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DISSERTATION ABSTRACT

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“Doctor” in Professional Field 3.8 Economics

Topic

**THE ROLE OF CIRCULAR ECONOMY TRANSITION POLICIES IN
ECONOMIC GROWTH
(The Case of the Waste Economy)**

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The author of the doctoral dissertation is enrolled as a part-time doctoral candidate at the “Macroeconomics” Section of the Economic Research Institute at the Bulgarian Academy of Sciences (BAS).

The doctoral dissertation comprises a total of 194 pages, including an introduction, four chapters, a conclusion, a bibliography, a list of abbreviations, a list of tables and figures, and twelve appendices. The main body of the thesis includes 17 tables and 9 figures. The bibliography comprises 139 sources, of which 7 are in Bulgarian and 132 are in English, including books, academic articles, reports and studies, strategic documents, legal acts, and other sources.

I. GENERAL CHARACTERISTICS OF THE DISSERTATION

1. Relevance of the Research

The circular economy has become one of the central priorities of European Union (EU) policies, presented as a key instrument for achieving sustainable growth, competitiveness, and climate neutrality. Despite its prominent position in contemporary policy discourse, the circular economy remains a theoretically ambiguous and methodologically heterogeneous concept. This diversity reflects the absence of a unified analytical framework capable of systematically explaining the economic mechanisms underlying circularity.

The theoretical positioning of the circular economy is particularly complex. Different schools of economic thought provide divergent interpretations as to whether it represents a natural extension of market logic or requires active state intervention. On the one hand, the neoclassical paradigm emphasizes the role of technology and innovation as market-driven mechanisms for resource optimization. On the other hand, Keynesian and institutional economics highlight the necessity of coordinated public policies aimed at stimulating investment, infrastructure development, and changes in production and consumption patterns.

From a policy perspective, the circular economy has simultaneously evolved into a policy objective, an instrument, and a regulatory justification: a goal pursued by Member States; an instrument for achieving broader objectives such as resource efficiency and green transition; and an argument for the introduction of new regulations that gradually reshape the relationship between the state and the market. Its tangible expression lies in the flows of raw materials, products, and waste circulating within the economic system. For this reason, the waste economy represents the most concrete and measurable manifestation of circularity. The EU introduced its first consistent measures precisely in this sector, transforming waste management into a practical example of the implementation of circular economy principles.

A critical analysis of existing policies reveals questions regarding their prioritization and their actual impact on the overall material intensity of the economy. Another significant challenge concerns the quality and comparability of statistical data used to measure progress toward a circular economy. The difficulty in assessing the effectiveness of EU circular economy policies also stems from their continuous expansion and parallel implementation over time.

In this context, the present dissertation examines the waste economy as an analytical instrument for assessing the transition to a circular economy. By combining politico-institutional analysis, statistical evaluation, and econometric modelling, the study aims to

determine whether and to what extent there is empirical evidence of the impact of circular policies on economic growth, as well as to delineate the limits of measurability of this effect.

2. Object and Subject of the Research

The object of the study comprises the policies, institutional frameworks, and economic processes related to the transition to a circular economy in the EU, examined through their impact on waste management and economic growth in the Member States, and in particular in Bulgaria.

The subject of the research is the interaction between EU policies and legislation in the field of waste and the circular economy and their manifestation as measured through statistical data and waste-related indicators. The study focuses on the comparability and methodological limitations of these data, which determine the possibilities for assessing the effects of policies on economic growth. By combining normative, statistical, and empirical approaches, the research aims to outline the extent to which the circular economy can be assessed as either a source or a consequence of economic development.

3. Aim and Objectives of the Dissertation

The primary aim of the dissertation is to assess the role of EU policies and legislation in the transition to a circular economy by examining their manifestation in the field of waste management and their relationship with economic growth indicators.

In order to achieve this aim, the following main **objectives** are pursued:

- to present the theoretical foundations and schools of economic thought within which the concept of the circular economy and its relationship with economic growth may be situated.
- to analyse the development of the European legislative and policy framework in the field of waste as a principal instrument for the implementation of circular economy principles.
- to evaluate the dynamics, reliability, and comparability of statistical data used to monitor the circular economy.
- to examine the empirical relationships between indicators of economic development and circular economy indicators through regression analysis.
- to identify the limitations of the available data and propose directions for improving the system of indicators.

4. Research Thesis and Hypotheses

The research thesis of the dissertation is grounded in the fundamental principle of examining the waste economy in its systemic integrity. It posits that the relationship between the circular economy, waste management, and economic growth is neither automatic nor unidirectional, but structurally conditioned by the level of economic development, the institutional environment, and the material structure of the economy. Economic growth more frequently manifests itself as a precondition for higher levels of recycling and resource efficiency rather than as their consequence, while the effect of circular policies on economic growth remains limited and dependent on multiple internal and external factors. In this sense, the transition to a circular economy cannot be regarded as an autonomous driver of growth, but rather as a process whose outcomes depend strongly on the complex interaction between regulation, economic structure, institutional capacity, and statistical measurability.

The hypotheses are formulated to encompass different levels of analysis – from policy dynamics and their economic rationale, through the limitations of the statistical base, to empirically testable relationships. They are as follows:

Hypothesis 1: At present, there is no empirical evidence of a decoupling of economic growth from waste generation as a result or expression of circular economy policies.

Hypothesis 2: Economic growth in many cases appears to function as a more important precondition for achieving the objectives of the circular economy than the reverse, as the structure and stage of economic development are likely to play a key role in shaping levels of recycling and resource efficiency.

Hypothesis 3: Outcomes in waste management are the result of a complex interaction of economic, institutional, and behavioural factors, which does not allow for the isolation of a direct causal relationship between specific policies and observed results.

Hypothesis 4: The implementation of policies varies significantly across Member States depending on institutional models, levels of public investment, and the role of the state, with no single model of expenditure and employment guaranteeing positive outcomes.

Hypothesis 5: Recycling and waste management outcomes are influenced by external economic factors such as imports, exports, and prices of recyclable materials; however, these relationships are not universal.

Hypothesis 6: An increase in the share of recycled waste has a limited effect on economic growth, influencing primarily the sectoral rather than the macroeconomic level.

Hypothesis 7: Given the dynamic changes in regulations and calculation methodologies, it is premature to draw definitive conclusions regarding the effects of circular economy policies.

Hypothesis 8: Existing statistical indicators do not fully capture the actual processes of the circular economy and should be improved through the development of new, more integrated indicators.

