simple data to support circular decision-making. It is scheduled to be used for Green Public Procurement.
	Green Public Procurement	Large scale purchase of circular products used by the municipality in public spaces (e.g. reused materials for constructing bridges decks, waterway timbering and highway fences built using recycled material, waste bins and containers made of circular plastic).
	Green tender office furniture	Replacement of office furniture over ten years in the whole municipality.
	Green Public Procurement training	Eight interactive workshops for purchasing in a circular way: from request and procedure, to measuring and weighing criteria to business models.
Waste	Circular Economy Hub	Incubator space for circular small businesses and start-ups, information center, repair hub and second-hand shops next to the waste delivery station.
	Groningen designs (Groningen Ontwerpt)	Sustainable design to reuse waste streams: new products from waste and residual materials for sale in seven shops in Groningen.
	Reuse	Repair cafes; collection of reusable items and paint for second-hand shops.
	Waste management Concession	Inclusion of circular criteria for waste processing for the new

	waste management concession after the year 2022.
Waste sorting facility	Waste sorting facility operated by the municipality with the highest possible resource recovery rate and the production of sustainable energy such as green gas.

*Source: OECD (2019)*

The city also supports small and medium enterprises with the Leader (Project Koploperproject). To ensure the transition of these enterprises to more sustainable and cyclical business models, environmental performance and carbon footprints of enterprises are calculated with the support of expert consultants, and business-specific recommendations are developed. Companies are expected to prepare an action plan in line with these recommendations and support it with a communication strategy. Within the scope of the project, efforts are also made to establish permanent networks among the members.

### **2.3.3. SWEDEN**

The basis of a circular economy strategy on a national basis in Sweden dates to 2016. The country is focused on consumers and reuse, industrial symbiosis. For this, various researches were carried out, efforts were made to increase cooperation opportunities, a tax reform supporting the repair of used products for reuse was carried out, and initiatives were supported to encourage the manufacture of recyclable products (Harris et al., 2018). In 2018, the National Delegation for the Circular Economy was established as part of the Swedish Agency for Economic and Regional Growth (OECD, 2020c:19). This delegation focused on plastics, public procurement and circular designs. It supports innovative business models that will serve purposes such as increasing the recycling of plastic, expanding reuse, increasing product life, and increasing green purchasing. For this, it tries to identify regulatory and financial barriers, best practices, potential networks, and recommends cost-effective measures and strategic practices at national and local level to support circular targets (Tillväxtverket, 2019). These efforts, which are tried to be expressed, are also carried out and supported by other central public institutions in Sweden. Some of these can be shown as: Swedish Innovation Agency (Vinnova), Swedish Environmental Protection Agency, Swedish Research Institutes (RISE) (OECD, 2020c:22).

#### **2.3.3.1. CIRCULAR ECONOMY INITIATIVES IN UMEA**

In the strategic plan covering the years 2016-2028, Umea Municipality has revealed its vision of making the city a role model in the context of the circular economy. A feasibility study was revealed with the field studies carried out in 2015 and 2016. The results of these studies were evaluated and 90% of the participants declared that they were interested in a pilot project to be implemented for the circular economy. Numerous projects have been organized by the municipality, some of them: Northern Sweden Circular Economy Enterprise Accelerator (CEBANS), Sharing City Umea (Sharing Cities Sweden), For a Green-Smart and Sustainable

Umea (RUGGEDISED, Low Carbon Place, Green Parking, Green Umea) such as projects). Many stakeholders from different categories are striving for Umea's transition to a circular economy. Business organizations and non-governmental organizations are important actors in Umea's transition to a circular economy. The Umea branch of an NGO called Cradlenet Norr is focused on raising awareness of the circular economy. A group called the Environmental Cafe holds periodic meetings to discuss environmental issues, including the circular economy. Umea University specializes in environmental science and technology, management and design of natural resources. They have included circular economy as a course in some graduate programs and encourage graduate students to work on circular economy. The Design Institute, also located in Umea, focuses on eco-design and carries out projects on transportation and mobility, modular building designs, and ecological production processes. The Umea School of Business, Economics and Statistics teaches Sustainable Entrepreneurship for SMEs and start-ups. Umea University Faculty of Science and Technology contributes to the development of the circular economy in the country with its research and development projects (OECD, 2020c: 22-37).

### 3. CONCLUSION

With the Industrial Revolution, the developing production technologies and the need for resources have reached a size that consists of many networks and actors whose scale cannot be easily managed by the 21st century. It is observed that the predictions made regarding the consequences of global warming due to uncontrolled growth begin to come true much earlier than the time, the degradation in nature has reached irreversible points, and the endangered species are constantly increasing. Now, city people have begun to be afraid of seasonal differences and the frequency and severity of natural disasters. All these mentioned results are the result of linear economy based on produce-use-dispose. The continuous increase in production and the necessity and existence of a perspective that define the needs of the consumer as unlimited in order to sustain production have made the boundaries between desire and need even more ambiguous for individuals whose consumption demands have increased by diversifying. The fact that the linear economy is not sustainable has long driven the scientific community to seek approaches based on new production and consumption models.

The transition from the linear economy to the circular economy will significantly reduce the negative effects of the classical production and consumption approach. However, achieving this transformation requires an important planning and implementation process. Considering that almost three quarters of energy and resource use takes place in cities, the flexibility on decision making and implementation, ability to manage local cultural values and experiences of developing fast and effective local applications make them privileged. The fact that each city has relative advantages and consists of different cultural values and human capital will make it easier to evaluate a uniform plan approach as inefficient. Despite the familiarity of the city administrations with the existing structure, their experience

and the power of implementation, it cannot be expected that a transformation to the circular economy will be realized by a single actor. For this, public institutions, private sector, non-governmental organizations and citizens need a collaborative approach. Each actor will take on a different role: citizens will change their current consumption habits and demand products with circular designs, the private sector will develop innovative products/solutions in line with the demand of the citizens, public actors will produce various policies to provide infrastructure and incentives, and non-governmental organizations will also facilitate communication and raising awareness between stakeholders in this process.

The transition to the circular economy requires a planning, implementation and control process. Here, the leadership role of city administrations has a special importance. Because it is possible with local governments to approach the event with a holistic perspective and develop measures in overcoming financial-technical-institutional and social obstacles. At the first stage, it is necessary to create awareness for the circular economy across the city that covers all actors, because it is a possible scenario that sectors and businesses that are accustomed to the linear economy will resist the transition to this uncertain and risky process.

In summary, cities have a key role in the transition to a circular economy. For this purpose, it is necessary to develop a vision, to define goals clearly and measurably, to take action by creating strategic plans, to monitor the process and to control the extent to which the development is in harmony with the planning. This process is a team effort and it would be appropriate to include the whole society, sectors and businesses in the process, with the support of non-governmental organizations under the leadership of local governments, and to follow a participatory management approach. In addition, as in the examples in this study, the creation of reports showing the results of real practices in the field and the identification and dissemination of best practices will accelerate the process.

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