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European Union circular economy policy and harmonization process for Türkiye

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Abstract

Faced with the traditional linear economic model threatening environmental sustainability, the European Union (EU) launched a radical paradigm shift in the production–consumption cycle through its Circular Economy Action Plans of 2015 and 2020. Within this scope, systematic transformation has been targeted with structural tools such as resource efficiency, eco-design, industrial symbiosis, and digital product passports. Türkiye, on the other hand, is directly experiencing the effects of this transformation due to its high level of trade integration with the EU and its Customs Union relationship. This study aims to evaluate Türkiye's adaptation process to the European Union's circular economy policies, and to develop feasible policy recommendations to align Türkiye's circular economy policies with EU standards. Within the scope of the study, Within the scope of the study, Türkiye's legal and institutional compliance, sectoral transformation capacity, and financing mechanisms were examined in detail, while technical infrastructure challenges were addressed in selected sectors through illustrative examples; strategic recommendations were presented considering comparative analyses with the EU and member country practices. The findings reveal that Türkiye has made progress in the compliance process at the legislative and institutional levels; however, structural deficiencies persist in the areas of implementation, supervision, and social awareness.

Key words: Circular Economy, Green Deal, EU Harmonization Process, Türkiye
Jel codes: Q56, F15, O44, P28, Q01

1. Introduction

The traditional linear economy model (take–make–dispose) poses a serious threat to environmental sustainability due to excessive consumption of natural resources and waste generation. In this context, the European Union (EU) has adopted the circular economy (CE) model, which aligns economic growth with principles of resource efficiency, waste prevention, and sustainable production–consumption, as a strategic priority. Especially with the publication of the new Circular Economy Action Plan (CEAP 2.0) in 2020, it is evident that the EU has positioned the circular economy not only as an environmental policy but also as a core component of economic and industrial strategies (Mısır & Arıkan, 2022). The plan foresees a system transformation based on waste management, sustainable product design, recycling, digitalization, and reuse of resources (Fogarassy & Kuci, 2021). As a candidate country with strong economic ties to Europe, Türkiye is directly impacted by this transformation in several dimensions, particularly in terms of environmental standards, trade regulations, and compliance with carbon-related policies under the European Green Deal.

The main aim of this study is to analyze the EU's circular economy policies, evaluate Türkiye's adaptation capacity, and identify the institutional, legal, and technical challenges encountered during this process. This is crucial since approximately 41% of Türkiye's foreign trade is conducted with the EU and new obligations such as carbon border taxes, sustainability criteria, and waste policies are being introduced under the European Green Deal. Therefore, Türkiye's transition to a circular economy is not only an environmental necessity but also a strategy to maintain economic competitiveness.

This study adopts a qualitative research approach, utilizing literature on circular economy, EU policy documents, Turkish strategy papers, academic publications, and sector-related reports. Key sources include the European Commission's 2020 "New Circular Economy Action Plan" and the 2023 Zero Waste Report by the Ministry of Environment, Urbanization and Climate Change of the Republic of Türkiye. The analysis highlights Türkiye's general alignment efforts, with illustrative references to the textile, waste management, and industrial sectors.

2. The EU's Circular Economy Policies: Conceptual Framework and Core Principles

The circular economy (CE) is an alternative economic model that aims to minimize resource consumption, prevent waste generation, and promote sustainable production–consumption cycles. Unlike the linear model (take-make-dispose), it focuses on extending product lifespans, encouraging reuse, and enabling recycling. The concept first emerged in Japan in the 1980s under the terms "zero emissions" and "resource productivity," and was later systematically defined by the Ellen MacArthur Foundation in Europe (Ellen MacArthur Foundation, 2013).

Inspired by closed-loop systems observed in nature, the circular economy presents a sustainable alternative to the linear model (Gedik, 2020). It targets maintaining materials and energy within the system for as long as possible, as opposed to treating them as infinite and disposable (Velenturf & Purnell, 2021). Its foundation is rooted in the first and second laws of thermodynamics, which emphasize conservation of energy and the increase of entropy in systems (Yılmaz, 2022).

Beyond environmental sustainability, the circular economy provides a framework for economic resilience, reduced dependency on raw materials, job creation, and digital transformation (Okorie, Russel, Cherrington, Fisher & Charnley, 2022). Thus, it should be considered not only an economic model, but also a resource strategy aligned with natural laws (Reyhan, 2023).

The circular economy is more than just a waste management model; it is a multi-layered structure aimed at the systemic transformation of the entire economic process from production to consumption (Hollander, Bakker & Hultink, 2017). The followings are the core elements of this model, which are essential to ensure economic, environmental, and social sustainability:

