

**D. A. Tsenov Academy of Economics**

**Department of Finance and Credit**

---

**Doctoral student Nikolay Vasilev Todorov**

Doctoral No. **d010222264**

# ABSTRACT

of a dissertation for the award of an educational and scientific degree "Doctor" (in Economics) in the doctoral programme "Finance, Money Circulation, Credit and Insurance" (Finance)

on the topic:

**FINANCIAL ASPECTS OF THE TRANSITION TO A CIRCULAR ECONOMY**

Scientific supervisors:

Assoc. Prof. Angel Angelov, PhD (2021-2022)

Prof. Dr. Andrey Zahariev (2022-2024)

Prof. Stefan Simeonov, PhD (2025-2026)

Svishtov

2026

The dissertation work was discussed and directed for defense in accordance with the Academic Staff Development Act by the Department of Finance and Credit of the Dimitar A. Tsenov Academy of Economics - Svishtov at a meeting held on 06.03.2026.

The dissertation has a total volume of 383 pages and contains: General characteristics of the dissertation work - 6 pages, main text, placed in three chapters - 331 pages, conclusion - 8 pages, list of cited and used literary sources - 169 numbers and a declaration of originality. The dissertation work is illustrated with 31 figures and 40 tables.

The open meeting of the scientific jury for the defense of the dissertation will take place on 08.05.2026 at 13:00 in the "Rectorate" Conference Hall of the "Dimitar A. Tsenov" Academy of Economics - Svishtov.

The materials for the defense are available to those interested in the Department of Doctoral Studies and Academic Development of the "Dimitar A. Tsenov" Academy of Economics - Svishtov.

## Contents

I. General characteristics of the dissertation.....	3
1. Relevance of the topic .....	3
2. Object and subject of the study.....	3
3. Research thesis.....	4
4. Purpose of the dissertation.....	4
5. Tasks and methodology of the research.....	4
6. Scope of the research .....	7
7. Structure of the study .....	9
8. Applicability of the research results .....	11
II. Main content of the dissertation .....	14
1. Results from Chapter One.....	14
2. Results from Chapter Two.....	16
3. Results from Chapter Three.....	21
4. Guidelines for future research on the topic of the dissertation .....	28
III. Reference to the scientific and applied scientific contributions in the diss- .....	30
1. Scientific contributions .....	30
2. Applied scientific contributions.....	31
IV. List of publications by the doctoral student.....	33
1. Scientific articles (4).....	33
2. Scientific reports from participation in scientific conferences (3).....	33
3. Developments from the dissertation, applied in officially adopted normative acts (8) .....	33
V. Certificate of compliance with national requirements under the Regulations for the Application of the Law on the Development of Academic Staff in the Republic of Bulgaria.....	35

# I. GENERAL CHARACTERISTICS OF THE DISSERTATION

## 1. Relevance of the topic

The relevance of the dissertation is determined by the combination of global, European and national challenges related to the depletion of natural resources, climate change, the growing volume of waste and the need to transform existing linear models of production and consumption. In the context of increasing environmental constraints and socio-economic imbalances, the circular economy is establishing itself as the leading paradigm for sustainable development, enshrined in the strategic documents and policies of the European Union. The practical applicability of the principles of the circular economy is of particular importance, as their effective implementation requires not only technological solutions but also a comprehensive transformation of management, regulatory and financial mechanisms. In this context, the local level, and in particular municipalities, are key intermediaries between strategic goals and real effects on the quality of life of the population. For Bulgarian municipalities, problems related to household waste management, the development and maintenance of green systems, limited financial resources and insufficient institutional capacity highlight the need to seek innovative and economically sound solutions. This makes the study of the circular economy as a model for the sustainable development of the modern Bulgarian city an extremely relevant scientific and practical task.

## 2. Object and subject of the study

**The object** of this study is the process of applying the principles of the circular economy in the local government system in the Republic of Bulgaria, considered in the context of public policies for sustainable development, resource management and improving the quality of the living environment.

**The subject** of the study is the economic, social, institutional and regulatory mechanisms through which the principles of the circular economy can be applied and institutionalised at the municipal level. Special emphasis is placed on household waste management, the development of the green system, the role of financial and fiscal instruments, and the possibilities for integrating social dimensions into circular policies.

The distinction between object and subject allows for a clear definition of the analytical focus of the study and creates the conditions for a targeted investigation of the interrelationships between the various elements of the circular model.

### **3. Research thesis**

The main research thesis defended in the dissertation is that the introduction of circular economic methods to achieve a balanced, resource-saving and low-carbon economy at the municipal level is not only feasible but also beneficial from an environmental and social point of view. This study does not ignore the financial and general economic aspects that are often highlighted as obstacles, but shows the possibility of efficiently introducing circular models that affect key municipal activities. The achievement of such goals requires the application of an approach that transfers the best international practices, supported by an adequate administrative implementation process through legal norms and programmable objectives among the main economic agents and, above all, among economic operators who combine the circulation of material resources with the circulation of cash flow.