It should be noted that the formulated research hypotheses differ in their nature and degree of specificity. Some of them are empirically testable and are operationalised through the econometric analysis presented in Chapter Four, while others have a broader conceptual and methodological scope and are examined through theoretical and institutional analysis. Given the limitations of the available data and the complexity of the processes under study, not all hypotheses are subject to direct quantitative verification.

5. Methodology and Data Sources of the Research

The research methodology is based on an interdisciplinary approach integrating economic, environmental, and policy analysis. The following methods are applied:

- Theoretical analysis of economic schools of thought related to sustainable development, the green and circular economy, the waste economy, and institutional approaches.
- Normative and documentary analysis of the strategic and legislative frameworks of the EU.
- Empirical analysis of statistical data from Eurostat for the period 2009–2023 in the field of waste.
- Econometric analysis using regression models to assess the relationships between GDP and the potential effects of implemented circular economy policies, as reflected through waste and circular economy indicators for Bulgaria.

Data Sources

A variety of information sources were used to ensure the empirical grounding of the study. In order to identify a direct relationship between EU policies and their outcomes, statistical indicators and datasets from the European Statistical Office (Eurostat) were employed. Core information was also drawn from reports and analyses of the European Environment Agency (EEA) and the European Court of Auditors.

In accordance with the objectives of the study, strategic EU documents and key legislative acts in the field of waste management (directives and regulations), as well as essential secondary legislation related to their implementation (implementing and delegated acts), were examined.

6. Research Limitations

The conduct of the research was accompanied by several limitations, primarily related to the nature, comparability, and level of aggregation of the statistical data used. A substantial share of the indicators included in the EU Circular Economy Monitoring Framework is based on methodologies that reflect structural characteristics of the economy and trade flows, rather than exclusively the potential effects of specific waste management policies.

Data on total waste generation, including sectoral breakdowns, are reported at biennial intervals in accordance with Eurostat methodology. This results in relatively short time series and limits the possibility of conducting more comprehensive dynamic analyses. Furthermore, a significant proportion of publicly available data are presented in highly aggregated form, restricting the simultaneous analysis of waste generation and recycling by individual waste streams and by economic sectors.

These limitations necessitated the use of statistical data on municipal waste generation and recycling exclusively in the econometric modelling, rather than sector-specific waste data.

Changes in certain European data reporting methodologies during the examined period, as well as the relatively short time horizon for evaluating more recent regulatory measures, further limit the possibility of fully isolating the effect of individual policies from the complex interaction of economic, institutional, and behavioural factors. Additional external influences include fluctuations in international waste markets, price volatility of secondary raw materials, and macroeconomic cycles.

In the analysis of waste-related legislation, emphasis is placed on the principal regulations, directives, and major policy initiatives, without engaging in a detailed legal interpretation of all specific provisions. These limitations require caution in the interpretation of the results and highlight the need for future research based on more disaggregated datasets and longer time series.

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INTRODUCTION

The introduction substantiates the relevance of the research, determined by the increasing political and regulatory focus on the transition to a circular economy within the European Union and by the need to assess the actual economic effects of these policies. The central question concerns the relationship between economic growth and waste generation, and the extent to which the implemented policies contribute to a process of decoupling between them.

The object and subject of the research are defined, with the analysis focusing on the interaction between circular economy policies, waste dynamics, and macroeconomic indicators. The main research thesis is formulated, asserting that the relationship between the circular economy, waste management, and economic growth is neither automatic nor unidirectional, but structurally conditioned by the level of economic development, the institutional environment, and the material structure of the economy. Eight specific hypotheses are formulated to be tested and either confirmed or rejected in the course of the research.

The introduction defines the aim and objectives of the study, including an analysis of the European regulatory framework, an assessment of statistical trends, and an empirical investigation of the relationship between economic and environmental indicators. The methodology applied is presented, based on theoretical analysis, comparative approach, and quantitative methods. The scope and structure of the dissertation are outlined.

CHAPTER ONE. THEORETICAL ISSUES RELATED TO THE CIRCULAR ECONOMY AND ECONOMIC GROWTH

The purpose of this chapter is to construct the theoretical and conceptual framework of the research by positioning the circular economy and waste management policies within the context of the main economic schools of thought and theories. It is argued that the circular economy does not constitute a standalone and homogeneous economic theory, but rather a complex political-economic framework that is implemented in practice primarily through public policies, regulatory mechanisms, and targeted state intervention, particularly in the field of waste management.

The analysis demonstrates that the concept of the circular economy integrates diverse theoretical approaches and ideas, ranging from ecological economics and industrial ecology to institutional economics and theories of sustainable development. Despite this conceptual

diversity, the waste sector emerges as the principal empirical and policy foundation of the circular economy. Waste management provides measurable material flows, identifiable economic incentives, and concrete regulatory instruments through which circular economy principles are translated into applicable economic practice.

The chapter advances the thesis that the waste economy represents the key domain in which the circular economy is operationalised through policies such as extended producer responsibility, recycling targets, landfill restrictions, and the creation of markets for secondary raw materials. In this sense, waste is not viewed as the final outcome of economic activity, but rather as a secondary resource and economic flow subject to management, regulation, and reintegration into the production process.

The critical review of classical and neoclassical economic theories indicates that natural resources and waste occupy a peripheral position within these frameworks. Classical economics and neoclassical growth models treat the natural environment and waste as external to the economic system, thereby limiting their explanatory power in addressing contemporary environmental challenges. Although the instruments of Pigouvian welfare economics and the Coase theorem provide important mechanisms for internalising externalities, they prove insufficient in explaining the large-scale and systemic policies characteristic of the circular economy.

Special attention is devoted to institutional economics and the role of institutional design in waste management. It is shown that the effectiveness of circular economy policies depends less on individual market decisions and more on the quality of the regulatory framework, the clear allocation of responsibilities among economic actors, and the presence of economic incentives for behavioural change. Waste management thus represents a typical sector in which market mechanisms operate in close interaction with state regulation.

A central place in this chapter is occupied by the argument in favour of a Keynesian and neo-Keynesian interpretation of the circular economy. The chapter substantiates the thesis that contemporary EU policies in the field of the circular economy and waste management presuppose an active role of the state through public investment, regulatory intervention, and the deliberate creation of markets. For this reason, the circular economy is conceptualised as a form of industrial and environmental policy that is difficult to reconcile with a neoliberal model of minimal state intervention.