- **Resource efficiency** refers to achieving the same output with less input by minimizing the consumption of natural resources (Ekins et al., 2016). This approach not only reduces economic costs but also significantly lowers environmental pressure (Ekins & Zenghelis, 2021). The EU's circular economy strategy incorporates resource efficiency into the principle of "decoupling" economic growth from natural resource use (Özdemir & Gür, 2024). Improving efficiency in energy, water, and raw material use is a fundamental goal of the circular system.
- **Eco-design** is a design philosophy that aims to minimize the environmental impact of products throughout their life cycle. Products developed with this approach are more durable, easier to dismantle, repairable, and recyclable (Navajas, Uriarte & Gandía, 2017). Under the European Commission's "Sustainable Product Initiative," eco-design principles have been extended to sectors such as electronics, textiles, and furniture. Eco-design lies at the core of sustainable production policies (Gedik, 2020).
- Repair and remanufacturing are methods that allow products to retain economic value even after their initial use phase. The "repair, don't dispose" approach not only transforms consumer behavior but also prevents waste generation (Ay Türkmen & Kılıç, 2020). The EU's "right to repair" regulation grants consumers the legal right to repair products and obligates manufacturers to design products accordingly (Çetiner, 2025). Remanufacturing, especially prevalent in the automotive and machinery sectors, involves refurbishing used components in factory settings for reuse (Güner & Güner, 2020).
- Industrial symbiosis is a collaborative production model where the outputs (waste, energy, by-products) of one industrial facility are used as inputs by another. In this model, companies exchange materials, energy, water, and services (Durusoy, 2024). For instance, the waste heat from a power plant may be used in a nearby greenhouse operation (Samberger, 2022). Such collaborations offer both environmental and economic benefits and support circularity.

- Closed-loop systems are structural models that reintegrate products or components into the production cycle at the end of their lifecycle, preventing them from becoming waste (Hapuwatte & Jawahir, 2021). These systems aim to circularize material and product flows, minimizing natural resource use and waste generation (Altuntaş, 2024). As highlighted by NIST (2023), designing products to be retrievable, repairable, and reusable is key to this process. From the beginning of production, modular design, traceability, and ease of disassembly must be ensured. These systems are especially important in sectors with high waste output, such as packaging, electronics, and automotive. Effective implementation requires take-back systems, reverse logistics networks, and extended producer responsibility (EPR) mechanisms (Kara, Hauschild, Sutherland & McAloone, 2022). Thus, product life cycles are extended, environmental impacts reduced, and resource efficiency improved.

Systems thinking enables the circular economy to be addressed not only as a technical transformation but also within its social, economic, and managerial contexts (Eren Şeneras & Sezen, 2017). The life cycle approach requires evaluating the environmental impacts of a product across all stages—from raw material acquisition to production, distribution, use, and disposal (Lazarevic, Buclet & Brandt, 2012). This holistic perspective enables policymakers and producers to make more sustainable decisions. In EU policies, life cycle analysis is used especially for measuring carbon footprints and material efficiency (Durmuş & Gücüyeter, 2024).

2.1 The EU's Circular Economy Approach: Strategies and Action Plans

The European Union made the circular economy an official policy with its first Circular Economy Action Plan (CEAP), published in 2015. The main pillars of this plan are: Strengthening product design and sustainability criteria, preventing waste generation, raising consumer awareness, developing secondary raw material markets, and supporting innovative business models.

The New Circular Economy Action Plan (CEAP 2.0), published by the European Commission on March 11, 2020, is a strategic document implemented under the European Green Deal and supports the European Union's goal of becoming a climate-neutral, resource-efficient, and competitive economy by 2050 (European Commission, 2020). This plan aims to decouple economic growth from environmental impacts and proposes structural transformations that reduce resource consumption, extend the life of products, and systematically prevent waste generation (Ministry of Trade of the Republic of Türkiye, 2023). CEAP 2.0 aims to bring about a permanent paradigm shift in all economic processes, from production to consumption, finance to trade, rather than limiting the circular economy approach to environmental policies alone (Li, Wang, and Gu, 2023). Among the key priorities highlighted in the plan is ensuring that products launched alongside sustainable product initiatives are more durable, repairable, and recyclable. Additionally, legal regulations supporting circularity are being encouraged, particularly in high-waste-producing sectors such as textiles, electronics, construction, and plastics (De Pascale et al., 2023). Mechanisms that guide consumers toward sustainable choices, such as the right to repair, environmental labeling practices, and carbon footprint tracking, are being strengthened. Additionally, digital product passports are increasing traceability throughout the product life cycle and imposing waste prevention and responsibility-based obligations on manufacturers (Eckert and Kovalevska, 2021).

2.2 The Place of the Circular Economy in Politics and Economics

The circular economy is a holistic approach that aims to transform today's economic systems not only from an environmental perspective but also from political and economic perspectives (Balbay, Sarıhan, and Avşar, 2021). The European Union (EU) aims to both ensure environmental sustainability and create fundamental structural change in industry, trade, and employment through this model. In this context, the circular economy has become a multidimensional strategic development model that goes beyond traditional environmental policies (Önder, 2018).

The foundation of the EU's circular economy vision was laid with the European Green Deal, announced in 2019 (Domenech and Bahn-Walkowia, 2019). The Green Deal envisions the construction of a low-carbon and resource-efficient structure in sectors such as energy, industry, agriculture, transportation, and finance, while defining the circular economy as one of the cornerstones of this transformation (Ganzevles, Potting, and Hanemaaijer, 2017). In this context, the New Circular Economy Action Plan (CEAP 2.0), published in 2020, presents a comprehensive set of policies that include measures to promote the sustainability of products throughout their life cycle (Ecer, Güner, and Çetin, 2021).

The sustainable product policy developed under this plan aims to make criteria such as product design, durability, repairability, and recyclability legally binding (Çetiner, 2025). Applications such as digital product passports, the right to repair, and product environmental footprint labeling enable consumers to make informed choices and encourage producers to take environmental responsibility (Şapaloğlu, 2022).

The circular economy is also integrated with the EU's industrial strategy. Particularly in raw materials and energy inputs with high external dependency, the goal is to achieve strategic autonomy through circular systems (Mhatre, Panchal, Singh, & Bibyan, 2021). Recovery mechanisms and closed-loop systems are supported in areas such as electric vehicle batteries, rare earth elements, and electronic waste. This increases both resource efficiency and supply chain resilience (Avcı, 2022).