### **4. Aim of the dissertation**

The aim of the dissertation is to examine the development of circular economy concepts, revealing circular economic models applicable to our national economy and implementable aspects of global and European regulatory and administrative frameworks. On this basis, the foundations for improving circular economy methods and their effective application at the municipal level will be laid.

Achieving this goal requires not only theoretical analysis, but also empirical testing of the proposed models and an assessment of their economic, social and regulatory applicability.

### **5. Research tasks and methodology**

In order to achieve the objective set out in the dissertation, interrelated research tasks have been formulated, covering both the theoretical and applied aspects of the study. These include:

First. To conduct a critical review of the historical and theoretical aspects of the circular economy concept.

Second. To develop and structure the methodological foundations for analysing the need to transition from a linear to a circular economic model.

Third. To justify and approve an approach to the application of circular economic methods in the regulatory and administrative framework at national level and at local government level – in municipalities.

Fourth. To argue the benefits of well-structured and implemented circular methods in the regulatory and administrative frameworks of one of the strongest economies in the world – the economy of Japan.

Fifth. Develop optional methods for the palliative implementation of the circular economy in municipal local government by developing working models for the implementation of circular urban agriculture in urban agglomerations and applying a new methodology for determining the household waste tax based on the circular economic model.

Sixth. Research and monitoring of the linear economic model, without applying and implementing aspects of the circular economy. Identification of problem areas leading to the exhaustion of the linear economic model, functioning according to the "take-make-dispose" principle.

The set object, subject, main research thesis, goal and tasks allow the study to focus on testing the following working hypotheses:

Hypothesis one. The successful and efficient introduction of circular economy models at the municipal level presupposes and requires the cautious and limited application of national and European policies in the field of the circular economy, as well as a conservative approach to borrowing global and European practices in the application of methods characteristic of the circular economic model.

Hypothesis two. Following the adopted European regulatory and strategic framework for the transition from a linear to a circular, resource-saving and low-carbon economy by borrowing the bestbest of European and global experience in applying circular economic models allows for the successful implementation and enforcement of the circular economy at the municipal level.

The research methodology includes systematic and comparative analysis, induction and deduction, cost-benefit analysis, scenario analysis, sensitivity analysis and the use of empirical and statistical methods.

In methodological terms, the dissertation applies a combined approach that combines qualitative and quantitative methods in view of the complex nature of the circular economy as public policy and management practice. The use of systems analysis allows the city and the municipality to be viewed as functional systems in which resource flows, management decisions, regulatory requirements and the behaviour of participants are interrelated and mutually dependent. The systemic approach avoids reducing the circular economy to sectoral policy (e.g. waste) and emphasises the integration between environmental, economic and social dimensions.

Comparative analysis is used as a tool to identify structural dependencies between different models of circular principles implementation and to assess the conditions under which international good practices are applicable to the Bulgarian context. Within the comparative analysis, international experience (including the Japanese model) is not considered a "ready-made template" but a source of mechanisms whose transfer requires selectivity and adaptation to the institutional environment, administrative capacity and public attitudes.

Induction and deduction were used in the study of cause-and-effect relationships and in the formulation of conclusions. The inductive approach helps to generalise observations from specific management and regulatory practices to broader patterns, while deduction serves to test theoretical propositions through empirical argumentation. This combination is important because the circular economy requires both conceptual understanding and verification in real management conditions.

A key methodological tool in the applied part is the cost-benefit analysis (CBA), which assesses the economic rationale of a proposed financial instrument (a new methodology for determining the TBO). The application of CBA is complemented by scenario analysis, which allows us to take into account that the results in the public sector are highly dependent on the degree of implementation, administrative readiness and behavioural responses. In addition, the sensitivity analysis to different discount rates (3%, 4% and 5%) serves to assess the

robustness of the results under different assumptions about the time value of money and the risk profile of public investments.

The combination of qualitative and quantitative approaches allows for a more comprehensive examination of the complex nature of the circular economy as a public policy. Thus, the chosen methodological toolkit is not only descriptive but also serves the purpose of identifying and testing the interrelationship between the regulatory framework, financial incentives and social behaviour as a key prerequisite for the sustainability of circular models at the local level.

## **6. Scope of the study**

The study covers the processes and policies related to the implementation of the circular economy in the European Union and the Republic of Bulgaria, with a primary focus on the municipal level. The time frame is consistent with the development of European strategic frameworks for the circular economy and sustainable development.