The analysis demonstrates that Keynesian logic provides a more adequate explanation of processes such as the subsidisation of recycling capacity, public financing of waste management infrastructure, and regulatory stimulation of demand for secondary raw materials.

These mechanisms not only affect the structure of economic activity, but also have potential implications for employment, investment, and economic growth, thereby situating the circular economy within the broader context of macroeconomic policy.

The relationship between the circular economy, waste management, and economic growth is identified as the central theme of the dissertation. The analysis shows that the debate on the circular economy is intrinsically linked to broader discussions on models of economic growth and their environmental constraints. The circular economy is often presented as a compromise framework aiming to reconcile continued economic growth with reduced resource intensity and environmental pressure.

The concept of “green growth,” which occupies a prominent place in EU strategic documents, is critically examined. While green growth presupposes a relative decoupling of economic growth from resource use and waste generation, empirical evidence of sustained and absolute decoupling remains limited and inconclusive. This conclusion is directly related to debates surrounding the Environmental Kuznets Curve, which assumes a nonlinear relationship between economic development and environmental pressure, but whose empirical validation in the field of waste remains subject to significant academic controversy.

Alternative theoretical approaches are also discussed, including the concepts of “degrowth” and “post-growth,” which challenge the central role of economic growth as the primary objective of public policy. The analysis suggests that these approaches question the compatibility between economic growth and environmental sustainability, while serving primarily as a critical framework for evaluating growth-oriented policy assumptions.

It is argued that contemporary EU policies on the circular economy and waste management are built upon the assumption of compatibility between economic growth and environmental sustainability, whereby growth is not perceived as a problem per se, but as a factor that can be “redirected” through regulation, investment, and technological change. This necessitates an empirical analysis of the relationship between economic development, waste management, and the outcomes of circular economy policies, including the testing of the hypothesis of a nonlinear relationship consistent with the Environmental Kuznets Curve.

Overall, the chapter not only outlines the theoretical foundations of the circular economy, but also clearly formulates the research problem related to economic growth: whether and under what conditions economic development becomes a precondition for improved waste management performance, or conversely, whether the implementation of circular policies can independently stimulate more sustainable growth patterns.

In essence, the chapter serves as the conceptual foundation of the research and logically prepares the subsequent analysis of European policies and the regulatory framework, as well as the empirical data and econometric modelling. The theoretical conclusions derived justify the need for an in-depth examination of the actual results of circular economy implementation and waste management practices in the EU and in Bulgaria, which constitute the subject of the following chapters of the dissertation.

CHAPTER TWO. EU POLICIES AND LEGISLATION IN THE FIELD OF THE CIRCULAR ECONOMY: WITH EMPHASIS ON WASTE MANAGEMENT

This chapter analyses the evolution of EU policies and the regulatory framework in the field of the circular economy, with particular emphasis on waste management as its primary practical and institutional core. The main objective is to assess the extent to which European policies succeed in transforming economic models of production and consumption, and to what degree the achieved results correspond to the ambitious objectives of the circular economy.

A central conclusion is that waste management constitutes the backbone of the circular economy in the EU, both in terms of the regulatory framework and the available monitoring indicators. A substantial share of the objectives, measures, and indicators within the circular economy framework are directly or indirectly linked to waste prevention, collection, recycling, and recovery. This renders the waste sector crucial for evaluating the real impact of circular economy policies and for analysing their relationship with economic development.

The analysis of early European waste policies demonstrates that the mere existence of a legislative framework is not in itself a sufficient condition for achieving substantial results. For decades, the EU has had in place directives, targets, and a waste management hierarchy that inherently incorporate key elements of what was later conceptualised as the circular economy—waste prevention, reuse, recycling, and extended producer responsibility. Nevertheless, the implementation of these principles has been characterised by fragmentation, significant disparities among Member States, and limited progress, particularly with regard to waste prevention and high-quality recycling.

The analysis further shows that leaving the realisation of circular economy principles primarily to market logic and minimal regulatory requirements does not result in a comprehensive transformation of production and consumption patterns, but rather leads to partial and uneven achievement of policy objectives.

This leads to the conclusion that the problem does not lie in the absence of regulation or in the lack of preconditions for circularity, but rather in the limited effectiveness, coordination, and binding force of early policies. It is precisely this experience that explains the subsequent strengthening of the regulatory framework and the shift toward more integrated and mandatory instruments, which place the circular economy at the centre of European policy.

The 2015 Circular Economy Package and the Circular Economy Action Plans of 2015 and 2020 represent a political and regulatory upgrading of EU policy. The author concludes that through these initiatives the EU moved from a fragmented approach to a more systematic and integrated framework encompassing not only waste management, but also product policy, secondary raw materials, product design, and demand stimulation. Nevertheless, the analysis shows that even this expanded framework does not, at this stage, automatically guarantee the achievement of the declared objectives, as sufficiently reliable indicators for measuring structural changes in the economy remain lacking.

An important conclusion is that the transition from directives to regulations, as well as the introduction of stricter and more binding instruments, reflects the EU's attempt to overcome the weaknesses of the previous model. However, this trend is accompanied by increasing tension between ambitious policy objectives and actual economic processes. The analysis demonstrates that growth in production and consumption may, in many cases, offset the progress achieved in recycling and resource efficiency, thereby calling into question the possibility of achieving sustained decoupling between economic growth and waste generation. Moreover, this raises concerns regarding the objective statistical measurement of such decoupling.

Special attention in this chapter is devoted to several key regulatory cases that illustrate the structural constraints of circular economy policies and the mechanisms of their adoption. The analysis of the Waste Shipment Regulation reveals the tension between the objective of closing material loops within the EU and the reality of globalised secondary raw material markets. Similarly, the Single-Use Plastics Directive demonstrates the strength of direct market intervention, while at the same time exposing significant challenges related to measuring its effects and to the potential displacement of environmental pressure onto a limited set of product categories.

Particularly illustrative is the introduction of the EU plastic own resource, which directly links the circular economy to fiscal policy. The analysis concludes that this instrument represents an attempt to integrate economic incentives into waste management; however, it simultaneously exposes serious weaknesses in the statistical base and in the comparability of

data across Member States. This further complicates the assessment of the real impact of circular economy policies on economic growth and fiscal sustainability.