Comprehensive financial and fiscal tools have also been put in place to ensure the economic sustainability of the circular transition (Şimşek, 2024). The EU has mobilized funding sources such as Horizon Europe, the LIFE Program, Structural Funds, and the Green Taxonomy to promote circular business models and technologies (Cengiz and Kurtar, 2019). In addition, eco-tax systems and carbon taxation policies based on the "polluter pays" principle ensure that environmental costs are priced within the economic system (S. Veral and Yiğitbaşıoğlu, 2018).

The circular economy is also directly related to trade policies. In particular, the Carbon Border Adjustment Mechanism (CBAM), which imposes additional costs on the import of carbon-intensive products, has made environmental performance an economic necessity for countries trading with the EU (Yamaguchi, 2021). For countries like Türkiye, which have a high level of trade integration with the EU, this transformation is not only environmental but also directly related to competitiveness (World Bank, 2025).

It is evident that the circular transition is not limited to industry and trade but also extends to employment and social policy dimensions (European Economic and Social Committee [EESC], 2023). The emergence of new occupational fields such as recycling engineering, repair services, and green logistics has increased the demand for green skills in the labor market (European Commission and CEPS, 2023). In this context, the EU is integrating a circular economy perspective into education systems and labor force planning (EESC, 2023).

The success of the circular economy depends largely on monitoring and tracking systems supported by digitalization (Olga, 2024). Digital infrastructures such as blockchain-based supply chain applications, life cycle analyses, and product information systems enable the transformation to be based on data by making the environmental history of products transparent and verifiable (Kim, Lee, and Kim, 2024).

Within this framework, the circular economy emerges as a comprehensive development strategy that encompasses macroeconomic growth, competitiveness, resource management, employment, and geopolitical objectives, going far beyond the EU's environmental policies (McCarthy, Dellink, and Bibas, 2018).

The European Union's circular economy policies have a multi-layered structure that encompasses not only environmental sustainability but also economic development, industrial competitiveness, financial systems, and trade policies (Ekdahl, Milios, and Dalhammar, 2024). The European Commission is implementing its circular economy strategies in line with the following key documents: the EU Industrial Strategy, the Zero Pollution Action Plan, the Fit for 55 Package, and the EU Taxonomy Regulation (Özdemir and Gür, 2024). Additionally, numerous financial incentives and grant programs are in place to support circular practices (Asmundo, 2025).

2.3 Member State Experiences and Application Examples

Many countries within the European Union have implemented different strategies during the transition to a circular economy and have paved the way for transformation with exemplary projects (European Environment Agency [EEA], 2023; OECD, 2020). Among these countries, the Netherlands, Germany, Sweden, and Finland are particularly pioneering in terms of policy development, implementation tools, and industrial transformation (European Commission, 2020; Sitra, 2021).

- *The Netherlands: Systematic Strategy and Green Public Procurement*

The Netherlands became one of the first countries aiming to have a circular economy in all sectors by 2050 when it published its national plan titled "A Circular Economy in the Netherlands by 2050" in 2016 (Government of the Netherlands, 2016).

Under the Green Deal Circular Procurement (GDCP) program, public institutions are required to consider the recyclability of products, eco-design criteria, and carbon footprint in their procurement processes. The aim is to make public procurement a catalyst for the circular economy (Rijkswaterstaat, 2018).

- *Germany: Industry-Based Recycling and Technological Investment*

Germany is a pioneer in technology-based circular economy strategies in Europe. The "German Resource Efficiency Program (ProgRess III)" published in 2020 aims to drive innovative transformation in the industrial and waste management sectors (Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety [BMU], 2020). Automotive giants such as BMW and Volkswagen have developed reverse logistics models that

enable their products to be recovered at the end of their life cycle and reused through spare parts production and reassembly (BMW Group, 2021; Volkswagen AG, 2021).

- *Sweden: Consumer-Focused Tax Incentives and Electronic Waste Recycling*

Sweden's circular economy vision is reinforced by economic incentives aimed at transforming consumer behavior. The Swedish government was one of the first countries to economically incentivize repairs by reducing VAT on repair services from 25% to 12% in 2017 (Government Offices of Sweden, 2017).

- *Finland: Policy Integration and Innovation-Based Transformation*

Finland holds the distinction of being the first EU member state to publish a national circular economy strategy. The "Finland Circular Economy Roadmap," published in 2016, has encouraged systemic transformation through public-private sector collaboration (Sitra, 2016; OECD, 2025). Sitra – Circular Economy Fund is a public fund established by the Finnish government that provides grants and consulting support to startups developing circular business models; it also offers analysis services such as life cycle assessments and digital carbon measurements (Sitra, 2021).

3. Review of EU Policies and Regulations

The European Union's circular economy approach is not merely a vision statement but has evolved into an institutional policy framework supported by multi-layered legal regulations, sectoral strategies, economic incentive systems, and monitoring mechanisms (European Commission, 2020). In this context, the EU has gone beyond environmental policies and developed regulations that make circularity mandatory in strategic sectors such as industry, agriculture, construction, textiles, plastics, and electronics (Kalmykova, Sadagopan, and Rosado, 2018).