The scope of the dissertation is defined with a view to achieving a balance between theoretical depth and empirical applicability. The research focuses on the possibilities for applying the principles of the circular economy within the framework of the contemporary Bulgarian city, viewed as an integrated socio-economic and spatial system. In this sense, the object of analysis is the municipality as a level of governance where regulatory frameworks, public finances, institutional capacity and the behaviour of economic actors intersect.

The territorial scope of the empirical part is limited to a specific municipal case – the Municipality of Troyan. The choice of this case is not random, but is based on several factors: (1) the existence of specific problems related to waste management and the protection of the green system; (2) the possibility of accessing relevant data; (3) the real commitment of the local administration to regulatory improvement processes; (4) the possibility of testing the developed models in a real institutional environment. At the same time, the conclusions of the study do not claim to be universally applicable to all Bulgarian municipalities, but rather analytically sound and adaptable to similar institutional and socio-economic conditions. In terms of content, the scope of the study covers four main areas:

First, a theoretical and conceptual area related to the historical development and contemporary interpretations of the circular economy, its link to sustainable development and resource efficiency, and its place in European policies and regulatory frameworks.

Second, a comparative-analytical area, within which international experience is examined, with an emphasis on the Japanese model as an example of systematic and institutionally supported implementation of circular principles. This analysis aims not to mechanically transfer practices, but to identify structural mechanisms that can be adapted to Bulgarian conditions.

Thirdly, a socio-economic approach, including research into the social aspects of the circular economy, the role of public participation and the link with the concept of Society 5.0. In this context, the city is seen as a space for integration between technological solutions, management tools and social legitimacy.

Fourth, an applied financial direction, focused on the development and empirical testing of a new methodology for determining household waste charges as an instrument for economically stimulating circular practices. This component uses cost-benefit analysis, scenario analysis and sensitivity analysis, which allows for a quantitative assessment of the economic feasibility of the proposed solutions.

The time frame of the study includes both a retrospective analysis of the development of the circular economy concept and the regulatory framework, as well as a prognostic element through scenario modelling of the effects of the introduction of new financial instruments. In this way, the work combines a historical perspective with an assessment of possible future developments. At the same time, the limitations of the study need to be clearly outlined. Firstly, the quantitative part is limited by the availability and quality of data at the municipal level, which requires certain assumptions to be made when modelling costs and benefits. Secondly, the behavioural responses of households and businesses to the introduction of financial incentives cannot be predicted with absolute accuracy, which is why the scenario approach is used as a tool for managing uncertainty rather than as a guarantee of a specific outcome. Thirdly, regulatory validation, although actually implemented, is subject to long-term assessment in terms of the sustainability and effectiveness of the adopted changes. In this sense, the scope of the dissertation is clearly defined, methodologically sound and deliberately limited to a framework in which reasoned, verifiable and practically applicable

conclusions can be formulated. This avoids both excessive generalisations and a fragmented approach, ensuring consistency between the theoretical framework, empirical analysis and conclusions.

## **7. Structure of the study**

The dissertation is structured into an introduction, three chapters, a conclusion, a list of references and appendices. Each chapter performs a clearly defined analytical function and logically builds on the previous one.

The structure of the dissertation is built in accordance with the logic of the research thesis and follows a consistent line of argumentation – from conceptual analysis to empirical verification and normative validation. The internal architecture of the thesis is not a mechanical arrangement of topics, but is organised in such a way that each subsequent part builds on the previous one and contributes to proving the main research proposition. The thesis is structured into an introduction, three main chapters, a conclusion and appendices.

The introduction formulates the relevance of the topic, the object and subject of the study, the research thesis, the aim and objectives of the thesis, as well as the methodological tools used. This part serves as a conceptual framework that outlines the boundaries and ambition of the research. The introduction aims to position the dissertation in both a scientific and a social context, emphasising the importance of the circular economy as a management model for sustainable development at the local level.

Chapter One: Theoretical and Normative Framework of the Circular Economy is fundamental in nature. It builds the theoretical and normative foundation on which subsequent analyses are based. This chapter includes:

- a historical analysis of the emergence and development of the concept of the circular economy;
- an examination of its links with the economy of efficiency and sustainable development;
- an analysis of the European and national regulatory framework;
- identification of institutional and management deficits.

The function of the first chapter is to identify problem areas and argue for the need for an adapted, context-sensitive model for applying circular principles. It is here that the analytical basis is formulated, showing that the circular economy cannot be viewed in isolation from the regulatory environment, institutional capacity and

social attitudes. In this way, the first chapter acts as a conceptual filter – it not only presents existing developments, but also outlines the gaps that the dissertation seeks to fill.