Considerable attention is also given to the EU Circular Economy Monitoring Framework, which constitutes the principal instrument for evaluating progress in the implementation of circular policies. The analysis shows that although the Monitoring Framework provides a systematised set of indicators, it suffers from several structural limitations that hinder the assessment of the actual economic and environmental effects of the circular economy. A key conclusion is that the Monitoring Framework is heavily concentrated on indicators related to waste management and material flows, while its linkage to macroeconomic indicators, including economic growth, remains underdeveloped. A substantial share of the indicators focus on end-of-life outcomes, thereby limiting the possibility of analysing causal relationships between policies, economic structure, and waste generation.

The analysis further identifies significant problems concerning the comparability and completeness of statistical data across Member States. The absence of fully harmonised methodologies, differences in national reporting systems, and frequent data revisions create serious difficulties in tracking long-term trends. This raises questions regarding the capacity of the Monitoring Framework to serve as a reliable basis for evaluating the effectiveness of circular economy policies at EU level.

A particularly problematic aspect is that the Monitoring Framework does not allow for a clear distinction between the effects of circular economy policies and the influence of broader economic factors such as economic growth, changes in consumption patterns, and structural transformation of the economy. In this respect, observed improvements in individual indicators may result either from targeted regulatory measures or from cyclical or structural economic processes.

In summary, there exists a significant discrepancy between the ambitions of the circular economy as a policy framework and the analytical capacity of the existing monitoring system. This gap limits the possibility of objectively assessing progress and hinders the formulation of effective, evidence-based policies. The chapter thus logically prepares the transition to the analysis of statistical data and empirical relationships in the subsequent parts of the dissertation. The conclusions drawn justify the need for a quantitative examination of the relationship between economic growth, waste generation and recycling, and the actual performance of Member States within the circular economy framework.

CHAPTER THREE. ANALYSIS OF WASTE AND CIRCULAR ECONOMY DATA – REFLECTION OF POLICY IMPLEMENTATION

An empirical analysis of key waste management and circular economy indicators is conducted using official Eurostat datasets, complemented by the construction of additional indicators and a critical assessment of the methodological limitations of the available data. The principal conclusion is that waste statistics provide valuable but limited indications of the outcomes of circular economy policies. They outline trends and enable comparisons; however, they contain significant shortcomings, including incomplete time series, differing national reporting practices, and the effects of methodological changes, including those related to the measurement of recycling. As a result, EU averages are highly dependent on the performance of a small number of large economies, which limits their usefulness as a reliable benchmark for individual Member States.

The empirical review of overall waste flows shows that the aggregated presentation of data by sectors and categories often conceals the actual structural changes that would be relevant for assessing progress toward a circular economy. In the case of production waste, divergent cycles are observed, driven by country-specific sectoral and structural factors, while highly aggregated categories make it difficult to draw unequivocal conclusions regarding genuine “circular” progress at sectoral level. In this sense, decreases or increases in total quantities may reflect changes in the structure of the economy rather than the direct result of prevention or recycling policies.

Within the total volume of production waste in the EU, nearly 45% is generated by the “big four” (Germany, France, Italy, and Spain); however, the data reveal a more nuanced picture. With almost no exceptions, waste volumes declined in 2020, while in 2022 ten Member States recorded decreases, including Belgium, where quantities more than halved, and Latvia, where they fell by 65%. In Germany, the change was minimal (–0.07%), whereas the other three large economies registered increases of approximately 6%. Such sharp fluctuations within a short period cannot plausibly be explained by policy effects alone and are more likely to reflect structural shifts or temporary variations in production sectors. At the same time, they indicate the absence of a uniform European profile, in contrast to an assumed overall downward trend (Table 1).

Table 1. Waste generated from manufacturing, selected Member States

Member State	2018	2020	2022	Percentage change 2020/2018	Percentage change 2022/2020
EU-27	158 380 000	149 430 000	148 670 000	-5,65%	-0,51%
Belgium	13 704 475	11 773 789	5 870 655	-14,09%	-100,55%
Bulgaria	1 608 644	3 326 598	3 630 980	106,80%	8,38%
Germany	21 298 850	20 328 528	20 314 410	-4,56%	-0,07%
Estonia	332 685	2 255 814	2 081 629	578,06%	-8,37%
Spain	9 579 925	9 186 264	9 995 167	-4,11%	8,09%
France	16 893 926	14 433 434	15 091 299	-14,56%	4,36%
Italy	21 162 153	20 073 439	21 454 331	-5,14%	6,44%
Latvia	311 688	435 525	263 215	39,73%	-65,46%
Hungary	1 978 675	1 849 585	3 608 084	-6,52%	48,74%

Source: Eurostat, env_wasgen

As an analytical extension, the chapter introduces a waste intensity indicator, aimed at identifying a more systematic relationship between waste generation and economic output (e.g., tonnes per million euro). The conclusion is that this indicator has significant potential to capture structural differences and to complement standard volume-based measures. At the same time, however, it brings to the forefront statistical and structural anomalies that render the results difficult to interpret unambiguously without additional verification. Bulgaria represents a characteristic example: in certain categories and years, values are observed that are economically difficult to explain and likely reflect limitations in reporting practices and methodology. This confirms the need for statistical indicators to be interpreted with particular caution and within their broader context (Figure 1).

An important contribution of the chapter is the introduction of additional coefficients linking municipal waste to final household consumption (in PPS). This approach builds upon the per capita indicators included in the EU Circular Economy Monitoring Framework by offering a more informative perspective on the relationship between material consumption and waste generation. The data show that in the EU-27, household consumption has increased steadily (by nearly 50%), while municipal waste per capita has not followed a proportional trajectory, suggesting a degree of relative decoupling between consumption growth and waste generation. Nevertheless, national profiles differ significantly, and in the case of Bulgaria, atypical values and dynamics are observed, which should be interpreted with heightened caution due to the likely influence of reporting practices and the structure of consumption.