The first Circular Economy Action Plan, published in 2015 to accelerate the transition to a circular economy, focused on resource efficiency and waste prevention, while the New Circular Economy Action Plan (CEAP 2.0), published in 2020, expanded this strategy to cover the entire product life cycle. These plans aim not only to achieve environmental sustainability but also to increase economic competitiveness and elevate European industry to a leading position in the global green transition (Ekins et al., 2019).

One of the most important aspects of the EU's circular economy policies is that these goals have been concretized through legal frameworks. Various regulations issued within this framework, such as waste management directives, eco-design regulations, single-use plastic bags, producer responsibility systems (EPR), and digital product passports, are the main tools that enable the practical implementation of the circular economy (EEA, 2021; Milios, 2018).

3.1 Legal and Institutional Framework

The European Union's transition to a circular economy has not been limited to a vision based solely on strategic goals and planning; it has also been supported by a multi-layered and binding legal framework (European Commission, 2015; Milios, 2018). The principles of the circular economy have been translated into concrete policies that create legal obligations for all member states through directives, regulations, and implementation plans developed under the leadership of the European Commission. This framework is based on a systemic transformation approach that promotes sustainability throughout the entire value chain, from production to consumption (Kalmykova et al, 2018).

These general policy orientations have been implemented through detailed legal texts created by the European Union in the field of the circular economy. For example, the Waste Framework Directive (2008/98/EC) has become a binding norm in all EU countries by establishing a priority order (prevention, reuse, recycling, energy recovery, and final disposal) in the field of waste management (European Parliament and Council, 2008). The Packaging and Packaging Waste Directive has defined material-based recycling targets, and the Single-Use Plastics Directive, which came into force in 2019, has taken an important step in combating plastic pollution (European Commission, 2019). In addition, the Eco-Design Directive makes it a legal requirement for products to be manufactured in a more durable, repairable, and recyclable manner, bringing circularity to the product design stage (EEA, 2021).

Another important component of the EU's circular economy policy is Extended Producer Responsibility (EPR) systems. Under these systems, producers are responsible for collection and recycling processes that minimize the environmental impact of their products after their useful life has ended (Milios, 2018). Electronic waste, batteries, packaging, and automobiles are among the priority product groups in this context.

The enforceability of this legal system is ensured not only by legal texts but also by a multi-layered governance mechanism. The European Commission is the main decision-making body responsible for preparing policy

proposals. Legislative proposals are voted on by the European Parliament and the European Council before entering into force. The European Environment Agency (EEA) is responsible for monitoring implementation, reporting on performance indicators, and conducting comparisons between member states (EEA, 2021). Each member state is responsible for integrating these regulations into its national legislation and implementing them.

In conclusion, the European Union's transition to a circular economy has been transformed into a systematic transformation program not only through well-intentioned policy documents but also through detailed and sector-specific legal regulations and institutional structures. For countries such as Türkiye, which have a high level of integration with the EU, the careful analysis and harmonization of this structure is a strategic priority in terms of both economic and environmental sustainability (TUSIAD, 2021).

3.2 Economic Incentives and Funding Mechanisms

The European Union has adopted the understanding that the circular economy must be supported not only by a regulatory framework but also by financial incentives (European Commission, 2020). For this reason, numerous funds, grant programs, and financial regulations have been put in place to make environmental sustainability economically attractive. These incentive mechanisms accelerate the transition to circular production models, increase private sector investment, and facilitate the transformation of SMEs (Rizos et al., 2016).

The EU has planned a total investment of approximately €1 trillion under the frameworks of the circular economy, climate adaptation, and sustainable development for the 2021–2027 period. Key funding mechanisms include Horizon Europe (with €95.5 billion allocated for research and innovation), the LIFE Programme (which supports environmental and climate action projects), the Cohesion Fund (targeting sustainable infrastructure), and InvestEU (mobilizing public–private investments in green technologies). For example, under Horizon Europe, more than 100 projects directly related to circular economy innovations were funded by 2023, particularly in sectors like plastics, construction, and electronics (European Commission, 2023). These funding mechanisms are detailed in Table 1, which summarizes their focus areas and contributions to circular economy goals across Europe.

Table 1. Key EU Funding Programs Supporting the Circular Economy (2021–2027)

Program Name	Main Focus Area	Total Budget (€)	Relevant Circular Economy Applications
Horizon Europe	Research & innovation	95.5 billion	Recycling tech, eco-design, circular materials R&D
LIFE Programme	Environment & climate action	5.4 billion	Waste prevention projects, pilot reuse initiatives
Cohesion Fund	Sustainable infrastructure & regional equity	42.6 billion	Waste treatment facilities, smart water systems
InvestEU	Public–private investment mobilization	372 billion (leverage)	SME support for circular business models, green startups
Just Transition Fund	Social & regional adaptation to green transition	17.5 billion	Retraining workers, supporting circular transition in regions

Source: European Commission (2021). "EU Budget for Recovery." Retrieved from https://ec.europa.eu/info/strategy/eu-budget_en

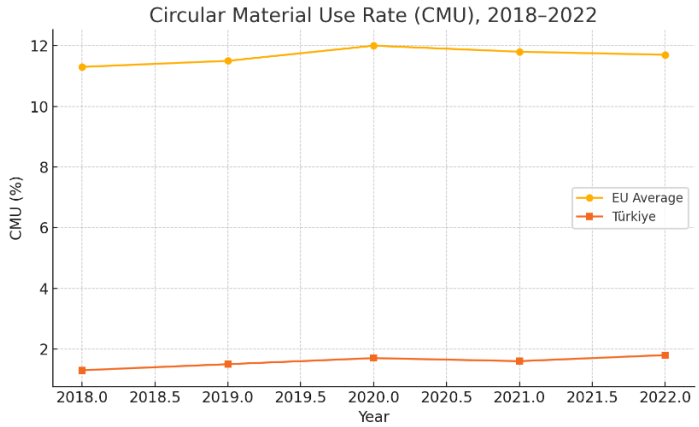
3.3 Implementation Tools and Monitoring Mechanisms