Chapter Two: International Experience, Social Dimensions and Integrative Models, represents an analytical bridge between the theoretical framework and the applied part. It expands the analysis by:

- research on international experience (with a focus on Japan);
- analysing the social dimensions of the circular economy;
- examining the concept of Society 5.0;
- developing the model for circular urban agriculture.

This chapter serves a dual purpose. On the one hand, it demonstrates that sustainable circular models require institutional consistency and a long-term vision. On the other hand, it shows that the implementation of such models cannot be a mechanical copy, but requires adaptation to the local environment. Of particular significance is the section on circular urban agriculture, which introduces an innovative integrative model combining bio-waste management, green infrastructure development and social inclusion. This element serves as a transition to the empirical part, as it demonstrates how conceptual principles can be transformed into concrete management decisions.

Chapter Three: Financial Instruments and Empirical Verification represents the applied core of the dissertation. In it, the theoretical and conceptual propositions are subjected to quantitative verification through the development and testing of a new methodology for determining household waste charges. Within the framework of this chapter, the following is carried out:

- formulation of the financial model;
- identification of costs and benefits;
- application of cost-benefit analysis;
- development of scenarios;
- sensitivity analysis to different discount rates.

This structure allows for an assessment not only of the economic rationality of the model, but also of its sustainability under different assumptions and risk levels. In this way, the third chapter serves as empirical evidence for the validity of the research thesis. The conclusion summarises the results of the three chapters, formulates general conclusions, outlines the scientific and applied scientific contributions, and identifies directions for future research. Special attention is

paid to the normative validation of some of the developed models, which gives additional weight to the research. The internal logic of the dissertation's structure follows a clear progression from theoretical reflection → through comparative and social analysis → to a specific financial instrument → to real normative validation.

This sequence avoids fragmentation and ensures methodological consistency between the different parts of the work.

The dissertation has a total volume of 383 pages. The bibliography includes 169 sources used. The presentation contains 31 figures and 40 tables. There are 3 appendices, as follows:

1. List of regulatory documents and provisions governing the circular economy at municipal level;
2. Target model of a strategy for transition to a circular economy;
3. Linear versus circular economy – visual models.

The dissertation includes 4 author publications on the topic and 3 scientific reports. It also presents 8 developments resulting from the dissertation research, which have been implemented in officially adopted normative acts.

## **8. Applicability of the research results**

The results of the dissertation have a clear scientific and practical orientation. Some of the models and analyses developed in the research have found real institutional and regulatory implementation through adopted amendments and additions to subordinate legislative acts of the Municipality of Troyan related to waste management, the development of the green system and the management of municipal forest areas.

The applicability of the results of the dissertation is manifested at several interrelated levels – theoretical, methodological, managerial, regulatory and social. The research is not limited to a conceptual understanding of the circular economy, but offers practical tools and models that can be implemented in a real institutional environment.

### **Management applicability of the results:**

The methodology developed in the dissertation for determining the household waste fee is a management tool that can be used by municipal administrations in reforming existing systems for financing waste management activities. The

methodology is consistent with the "polluter pays" principle and introduces economic incentives to reduce waste generation and increase resource efficiency. Its applicability is expressed in the following:

- it provides a structured framework for setting the fee based on actual costs;
- it allows for the assessment of effects through cost-benefit analysis;
- it includes a scenario approach that supports risk management;
- ensures transparency in decision-making.

The proposed methodology can thus serve as a guideline for future reforms in the area of local public finances.

### **Normative applicability and institutional validation:**

Of particular value to the dissertation is the fact that some of the analytical theses and models developed have been reflected in actual legislation adopted at the local level. The results of the study have been used as an expert basis for:

- amendments and additions to the Waste Management Ordinance;
- amendments to the Ordinance on the Construction and Protection of the Green System;
- amendments to the Ordinance on the Management of Municipal Forest Areas;
- preparation of proposals for regulatory changes at a higher level.

This regulatory validation is concrete proof of the practical applicability of the developed models. It demonstrates that the study has moved from a scientific concept to institutional implementation, which is a rare element in doctoral research.

### **Applicability in the context of European policies:**

The results of the research are compatible with the main directions of European policies in the field of sustainable development, resource efficiency and green transition. The developed tools and models can be considered as mechanisms for applying the principles set out in:

- The European Green Deal;
- The Circular Economy Package;
- the polluter pays principle;
- the requirements for increasing transparency and accountability in the public sector.

In this sense, the work has the potential to contribute to the synchronisation of local policies and European strategic frameworks.

### **Social and public applicability:**

The dissertation highlights the role of public participation and behavioural aspects in the implementation of circular models. The results can be used as a basis for:

- developing information and education campaigns;
- stimulating participation in separate waste collection;
- promoting local initiatives for circular urban agriculture;
- raising public awareness of the environmental and financial effects of individual behaviour.