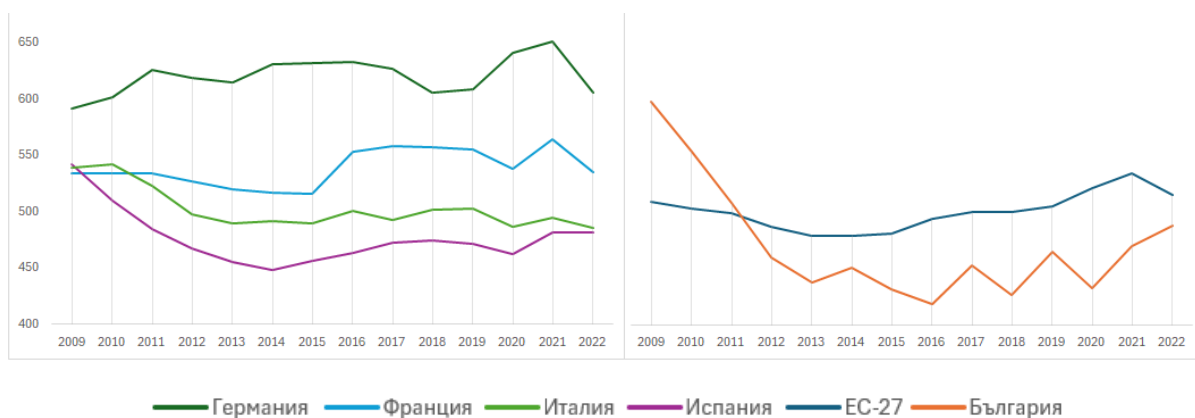


Figure 1. Municipal Waste Generation (2009–2020), kg per capita – Germany, France, Spain and Italy (left panel), EU-27 and Bulgaria (right panel)

Source: Eurostat (*env_wasmun*)

The chapter also devotes attention to transboundary waste movements as a factor influencing the interpretation of “circular” performance. The conclusion is that cross-border flows may significantly alter the actual picture of circular material management. High levels of treatment or recycling may coincide with substantial exports, raising the question of whether circularity is realised domestically or effectively outsourced through external markets and processing capacity. Consequently, assessing progress toward a circular economy requires combining waste data with data on trade and material flows.

Waste imports into EU Member States are concentrated primarily within intra-EU flows; however, imports from non-EU countries remain a significant component, although roughly half the total volume of exports, amounting to 16.1 million tonnes. A key observation is that the Member States that both import and export the largest quantities of waste to and from non-EU countries are largely the same (Table 2).

The seven countries listed in Table 2 account for approximately 68% of total EU exports. In Eastern Europe, Romania and Bulgaria also appear among the notable exporters, though at considerably lower absolute volumes. In their case, this pattern more likely reflects limited domestic capacity for the recovery of certain waste fractions and higher transaction costs associated with establishing national treatment infrastructure.

Table 2. Total Waste Exports to Non-EU Countries, Selected Member States, 2023

Member State	Export (Mt)
Netherlands	6,14
Belgium	4,14
Germany	3,65

Italy	3,07
France	2,46
Spain	1,95
Poland	1,90
Total	23,31

Source: Eurostat (env_wastrdmp)

A key component of the chapter is the analysis of the “economics of waste management” which complements traditional quantitative indicators with an assessment of the sector’s economic resources and effects. Specialised Eurostat databases are employed, including the Environmental Protection Expenditure Accounts (EPEA) and the Environmental Goods and Services Sector (EGSS), allowing the tracking of investment, current expenditure, value added, and “green” employment in the field of waste management. The principal conclusion is twofold: on the one hand, the sector has a clearly identifiable economic dimension (in terms of value added, employment, and investment); on the other hand, a greater economic weight of the sector does not automatically translate into better environmental outcomes (e.g., higher recycling rates). At the same time, no uniform pattern can be identified in the differentiated allocation of public and private investment that would justify unequivocal trends in waste management performance.

In the concluding part of the chapter, two key indicators from the EU Circular Economy Monitoring Framework—the Circular Material Use rate (CMU) and resource productivity—are critically examined. The analysis shows that although these indicators have high political visibility and analytical relevance, they do not constitute neutral measures of the success of waste-related policies. To a considerable extent, their values are determined by the material structure of the economy and the relative share of extractive industries, which systematically places more materially intensive economies at a disadvantage, irrespective of their efforts to implement circular economy policies.

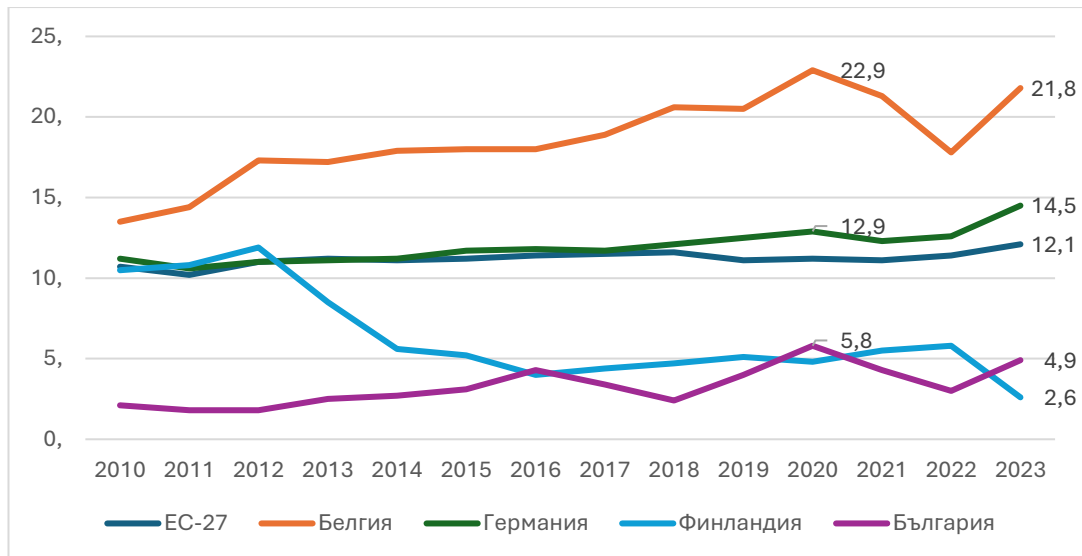


Figure 2. Circular Material Use Rate (CMU), EU-27 and Selected Member States, 2010–2022 (%)

Source: Eurostat, sgd_12_41

The data presented in Figure 2 indicate that at EU-27 level, the CMU rate increased from approximately 8% in the early 2000s to 12% in 2023. Progress has evidently been extremely gradual, particularly when focusing on the period after 2009 (10.4%), during which EU circular economy policies intensified significantly. As in the case of waste statistics, differences among Member States are substantial and provide a broad basis for comparative analysis.

The Netherlands and Belgium maintain high CMU values due to integrated recycling systems and strong industrial trade in raw materials, whereas countries such as Bulgaria and Romania remain at levels around or below 5%, indicating a limited share of secondary raw materials effectively reintroduced into the economy.