The European Union has not only established circular economy policies at the legislative level; it has also institutionalized measurement, monitoring, and control systems to ensure the effective implementation of these policies (Pacurariu et al., 2021; EEA, 2021). Ensuring the applicability of sustainability principles is not only possible through the existence of legal obligations, but also through the effective monitoring of these obligations and their evaluation based on performance indicators (Saidani et al., 2018).

In this context, the EU monitors the applicability of circular transformation through a comprehensive set of tools, including digital tracking systems, reporting obligations, and legal enforcement mechanisms. For instance, the Circular Economy Monitoring Framework developed by Eurostat tracks key indicators such as the circular material use rate (which reached 11.7% EU-wide in 2022) and waste recycling rates per sector. Moreover, countries like Germany and the Netherlands have adopted digital product passport pilots for electronics and textiles, enabling real-time tracking of materials and extended producer responsibility enforcement. At the legal level, failure to meet waste reduction targets can lead to infringement proceedings and financial penalties imposed by the European Commission (EEA, 2021; Eurostat, 2023). These tools not only promote transparency but also create a measurable accountability structure across Member States.

As shown in Graph 1, while the EU's circular material use rate remained around 11.7% in 2022, Türkiye's rate was still below 2%, indicating a significant gap in material recovery and reuse capacity.

Graph 1. Circular Material Use Rate (CMU), 2018–2022



Source: European Commission. (2023). *Circular economy monitoring framework*. Eurostat. Retrieved from https://ec.europa.eu/eurostat/web/circular-economy/indicators (Note: Türkiye figures are estimated based on national circular economy reports and are not directly reported in Eurostat.)

4. Türkiye's Transition to a Circular Economy and Current Status

The European Union's shift toward a circular economy has redefined not only its internal market rules but also the expectations from its trading partners. For countries like Türkiye, this transformation has immediate and multifaceted consequences. Due to its Customs Union ties and high trade volume with the EU, Türkiye faces mounting pressure to revise its regulatory infrastructure, modernize production systems, and adapt to emerging sustainability criteria. These pressures go beyond environmental obligations; they are directly tied to the country's economic competitiveness and access to the European market.

Although the concept of the circular economy has begun to be placed at the center of environmental policies in Türkiye in recent years, developments in this area are still in their early stages. According to the study "Transition Potential to the Circular Economy," legal regulations regarding the circular economy in Türkiye have not yet reached the desired level (Akpulat, 2022). Legal and institutional regulations are largely based on EU acquis; circular economy principles are being integrated through waste management, zero waste practices, and industrial transformation programs (ÇŞİKB, 2018; Memiş, 2023).

In this context, the Zero Waste Project launched in 2017 has been an important step in raising environmental management awareness among both public institutions and the private sector. In the case of Ankara, the project has been found to have a positive impact on the sorting behavior of project participants (Gül & Yaman, 2021). Under the project, waste sorting has been made mandatory in public buildings, and waste collection systems have been standardized in metropolitan municipalities (ÇŞİKB, 2018).

However, Türkiye's current regulatory framework, including the Waste Management Regulation, the Packaging Waste Control Regulation, the Environmental Law, and the Energy Efficiency Strategy Document, lays the groundwork for circularity to a certain extent. The Waste Management Regulation (2015) and the Packaging Waste Control Regulation (2017) partially support the circular approach (Akpulat, 2022). However, most of these legal regulations remain within the boundaries of the "linear model" and are far from achieving full compliance with the EU in areas such as product design, producer responsibility, and sectoral incentives (Akpulat, 2022).

At the institutional level, the Ministry of Environment, Urbanization, and Climate Change and the Ministry of Industry and Technology are the main coordinating bodies for circular economy applications. In addition, institutions such as the Turkish Environment Agency and TÜBİTAK have taken an active role in disseminating "Zero Waste" practices in provinces (Memiş, 2023; Gül & Yaman, 2021). Economically, circular transformation has not yet become a widespread industrial policy in Türkiye. Inadequate recycling infrastructure, lack of financing, and limited measurement tools are significant obstacles (Sapmaz Veral, 2018). Although there are transformation efforts in strategic sectors such as textiles, automotive, and food, the study Preliminary Research on Circularity Potential of Five Sectors in Türkiye has identified infrastructure deficiencies that prevent these sectors from strengthening their circular structures (SKD Türkiye & KPMG, 2022).

On the other hand, commercial regulations such as the Carbon Border Adjustment Mechanism (CBAM) implemented under the European Green Deal are making it almost mandatory for exporting companies in Türkiye to transition to low-carbon and circular production structures (Yazıcı et al., 2023).

In conclusion, Türkiye is facing a need for structural transformation in the field of the circular economy. For this transformation to be successful, it is necessary not only to comply with EU legislation but also to develop domestic strategies that promote circularity in its own domestic market, establish sector-based incentive systems, and actively involve local governments in this process (Akpulat, 2022; Memiş, 2023).