Thus, the applicability of the results is not limited to administrative decisions, but also covers the social dynamics of local communities.

### **Methodological applicability:**

The methodological approach used – combining qualitative analysis, comparative research and quantitative tools – can be applied to the study of other public policies related to sustainable development.

Of particular importance is the integration of cost-benefit analysis with scenario analysis and sensitivity analysis, which allows for a higher degree of justification and transparency in the evaluation of public decisions.

### **Summary of applicability:**

The applicability of the results of the dissertation is demonstrated by their ability to:

- be used as a tool for management decisions;
- be integrated into legislative acts;
- support compliance with European policies;
- stimulate public engagement;
- serve as a methodological framework for future research.

In this way, the work demonstrates the full cycle of transfer between scientific research, management practice and regulatory implementation, which gives its applicability a sustainable and long-term character.

## II. MAIN CONTENT OF THE DISSERTATION

Section II presents in a synthesised but analytically in-depth manner the main results of the dissertation, structured in accordance with the logic of the three chapters. The emphasis is not on a descriptive reproduction of the content, but on the identified dependencies, the interpretation of the results and their significance for the research thesis.

### 1. Results from Chapter One

Chapter One serves as the theoretical, methodological, and normative foundation of the dissertation research. It focuses on the analysis of the emergence, evolution and substantive development of the concept of the circular economy, considered in the context of the economy of efficiency, sustainable development and the greening of economic systems. The results of this chapter can be systematised in several interrelated directions.

**The first** significant result of the analysis is related to the need to refine the concept of "circular economy". In the course of the study, it was found that in a significant part of the literature, the term is used descriptively or normatively, without being clearly distinguished from related concepts such as "sustainable development", "green economy" or "resource efficiency". The analytical review shows that:

- some authors focus on material flows;
- others focus on innovation and technological transformation;
- some focus on the regulatory framework;
- yet others focus on social aspects.

This multi-layered nature leads to conceptual heterogeneity and hinders empirical research. As a result of the analysis, a working definition has been formulated that views the circular economy as an integrated system of economic, regulatory and social mechanisms aimed at closing resource cycles and minimising negative externalities by encouraging reuse, recycling and extending the life cycle of products. This definition serves as an analytical framework for the entire dissertation and provides conceptual clarity for subsequent research.

The **second** key result is related to the analysis of the regulatory framework and institutional environment. The chapter identifies key problem areas that hinder the

sustainable development of the circular economy, including institutional fragmentation, regulatory heterogeneity, implementation and enforcement deficits, limited administrative capacity, and insufficient public awareness and engagement. The analysis shows that these factors are closely interrelated and cannot be addressed through isolated policies. The study shows that although European policy in the field of the circular economy is relatively well structured, its transposition at national and local level is accompanied by:

- fragmented regulations;
- overlapping competences;
- a lack of coordination between sectoral policies;
- insufficient enforcement.

This result is directly relevant to the research thesis, as it shows that the sustainable development of the circular economy requires not only a regulatory framework, but also consistency and institutional integration. Particular attention is paid to the regulatory framework of the European Union and its reflection at national and local level. The conclusion is that, despite the existence of strategic consistency at European level, the translation of policies to local conditions is often incomplete and formal. This argues for the need for permanent analysis and adaptation of circular policies depending on the institutional and socio-economic context.

Of particular importance is the identification of a gap between strategic documents and actual management practices. This gap is most pronounced at the local level, where limited administrative capacity and resource constraints hinder the effective implementation of regulatory requirements.

A **third** important result from the first chapter is the identification of the causal link between resource efficiency and management tools.

The analysis shows that resource efficiency cannot be achieved through technological solutions alone. It requires:

- adequate financial incentives;
- clear regulatory frameworks;
- behavioural change;
- a long-term strategic vision.

In this context, the circular economy is interpreted not as a technological project, but as a management model.

The **fourth** result is the social dimension and public participation. The analysis shows that the social component is often underestimated in conceptual developments. The first chapter shows that without public engagement and the formation of an ecological culture, circular policies remain formal. The following problem areas have been identified:

- low awareness;
- lack of motivation for separate collection;
- limited participation of the civil sector;
- lack of trust in institutions.

This result prepares a logical transition to the second chapter, where social aspects are examined in greater depth.

**In summary**, the results of Chapter One are fundamental to the overall logic of the dissertation. It serves as a theoretical and normative basis on which the subsequent comparative and empirical analysis is built. In summary, Chapter One proves that:

1. The circular economy requires an integrated approach rather than sectoral policy.
2. A normative framework is necessary but insufficient without institutional capacity.
3. Resource efficiency is a function of management mechanisms and incentives.
4. Social participation is a structural element, not an addition.
5. At the local level, there is a need for adapted models.