It should be noted that the material flow methodologies underlying these indicators differ in nature from waste statistics and tend to reflect structural and trade characteristics rather than the direct impact of regulatory measures. This creates a real risk of misinterpretation if CMU and resource productivity values are taken at face value as evidence of actual circularity or as indicators of the effectiveness of national policies.

In summary, the statistical base and official indicators constitute a necessary point of departure, but they do not, in themselves, allow for the separation of the effects of circular economy policies from the influence of broader economic processes, including economic growth and structural change. The analysis therefore proceeds to an econometric stage, modelling the relationship between economic variables and waste-related indicators in order to

assess whether higher indicator values reflect genuine circularity or are primarily the result of economic structure and statistical characteristics.

CHAPTER FOUR. EMPIRICAL MEASUREMENT OF THE RELATIONSHIP BETWEEN WASTE AND ECONOMIC GROWTH

Chapter Four represents the final analytical stage of the dissertation, in which the question – introduced in the theoretical section – concerning the relationship between the circular economy and economic growth is subjected to empirical testing. The analysis builds upon the conclusions of Chapter Three, which demonstrate that official indicators and descriptive statistics alone do not allow for determining whether the observed progress in waste management is the result of targeted policies or merely a reflection of broader economic processes. In this chapter, econometric models are employed to examine the direction, strength, and limitations of the relationships between economic growth, waste management, and circular economy indicators.

The analysis is based on econometric models applied to Bulgaria, aiming to investigate both the potential impact of waste-related policies and practices on economic growth and the reverse relationship – the role of economic development as a precondition for improved waste management and recycling performance.

The specific hypotheses subjected to econometric testing, in connection with the verification of the main research hypotheses, are presented in Table 3. The table identifies the dependent and independent variables, as well as the dummy variables used to capture key periods with potential effects on the results.

Table 3. Hypotheses and Variables Used

H1. Decoupling: Economic growth may be decoupled from the increase in waste generation.		
Dependent Variable	Independent Variables	Notes
Municipal waste per capita	GDP per capita (real, PPS/euro)	Tests whether partial decoupling or a uniform trend is observed.
H2. Recycling and CMU: Municipal waste recycling generates secondary raw materials and contributes to an increase in the Circular Material Use rate (CMU).		
Dependent Variable	Independent Variables	Notes
CMU rate (%)	Recycled municipal waste per capita	Tests the relationship between material flows and the closing of material loops.
H3. Policies and Growth: Progress in key circular economy indicators affects economic growth.		
Dependent Variable	Independent Variables	Notes

GDP per capita	CMU rate, recycling rate, investment in waste management, EGSS indicators	Examines whether policy progress has a measurable macroeconomic effect.
H4. Reverse Relationship: Economic growth and the structure of the economy determine waste management outcomes.		
Dependent Variable	Independent Variables	Notes
Recycling rate (%), CMU rate (%)	GDP per capita, economic structure (manufacture sector)	Alternative hypothesis: economic development leads, rather than policies.
H5. International Trade: Waste exports/imports are associated with higher recycling rates and CMU levels.		
Dependent Variable	Independent Variables	Notes
Recycling rate (%), CMU rate (%)	Waste import/export volumes	External processing services may compensate for limited domestic capacity.
H6. Market Signals: Prices of recycled materials influence the quantities of collected and recycled plastic waste/packaging. At the same time, price dynamics reflect policy signals.		
Dependent Variable	Independent Variables	Notes
(a) Recycled plastic waste/packaging (tonnes); (b) Prices of recycled materials	(a) Prices of recycled materials (t-1); (b) Dummy variable: SUP Directive (post-2019)	Bidirectional hypothesis: prices as an incentive for recycling; prices as an indicator of policy impact.

The first group of models examines whether progress in key circular economy indicators is associated with economic growth. The results indicate that the “economics of waste management,” measured through sectoral investment and value added, exhibits a positive but limited relationship with GDP per capita. Public investment and value added in the waste management sector are associated with higher income levels, whereas the effect of private investment appears more ambiguous, likely due to delayed returns and relatively short time series.

The analysis of the relationship between recycling and growth shows that higher quantities of recycled municipal waste per capita are statistically significantly associated with higher GDP per capita in the subsequent year. This finding supports the thesis that circular activities may be compatible with economic growth; however, the results should be interpreted cautiously due to data limitations and the possibility of bidirectional causality.

With regard to the composite indicator of Circular Material Use (CMU rate), the models demonstrate a positive and statistically significant relationship between CMU and economic growth. Nevertheless, the analysis confirms the conclusions of the previous chapter that CMU is strongly influenced by the structure of the economy and material trade patterns, thereby limiting its interpretation as a direct outcome of waste management policies.

The second group of models reverses the direction of analysis by examining whether economic growth precedes and facilitates improved waste management outcomes. The results show that GDP per capita is consistently and positively associated with higher recycling rates and a higher CMU rate. This supports the alternative hypothesis that economic development, institutional capacity, and infrastructure constitute key preconditions for progress in the circular economy, rather than being merely a direct result of the policies themselves.

Additional models incorporating waste trade and market prices of recycled materials reveal weaker and more ambiguous relationships. In particular, the analysis of plastic packaging waste indicates that relative price tensions between recycled and virgin plastics may coincide with lower recycling levels; however, the aggregated nature of the price indicators and the lack of material-specific data limit the possibility of drawing definitive conclusions.

In the concluding part of the chapter, a Waste Kuznets Curve model is applied to examine the possibility of decoupling between economic growth and municipal waste generation per capita. The results indicate that within the observed income range for Bulgaria, no inverted U-shaped relationship—characteristic of the classical Kuznets hypothesis—is identified. However, a monotonic decline in municipal waste per capita is observed at higher income levels toward the end of the period, which may be interpreted as an indication of relative decoupling (Figure 3).

Given the significant limitations in the quality and length of the statistical time series, this result cannot be considered as evidence of the effects of circular economy policies, but rather as a hypothesis requiring further empirical verification.