4.1 Türkiye's Legal and Institutional Compliance Level

Türkiye's transition to a circular economy is essentially shaped by the goal of harmonizing with the European Union's environmental acquis. Regulations such as the EU Waste Framework Directive (2008/98/EC), the Packaging Waste Directive, the Eco-Design Directive, and the Plastics Directives have been integrated into Türkiye's domestic law to a certain extent. However, the level of regulatory compliance remains limited, and serious structural deficiencies are observed in terms of implementation and enforcement (Gündüzalp & Güven, 2016; REC Turkey, 2010).

In Türkiye, circular economy principles are not directly regulated by an overarching piece of legislation. However, various secondary regulations such as the Environmental Law (No. 2872), the Waste Management Regulation (2015), the Packaging Waste Control Regulation (first in 2004, updated in 2017), the Energy Efficiency Strategy Document, and the National Recycling Strategy can be evaluated in this context. The Waste Management Regulation, which came into force in 2015, regulates waste processes, while the 2020 amendment to the Environmental Law has also brought circular economy practices and zero waste principles to the level of law (Gündüzalp & Güven, 2016; ÇŞİKB, 2018).

Although an EU-style producer responsibility system (EPR) has been gradually implemented in Türkiye since 2021 for packaging and electronic waste, the legal infrastructure is still fragmented, and collection, tracking, and reporting mechanisms are not yet fully established (Narterlaw, 2022). For example, producer responsibility for products such as waste batteries and accumulators has effectively been transferred to public institutions and municipalities (Gökdemir et al., 2017).

Institutions directly related to the circular economy are shown in Table 2.

Table 2. Institutions and their Roles in Türkiye's Circular Economy Governance

Institution	Primary Responsibilities
Ministry of Environment, Urbanization, and Climate Change	General coordination, zero-waste policies, national planning
Ministry of Industry and Technology	Industrial efficiency, SME support, eco-design projects
TÜBİTAK and KOSGEB	Research and development, innovation support
Turkish Environment Agency (TÜÇA)	Coordination of producer responsibility systems, waste collection systems
Provincial Banks and Local Municipalities	Local government waste infrastructure and recycling activities

Source: Adapted from Narterlaw. (2022). *Türkiye'de üretici sorumluluğu sistemi: Mevzuat ve uygulama analizi*. İstanbul: Narterlaw Yayınları; and Ministry of Environment, Urbanization and Climate Change Reports (2022–2023)

However, the division of responsibilities among institutional structures is not clear; there are weaknesses in data sharing, monitoring capacity, and coordination. In particular, the capacity of local governments varies considerably, which prevents the homogeneous implementation of circular economy practices at the regional level (Kutlu, 2022).

Türkiye has many fundamental documents related to the circular economy in terms of legislation, but these documents are not structured in a comprehensive manner in line with the EU system (Yalçın and Negiz, 2020). There are still gaps in legislation in areas such as eco-design, digital product passports, and carbon footprint labeling (METU thesis, 2020; Ambalaj Sanayicileri Derneği [ASD], 2024).

At the corporate level, the main structure is relatively strong; however, implementation at the local level is fragmented and non-standardized (Yeditepe University, 2022). Therefore, for Türkiye to complete its legislative harmonization with the EU, it needs to clarify the sectoral legal frameworks and develop control, reporting, and monitoring systems for implementation (European Commission, 2024).

4.2 Comparative Analysis of the Circular Economy in the EU and Türkiye

The circular economy is not only the European Union's environmental sustainability strategy; it is also a comprehensive transformation model structured as an industrial policy, trade regulation, and financial governance tool. Türkiye, on the other hand, is increasingly striving to integrate into this transformation within the framework of foreign trade, acquis alignment, and national environmental policies. However, as of now, there are various structural differences between Türkiye and the EU in terms of circular economy practices.

In terms of policy level and strategic orientation, the EU has followed a long-term and systematic path with the Circular Economy Action Plans (CEAP) published in 2015 and 2020 (European Commission, 2020; EEA, 2020). In Türkiye, instead of a single umbrella document directly defining the circular economy framework, fragmented documents such as the Zero Waste Project, Waste Management Regulation, and Energy Efficiency Strategy have been created (IKV, 2025). This situation causes Türkiye to lag the EU in terms of strategic orientation.

In terms of regulatory compliance, the EU has developed detailed and binding regulations in the areas of waste management, packaging, plastics, eco-design, and producer responsibility (European Commission, 2015). While compliance in these areas has been partially achieved in Türkiye, there are still legal gaps in critical areas such as the single-use plastic ban, digital product passports, the right to repair, and green public procurement. Although EPR applications have started in packaging and electronic waste, collection, reuse, and monitoring systems have not yet been institutionalized (IKV, 2025; World Bank, 2025).

Table 3 illustrates the extent of Türkiye's legal compliance with key EU directives in the field of circular economy. It demonstrates Türkiye's current level of legal harmonization with major EU directives. While partial and moderate compliance has been achieved in areas such as waste and packaging, key regulatory tools—such as those for single-use plastics and eco-design—remain either non-existent or limited in scope. Moreover, although an extended producer responsibility (EPR) system exists in principle, its enforcement and institutionalization are still in progress. Without comprehensive legal adaptation and enforcement capacity, Türkiye's circular economy framework will continue to fall short of EU standards.