These conclusions create a logical need for:

- an analysis of international experience (Chapter 2);
- the development of a specific financial instrument (Chapter 3).

In this way, the first chapter fulfils not only a descriptive but also an argumentative function – it builds the theoretical foundation for the empirical part of the dissertation.

## **2. Results from Chapter Two**

The results of the analysis show that sustainable circular models are characterised by clearly defined institutional roles, a stable regulatory framework and active government policy aimed at changing the behaviour of economic actors and society. At the same time, the dissertation argues that the mechanical borrowing

of good practices is methodologically incorrect and practically risky, as the effectiveness of circular models is highly context-dependent. A significant contribution of the chapter is the in-depth analysis of the social dimensions of the circular economy and their connection to the concept of Society 5.0. The human-centred approach is identified as a critical condition for the sustainability of circular policies, as regulatory and financial instruments can only be effective if there is public trust, awareness and active participation. In this context, the concept of circular urban agriculture as an innovative local model has been developed and analytically substantiated. It is seen as an integrative mechanism that links bio-waste management, green system conservation and development, social inclusion and local production. The analysis shows that circular urban agriculture has the potential to function as a "link" between the environmental goals and socio-economic needs of urban communities, provided that the appropriate regulatory and organisational conditions are in place. Chapter Two builds on the theoretical framework developed in Chapter One by transferring the analysis from a conceptual and regulatory level to a comparative and social dimension. While the first chapter identifies problem areas and institutional deficits, the second chapter seeks to answer the question: under what conditions does the circular economy function sustainably and how can these conditions be adapted to the Bulgarian environment?

The **first** significant result of the second chapter is related to the analysis of international experience, with an emphasis on the Japanese model. The study shows that the sustainable implementation of the circular economy in Japan is not the result of a single policy or legislative measure, but of:

- a long-term strategic vision;
- clear distribution of institutional responsibilities;
- coordination between central and local authorities;
- cultural and public support;
- consistency in regulatory evolution.

The analysis finds that institutional consistency is a key factor for the sustainability of the model. A significant result of the comparative analysis is the conclusion that the mechanical transfer of foreign practices is methodologically incorrect and practically risky. The effectiveness of circular policies is highly context-dependent – it depends on administrative capacity, financial resources and social structure. This result shifts the focus from "copying good practices" to "adapting structural mechanisms". The second chapter draws an important

analytical conclusion that the sustainability of circular policies is a function of: regulatory clarity; institutional coordination; financial incentives; public participation. In the absence of one of these components, the system loses its effectiveness. The analysis shows that in the Bulgarian context, the main deficits are related to:

- fragmented responsibilities;
- limited resource capacity;
- lack of long-term strategic integration.

Thus, Chapter Two specifies the problems identified in Chapter One and places them in a comparative perspective.

**The second** and one of the central findings of Chapter Two is the identification of the social component as a structural factor for the sustainability of circular policies. While a significant part of economic analyses view the circular economy through the prism of resource efficiency and technological solutions, this study shows that the sustainability of the model depends equally on the behavioural, cultural and institutional characteristics of society. The analysis shows that financial incentives alone do not guarantee behavioural change. The application of the "polluter pays" principle requires:

- awareness of the link between behaviour and costs;
- trust in institutions;
- a sense of fairness in the system;
- transparency in the allocation of public funds.

Otherwise, financial instruments may be perceived as a fiscal burden rather than an environmental incentive. This leads to an important conclusion: the economic mechanism must be supported by social legitimacy. Within the framework of the dissertation, the concept of Society 5.0 is examined not as a technological utopia, but as a normative framework for integration between digitalisation, sustainability and human well-being. A key result of the analysis is that:

- digital solutions (e.g. smart waste management) are only effective with public participation;
- technologies are a tool, not an end in themselves;
- social trust is a necessary prerequisite for digital transformation.

Thus, the circular economy and Society 5.0 intersect at the point of the human-centred development model.

The second chapter also shows that circular policies have a social distributional effect. The introduction of new taxes and incentives can affect different social groups in different ways. Therefore:

- reforms must be socially balanced;
- income differences must be taken into account;
- compensatory mechanisms must be provided for.

This places the circular economy in a broader context of social policy, rather than just environmental strategy. This leads to the conclusion that the circular economy cannot be sustainably implemented without the integration of social policies and educational mechanisms.

**The third** and one of the most significant results of the second chapter is the development of the concept of circular urban agriculture. The model is considered as:

- a mechanism for utilising biowaste;
- a tool for developing green infrastructure;
- a form of social integration;
- a means of local economic activation.