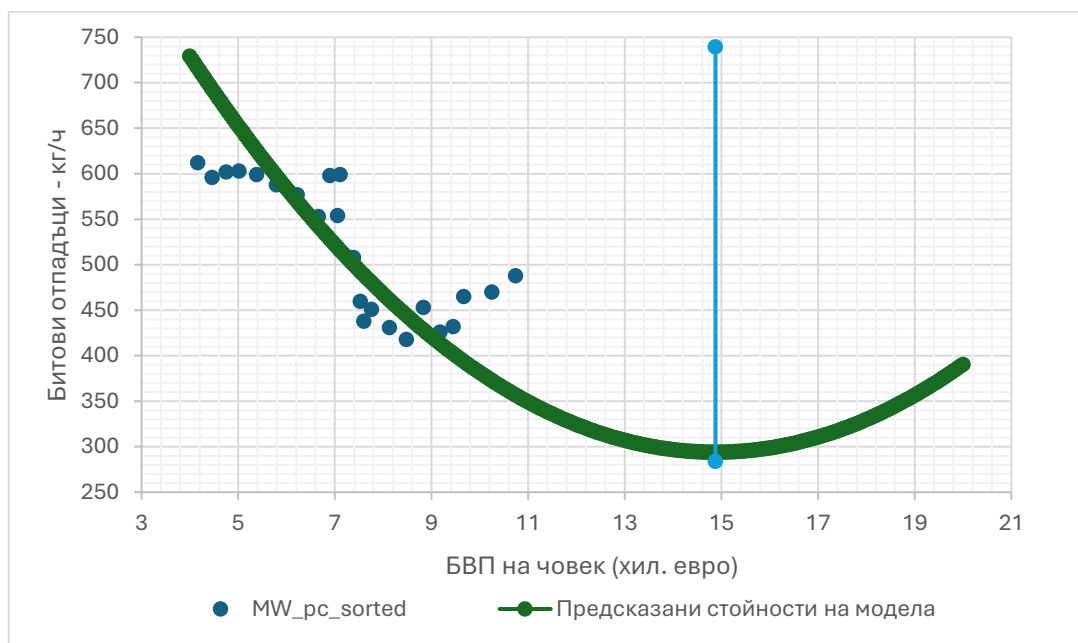


Figure 3. Environmental Kuznets Curve (EKC) Based on Model Forecast Values

In summary, given the available data, no definitive conclusion can be drawn regarding a causal relationship between circular economy policies and economic growth. The most consistent empirical signal is that economic development constitutes a key precondition for improved waste management and circular economy performance. This finding challenges simplified interpretations of an automatic “growth effect” stemming from circular policies and underscores the need for longer time series, more detailed data, and more refined methods for assessing the actual effects of the transition to a circular economy.

CONCLUSION

The present dissertation examines the role of circular economy policies in the European Union, considering the economics of waste management as the most visible and measurable manifestation of circularity. By combining theoretical, institutional, statistical, and empirical approaches, the study investigates not only the potential relationships between circular policies and economic development, but also the limits of their reliable assessment at the current stage of European policy and statistical development.

The analysis of the policy and regulatory frameworks (in Chapter Two) demonstrated that European circular economy policies evolve through continuous expansion and incremental strengthening of the regulatory framework, whereby new targets and requirements are introduced before the effects of previous measures have been fully evaluated. This dynamic of regulatory “accumulation” generates difficulties in relating outcomes to specific policy instruments and leads to a lack of clarity regarding causal relationships between individual measures and observed changes. The circular economy, conceived as a strategic transformation, is implemented predominantly through administrative mechanisms, which often shift the focus from economic logic toward regulatory design.

The conclusions of Chapter Three show that the EU statistical base on waste and the circular economy is both the most necessary and the most problematic instrument for evaluation. Changes in methodologies, the lack of full harmonisation among Member States, and the strong dominance of a few large economies in shaping EU averages lead to limited comparability of data over time.

In certain cases, methodological changes (notably in the calculation of recycling rates¹) create even the appearance of deteriorating performance, which cannot be unequivocally

¹ Under the current rules for measuring and reporting recycled waste quantities (Commission Implementing Decision (EU) 2019/1004), only those amounts entering the final recycling process (after the deduction of impurities and non-target materials) are counted as recycled. Under the previous methodology, quantities could be reported at the “input to the recycling facility” stage.

confirmed. In this way, statistics not only measure results but also shape them, thereby constraining the scope for independent empirical analysis.

The results of the regression models for Bulgaria presented in Chapter Four indicate that the relationships between economic growth and circular economy indicators are statistically sensitive and dependent on model specification. In several models, economic development appears to be more consistently associated with recycling and circular material use indicators than the reverse relationship from circular economy indicators to GDP. Given the limitations of the sample and the absence of a fully established causal relationship, this result should be interpreted as an indication of asymmetry rather than as definitive proof of causality.

The data confirm that policy attention is primarily directed toward waste streams with high public visibility, such as packaging and plastics, yet these categories represent a relatively limited share of the total mass of waste generated within the economy. Even the full achievement of recycling targets for these streams would have only a limited impact on overall material intensity if systematic action is not undertaken with respect to other major waste categories. This mismatch between political priorities and the material structure of the economy constitutes a significant obstacle to a genuine transition toward a circular economy. At the same time, for key economic sectors, comparable data are lacking that would allow for an assessment of the stage of implementation of circular economy measures.

Based on the research conducted, **the following conclusions** can be drawn **with respect to the formulated hypotheses**:

- The hypothesis regarding the dynamics of continuous regulatory expansion has been supported, indicating that this process complicates the assessment of policy effects and hinders the identification of clearly traceable cause-and-effect relationships.
- The hypothesis of an asymmetric relationship between economic growth and circularity has been partially supported – correlations are identified, but no definitive causal relationship can be established.
- The hypothesis concerning the complexity of factors influencing outcomes has been supported – economic structure, institutional frameworks, and the behaviour of stakeholders appear to play a more significant role than individual regulatory interventions.
- The hypothesis that there is no universal model of public investment and expenditure capable of guaranteeing positive outcomes has been supported.

- The hypothesis regarding a positive relationship between waste recycling and gross domestic product has been supported, although the results should be interpreted with caution.
- The hypothesis concerning the influence of market and trade factors has been partially supported, with limited validity in the case of Bulgaria.
- The hypotheses related to the methodological limitations of the data and the need to improve the system of indicators have been supported.

In conclusion, at its current stage, the circular economy represents primarily a process of regulation and institutional design rather than a fully realised economic transformation. The economic benefits of circular practices tend to manifest at the micro and sectoral levels rather than at the macroeconomic level, influencing employment, innovation, and the market for secondary raw materials, while their broader effects remain obscured within aggregated data presentations. The available data and indicators, at this stage, constitute a limited instrument for measuring the effects of policies, thereby calling into question the adequacy of existing assessments of progress. Finally, the political cycle of decision-making often advances faster than the analytical cycle of evaluation, undermining the possibility of empirically grounded, evidence-based governance.