Table 3. Legal Compliance of Türkiye with Key EU Circular Economy Directives

EU Directive	Equivalent in Türkiye	Compliance Status
Waste Framework Directive (2008/98/EC)	Waste Management Regulation (OG: 02.04.2015/29314)	Partial Compliance
Packaging Directive (94/62/EC)	Packaging Waste Regulation (OG: 27.12.2017/30283)	Moderate Compliance
Single-Use Plastics Directive	No direct legislative compliance yet	Incomplete
Eco-Design Directive (2009/125/EC)	Energy Labeling and Efficiency Communiqués	Sectoral and Limited
Producer Responsibility (EPR) Directives	Packaging Responsibility System (via Environment Agency)	Developing

Source: European Commission (2008, 2009); Ministry of Environment, Urbanization, and Climate Change (MEUCC) (2015, 2017); Narterlaw (2022)

In institutional and administrative applications, the EU manages policy formation and implementation monitoring together with institutions such as the European Commission and the European Environment Agency. In Türkiye, coordination is led by the Ministry of Environment, Urbanization, and Climate Change and carried out with institutions such as municipalities, TÜBİTAK, and the Turkish Environment Agency, but there are issues such as role confusion, lack of data sharing, and application standard problems (IKV, 2025; World Bank, 2025).

In terms of financial instruments, the EU supports the circular transition with billions of euros through funds such as Horizon Europe, LIFE, Cohesion Fund, and Invest EU; green investments are also prioritized through the Taxonomy (European Commission, 2020; EEA, 2020). Türkiye, on the other hand, has not yet had similar financial frameworks and carries out its investments largely with IPA, EIB resources, and limited national incentives, struggling to cover the transformation costs of SMEs (IKV – Economic Development Foundation, 2025). A comparative summary of the current state of circular economy frameworks in the EU and Türkiye is presented in Table 4 below.

Table 4. Comparative Overview of Circular Economy Policies: EU vs Türkiye

Category	European Union	Türkiye
Strategic Plan	CEAP 1.0 (2015), CEAP 2.0 (2020)	Zero Waste Project, Waste Management Strategies
Waste Recovery Rate (2022)	48–55% (by country)	13–17% (TÜİK, 2022)
Producer Responsibility Scope	Packaging, electronics, automotive, batteries	Limited application in packaging and electronic products
Eco-design Legislation	EU-wide mandatory, passport system integrated	Limited, adapted with sector-based circulars
Circular Material Use	12.8% (EU average, Eurostat 2022)	4.2% (estimated, no national report based on data)
Digital Product Passport	Expanded to all sectors by 2026	None yet
Circular Economy Funds	€95.5 billion (Horizon), €5.4 billion (LIFE)	Indirect IPA and EIB funds, limited direct resources
Carbon Footprint Tracking	Product and process-based mandatory tracking systems	Voluntary reporting, no legal obligation
Textile Waste Collection Target	EU-wide mandatory by 2025	No obligation other than pilot applications
Number of Recycling Facilities	>25,000 installations (different types)	~2,500 facilities (2023)

Source**:** CEAP (2020); Eurostat (2022); TÜİK (2022); OECD (2021); SKD Türkiye (2022); Ministry of Environment, Urbanization and Climate Change (2023).

Table 4 highlights the deep structural differences between the EU and Türkiye regarding the operationalization of circular economy principles. While the EU has developed a holistic policy framework with clear strategic targets and measurable implementation metrics, Türkiye's transition remains fragmented and pilot-based. For example, the circular material use rate in Türkiye remains below 5%, far behind the EU average of 12.8%. Likewise, Türkiye lacks national-level obligations in key areas such as digital product passports and textile waste collection. These disparities reflect the urgency of institutional reform, legal alignment, and capacity-building efforts if Türkiye is to effectively integrate into the EU's green economy agenda.

In terms of sectoral applications, the EU has widespread circular regulations in priority areas such as textiles, electronics, food, and construction (European Commission, 2020). In Türkiye, however, transformation in these sectors is mostly limited to pilot projects carried out by the private sector or local governments. There are initiatives for recycled yarn production, municipal composting, and waste reduction efforts by companies; however, these projects have not evolved into national policy (World Bank, 2025; IZLI, 2021).

Türkiye is following the European Union's strategic line in terms of the circular economy; however, it has not yet achieved full compliance in the areas of legislation, financing, and implementation (European Commission, 2020; Ministry of Environment, Urbanization, and Climate Change, 2023). Numerical indicators show that Türkiye lags significantly behind the EU average in areas such as recycling rates, secondary material use, and digitalization (Eurostat, 2023).

However, there is also a significant opportunity for progress thanks to the transformation needs of export-oriented sectors, investment potential, and existing pilot projects (OECD, 2021). However, for this opportunity to be turned into a strategic gain, institutional commitment, funding systems, and the legal framework must be strengthened rapidly (Mazur-Wierzbicka, 2021).

4.3 Key Challenges to the Circular Economy Transition in Türkiye

To achieve its circular economy goals, Türkiye needs to make simultaneous progress in many areas, including legislation, infrastructure, financing, technology, and social awareness (Yalçın, 2020). However, structural issues currently exist in these areas, limiting the speed, depth, and scope of the circular transition (MEUCC, 2022).

Türkiye's transition to a circular economy requires a multidimensional transformation. However, there are currently structural deficiencies in many areas, such as regulatory integrity, technical infrastructure, financial instruments, data monitoring systems, and social awareness, which limit the speed, prevalence, and sustainability of circular transformation.