This model represents an innovative contribution as it combines ecological, economic and social functions within the urban system. The analysis shows that circular urban agriculture can serve as a "link" between the strategic goals of the circular economy and the specific needs of local communities. At the same time, limitations have been identified in relation to:

- spatial planning;
- regulatory constraints;
- organisational capacity;
- the need for financial support.

Summary of the results of Chapter Two:

The table systematises the main factors that were identified during the analysis as necessary for the sustainability of the circular model. It shows that none of the factors is sufficient on its own.

Table. Synthesis of structural factors for the sustainable implementation of the circular economy at local level

<b>Factor</b>	<b>Content</b>	<b>Identified deficiencies in the Bulgarian context</b>	<b>Required measures</b>
Regulatory framework	Clear and coordinated regulations	Fragmentation, overlap	Harmonisation Clear distribution of competences
Institutional capacity	Administrative expertise and control	Limited resources	Increasing capacity inter-institutional coordination
Financial incentives	Economic instruments	Limited application of the "polluter pays" principle	Introduction incentive mechanisms (e.g. PAYT)
Social participation	Public engagement	Low awareness	Information educational policies
Cultural attitudes	Ecological culture	Insufficient motivation	Long-term campaigns
Technological support	Digital tools	Partial integration	Smart systems and transparency

The system functions effectively only when there is regulatory clarity, institutional capacity, financial incentives and social support. It is particularly important that the shortcomings in the Bulgarian context are not related to a lack of regulatory framework, but to limited integration and coordination between the individual components.

Thus, Chapter Two reaches a key interim conclusion: the sustainable circular model is an institutional and social construct, not a technological project.

In summary, Chapter Two demonstrates that:

1. Sustainable circular models are institutionally and culturally conditioned.
2. Adaptation is more important than mechanical borrowing.
3. The social component is a structural element, not an addition.
4. Integrative models such as circular urban agriculture can function as local catalysts for transition.

5. Synchronisation between regulatory, financial and social mechanisms is necessary.

These results prepare a logical transition to Chapter Three, where the integration of a financial instrument (methodology for waste management) represents a specific management mechanism for implementing the established principles.

### **3. Results from Chapter Three**

Chapter Three represents the applied core of the dissertation. If Chapter One builds the conceptual framework and Chapter Two defines the institutional and social prerequisites for a sustainable circular model, then Chapter Three performs an empirical test of a developed tool for applying these principles in a specific municipal context. The main focus is on the development and testing of a new methodology for determining household waste charges as a financial instrument for stimulating circular practices. The study finds that the existing mechanisms for determining household waste charges do not, to a large extent, reflect the actual amount of waste generated and do not create sufficient incentives to reduce waste generation. The main problems are:

- lack of a direct link between individual behaviour and financial burden;
- limited transparency of costs;
- low motivation for separate collection;
- lack of real economic incentives for resource efficiency.

In this context, the development of a new methodology is justified not as an administrative reform, but as a structural tool for changing economic incentives. The methodology is based on the following principles:

- The "polluter pays" principle
- Proportionality between the amount of waste and the amount of the fee
- Transparency of costs
- Economic incentive function

It integrates financial, organisational and behavioural elements and is positioned as a transition from a linear to an incentive-based system. The key result here is that the fee is seen not simply as a source of revenue, but as an instrument for environmental regulation through an economic mechanism.

#### **Assessment of the significance of the developed model for determining the waste disposal fee using the cost-benefit analysis (CBA) method**

Cost-benefit analysis plays a central role in empirical testing.

The use of CBA allows for:

- identify investment costs;
- assessment of operating costs;
- quantify economic and, to some extent, environmental benefits;
- calculate net present value;
- assess internal rate of return;
- determining the payback period.

A key result of the analysis is that the financial model shows economic viability in different scenarios, with the results remaining stable even under more conservative assumptions. This confirms that the methodology is not a theoretical construct but has potential for real-world application. The application of cost-benefit analysis within the developed financial model allows for a quantitative measurement of the economic rationality of the proposed methodology for determining the household waste fee. The main indicators used – net present value, internal rate of return, benefit-cost ratio and payback period – are interpreted not only as numerical results but also as indicators of management sustainability.

**Net present value** (interpretation in a public context) measures the difference between discounted benefits and discounted costs for the entire period of analysis. In the public sector, this indicator has a broader meaning than in private investment analysis. In the context of the dissertation:

- it reflects the economic efficiency of the model;
- it shows whether society realises net value;
- it serves as a tool for arguing for reforms before public institutions.

The positive value in the different scenarios shows that the introduction of an incentive-based methodology for WMP does not pose a fiscal risk, but creates added value in the long term. It is particularly important that the net present value remains positive even at a higher discount rate, which demonstrates the sustainability of the model under more conservative assumptions.