The conclusions indicate that while political ambitions in the field of the circular economy are high and multidimensional, the available data and analytical tools do not yet allow for a reliable quantitative assessment of its economic effects. This does not diminish the EU's achievements in establishing a strategic framework, but it underscores the need for more rigorously evidence-based governance, whereby new regulations are introduced on the basis of already evaluated outcomes. In this way, the circular economy may evolve from a political objective into a measurable economic reality, supported by transparent data, effective instruments, and an analytical approach that goes beyond the formal compliance with regulatory requirements and directs efforts toward the genuine transformation of material flows and economic thinking.

Based on the findings and conclusions derived from the analyses conducted in this dissertation, **the following recommendations can be summarised:**

1. Improvement of the Statistical Framework

- Harmonisation of methodologies for calculating waste and circular economy indicators should be pursued, alongside ensuring transparency with regard to any methodological changes.

- New and more integrated indicators should be developed, capturing not only quantitative aspects (e.g., recycling rates), but also the quality of secondary raw materials, the effectiveness of reuse, and the economic value of material flows.

- A unified public access system for data should be established, including metadata and explanations of methodological changes, in order to facilitate scientific research and comparative analysis.

2. Monitoring and Phased Policy Evaluation

- A periodic cycle of interim evaluations should be introduced prior to the adoption of new targets, in order to avoid the accumulation of policies without clearly assessed results.

- Baselines and indicative time benchmarks should be defined against which the effects of each regulatory change can be measured.

- Pilot programmes and experimental policies should be implemented on a limited scale before EU-wide adoption, with the aim of generating empirical evidence regarding their effectiveness.

3. Strengthening Institutional and Analytical Capacity

- The development of national and regional data analysis units should be supported, operating in close coordination with Eurostat to ensure greater accuracy and timeliness of national reporting.

- Cooperation between the scientific community and public institutions should be encouraged in the development of new indicators and evaluation models, including the integration of behavioural and institutional variables.

IV. STATEMENT OF SCIENTIFIC AND APPLIED CONTRIBUTIONS

The contributions of the present dissertation are of a theoretical-methodological and applied scientific nature and can be summarised as follows:

1. A theoretical and methodological contribution to the positioning of the circular economy within the system of economic theories. The study proposes an original interpretation of the circular economy as a concept grounded in multiple theoretical traditions, including neoclassical, Keynesian, institutional, and ecological economics. It is argued that, in the practical implementation of policies within the European Union, stronger manifestations of Keynesian and institutional elements can be observed, particularly in relation to active state intervention, regulatory mechanisms, and public investment.

2. A contribution to the critical analysis of EU policies and the regulatory framework for the circular economy. A systematic analysis of the development of EU waste legislation is conducted, demonstrating that the circular economy framework builds upon its evolution. The study advances the argument that regulatory development is characterised by continuous expansion and accumulation of measures without prior evaluation of the effects of earlier interventions. It is shown that this dynamic complicates the tracking of results and leads to overlaps between objectives and instruments, thereby extending existing assessments of the effectiveness of EU sustainable development policies. The analysis goes beyond a descriptive review by establishing a link between regulatory dynamics and limitations in measuring outcomes.

3. A contribution to the analysis of the statistical base and methodological limitations of circular economy data. The study provides a detailed critical review of statistical indicators related to waste and the circular economy, identifying inconsistencies, methodological changes, and a lack of comparability across Member States. Additional calculations are performed and analytical indicators are constructed, including measures of waste intensity and the relationship between consumption and waste generation. Furthermore, the study applies an original structured use of available data on the distribution of waste across sectors and subsectors.

4. An empirical contribution through econometric analysis of the relationships between circular economy indicators and economic growth. Based on a set of econometric models and data for Bulgaria, relationships between economic development and circular economy indicators are identified. The results suggest that, in some cases, economic growth is more

consistently associated with these indicators, while the conclusions should be interpreted as indicative.

5. A contribution to the development of recommendations for improving the statistical and analytical framework of the circular economy. Based on the analysis, a set of structured proposals is formulated to enhance comparability, integration of indicators, and a more comprehensive reflection of the interactions between economic processes and waste generation.

These proposals build upon existing recommendations in European practice, adapting them to the limitations identified in the study. The introduction of indicators capturing both quantitative outcomes and the relationships between economic processes and waste is proposed.

These recommendations have practical value, as they may contribute to more reliable measurement and interpretation of circular economy policy outcomes.

V. LIST OF PUBLICATIONS RELATED TO THE DISSERTATION

1. Peychev, A. (2023). *“Recycling Ambitions at the Crossroads between Market Forces and Regulation.”* Published in: Collection of articles of the International Scientific Conference “Economy of the Future,” University of Insurance and Finance and the Balkan Association of Economic Universities, 19–21 April 2023, ISBN 978-619-7622-56-0, pp. 168–178.

2. Peychev, A. (2025). *“EU Cohesion and Waste Management: Analysing Municipal Waste Performance through Economic and Policy Lenses.”* Published in: Collection of articles of the Jubilee International Conference “Economic Development and Policies: Realities and Prospects. European Integration, Convergence and Cohesion,” dedicated to the 75th anniversary of the Economic Research Institute at the Bulgarian Academy of Sciences, 25 November 2024, ISBN 978-954-9313-27-7, pp. 301–306.

3. Peychev, A. (2025). *“Analysis of EU Legislation in the Field of the Circular Economy.”* Published in: Collection of articles of the Fifth Student and Doctoral Conference “The Transition to a Green Economy and Sustainable Development – Challenges, Problems and Solutions,” University of Insurance and Finance, Balkan Association of Economic Universities and University College CEPS, 16 May 2025, ISBN 978-619-7622-83-6, pp. 67–73.

4. Peychev, A. (2026). *“How Aggregated Indicators and Data Gaps Distort the Analysis of Waste and the Circular Economy.”* Published in: Collection of articles of the International Scientific Conference “Economic Development and Policies: Realities and Prospects. Sustainability in the Conditions of Global Transformations,” Economic Research Institute at the Bulgarian Academy of Sciences, 24 November 2025, ISBN 978-954-9313-35-2, pp. 167–172.