Legislation related to the circular economy in Türkiye has generally been adapted piecemeal based on the EU Waste Framework Directive but has not been designed with systematic coherence (Yalçın and Negiz, 2020). Waste management regulations are mostly limited to disposal and recycling stages. There are still regulatory gaps in areas that deepen circularity, such as product design, extending product lifespans, digital product passports, and the right to repair (TÜBA, 2022). Eco-design applications are limited to specific sectors and lack binding force. This situation creates uncertainty for the private sector's long-term investment decisions and negatively affects the supervisory capacity of public authorities (MEUCC, 2022).

Technical infrastructure deficiencies are particularly evident in waste treatment systems. In many cities in Türkiye, recycling, advanced chemical separation, and biodegradable waste composting facilities are either non-existent or insufficient in capacity. For example, according to TÜİK data, only 8 cities have composting facilities for biodegradable waste, and source separation systems are not mandatory in 60% of municipalities (TÜİK, 2019; Eren and Taşarsu, 2021). In the textile sector, advanced chemical recycling practices are limited, and mechanical separation is widespread (Yavaşcaoğlu, 2012). These infrastructure deficiencies make it difficult to comply with obligations such as carbon border adjustments in trade with the EU (SKD Türkiye, 2022).

There are also serious problems in financing. While circular economy projects require medium- and long-term investments, credit and incentive mechanisms specifically designed for these projects are quite limited. Unlike in the EU, there is currently no financial classification framework based on green taxonomy in Türkiye (Yalçın, 2020). When it comes to accessing EU funds, SMEs have low participation rates due to reasons such as technical capacity deficiencies and the complexity of project preparation processes (MEUCC, 2022). For this reason, many businesses, especially SMEs, are not voluntarily participating in the circular transition but are doing so out of necessity.

Data gaps and inadequate monitoring systems also negatively affect the transformation process. The data infrastructure required to monitor and measure circular economy policies is largely lacking. There is no national infrastructure for a digital product passport system in Türkiye. Waste monitoring systems (TABS, MoTAT) are not standardized or integrated across municipalities. Sectoral circular data flows, such as secondary raw material ratios, are lacking in many sectors (Yalçın and Negiz, 2020). This situation complicates both internal performance measurement and reporting to the EU.

Finally, the circular economy requires not only technical but also social transformation. However, reuse, repair, and preference for durable products are not widespread among consumers. Awareness of waste separation and resource efficiency is low in institutions, and trust in recovery systems is limited (MEUCC, 2022). These behavioral barriers are delaying the transformation of consumption patterns and the adoption of the system.

Considering all these issues, Türkiye's transition to a circular economy is a complex transformation that requires simultaneous progress on many levels, including technical, legal, financial, and cultural. These issues must be addressed not only through technical solutions but also through coordinated efforts in areas such as regulatory coherence, governance capacity, financial strategy, and social awareness. Otherwise, Türkiye will face difficulties in both maintaining its commercial integration with the EU and promoting sustainable production in its domestic market.

5. Conclusions and Policy Recommendations

This study examined the structural framework of the European Union's circular economy model and assessed Türkiye's level of alignment with this paradigm. The analysis focused on strategic policy orientation, legal harmonization, institutional capacity, sectoral practices, and financing mechanisms. The comparative approach revealed that while Türkiye has taken notable steps—particularly in adopting national waste policies and initiating pilot projects—its progress remains limited in scope, depth, and coordination. The transition process is currently fragmented, and most efforts are either donor-dependent or limited to compliance with trade-driven obligations.

Türkiye's approach to the circular economy has yet to evolve into a coherent national strategy. While there is growing awareness at the policy level, legal fragmentation, weak implementation, and underdeveloped infrastructure continue to hinder systematic transformation. The absence of binding instruments in areas such as eco-design, digital traceability, and extended producer responsibility (EPR) limits the effectiveness of current practices. Furthermore, institutional roles often overlap, and local governments vary significantly in their capacity to manage waste and promote circular models.

The lack of tailored financing mechanisms, particularly for SMEs, constitutes another barrier to scaling up circular practices. Although certain sectors—such as textiles and construction—show promising initiatives, these have yet to be integrated into a national roadmap. Türkiye risks falling behind not only in environmental targets but also in global competitiveness if these gaps are not addressed promptly.

To accelerate Türkiye's circular economy transition and align more closely with EU expectations, the following policy actions are recommended:

1. Adopt a comprehensive Circular Economy Framework Law that consolidates existing regulations and introduces legally binding principles across sectors.
2. Expand eco-design and digital product passport requirements through enforceable legislation that ensures lifecycle transparency and traceability.
3. Institutionalize and broaden EPR systems, particularly in high-impact sectors such as electronics, automotive, and textiles.
4. Establish a national coordination body responsible for aligning environmental and industrial policy under a unified governance framework.
5. Create green financing instruments and dedicated circular investment funds, with simplified access procedures for SMEs and local authorities.
6. Invest in monitoring infrastructure and national data systems to track circularity indicators and facilitate evidence-based policymaking.
7. Integrate circular economy education and awareness into curricula and public campaigns to shift consumption patterns and promote behavioral change.

The circular economy offers Türkiye not only an environmental imperative but also a strategic opportunity to future-proof its economy. If approached with coherence, institutional resolve, and targeted investment, it can serve as a foundation for long-term competitiveness, resilience, and sustainability. Türkiye stands at a pivotal moment to turn its pilot practices into systemic transformation—and to reposition itself as a proactive player in the global green transition.

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