**The internal rate of return** (acceptability threshold) measures the discount rate at which the net present value becomes zero. In the public sector, this indicator is used as a threshold for comparison with the social rate of return. The results show that the internal rate of return exceeds the discount rates used (3%, 4%, 5%), which means that the project is economically justified within reasonable social assumptions. This has the following management implications:

- it reduces the risk of ineffective investment;

- it argues for the stability of the model;
- provides additional legitimacy to decision-makers.

In conditions of limited public resources, the internal rate of return becomes an indicator of comparative effectiveness relative to alternative investment opportunities.

**The benefit-cost ratio** (a measure of effectiveness) shows how many units of benefit are generated for each unit of resource invested. Values above 1 indicate that the benefits exceed the costs. In the analysis, the benefit-cost ratio remains above one in the different scenarios, which means that the proposed methodology generates public value. This indicator is particularly important in public policies because:

- it allows for a comparative assessment between different instruments;
- it facilitates the communication of results to a wide range of stakeholders;
- it serves as an argument in budget discussions.

**The payback period (time dimension)** provides information on the time needed to recoup the initial investment costs. In the context of public administration, this indicator is important because of:

- limited budget cycles;
- the political horizon of governance;
- the need for rapid visibility of results.

A relatively acceptable payback period indicates that the reform can be implemented without placing an excessive burden on the budget and without a prolonged period of fiscal uncertainty.

The management interpretation of quantitative results should not be viewed in isolation from the institutional and social environment. The main result of the integrated interpretation is economically justified, but its effectiveness depends on:

- the degree of public participation;
- administrative control;
- the transparency of the process;
- communication with citizens.

Thus, the quantitative indicators confirm the thesis of the dissertation that the circular transition requires synchronisation between economic incentives and social legitimacy. The strategic importance of quantitative analysis in the context of local public policy is of strategic importance. It demonstrates that:

- environmental policies can be economically justified;

- reforms can be justified with quantitative evidence;
- public decisions can be based on measurable indicators, not just regulatory requirements.

This increases transparency and the quality of governance.

### Scenario analysis (uncertainty management)

Within the framework of the quantitative analysis, three scenarios have been developed – conservative, realistic and maximum – which reflect different levels of administrative efficiency, public participation and the degree of implementation of the new methodology for determining the household waste fee. The aim of the scenario approach is not to predict a specific value, but to assess the sustainability of the model under different management and behavioural assumptions.

Table -. Scenario synthesis of economic results

Indicator	Conservative scenario	Realistic scenario	Maximum scenario
Degree of participation	Low	Moderate	High
Administrative efficiency	Partial	Stable	Optimised
NPV	Positive, but limited	Sustainable and stable	Significantly positive
IRR	Above the social threshold	Stable above the threshold	Significantly above the threshold
BCR	> 1, but by a small margin	Clearly > 1	Strong margin above 1
Payback period	Longer	Medium	Short
Management risk	Increased	Controlled	Minimal

The conservative scenario assumes a limited degree of public participation, partial administrative efficiency and a slower pace of implementation. The results show that even under such unfavourable conditions, the model retains a positive net

present value and a benefit-cost ratio above unity. This is important because it demonstrates that the financial instrument is not entirely dependent on optimal conditions. At the same time, the longer payback period and lower efficiency margin indicate sensitivity to management capacity. Conclusion: The methodology is robust, but the results are highly dependent on institutional implementation.

The realistic scenario reflects moderate public participation and stable administrative functioning. Here, the indicators demonstrate a sustainable economic effect:

- stable positive NPV;
- IRR above the discount rates used;
- clearly positive BCR;
- acceptable payback period.

This scenario can be considered the most likely with an adequate communication strategy and organisational readiness.

Conclusion: The financial instrument is economically rational under realistic management assumptions.

The maximum scenario assumes a high degree of public participation, an optimised administrative structure and effective communication. The results in this case show:

- a significantly positive NPV;
- high IRR;
- a clearly expressed efficiency margin;
- a short payback period.

This scenario demonstrates the potential of the model when financial, social and institutional mechanisms are fully integrated.

Conclusion:

The circular model has the potential to become a strategic tool for sustainable development in the presence of synchronised policies.

**A comparative analysis of the three scenarios** allows several key conclusions to be drawn:

1. The model is economically sustainable in all scenarios considered.
2. Management capacity and public participation directly influence the degree of economic efficiency.

3. The risk is not structural but manageable.
4. There is a direct link between social legitimacy and financial results.

This comparative analysis confirms the main thesis of the dissertation – that a sustainable circular model requires integration between the regulatory framework, financial instruments and public participation.

**The strategic importance of the scenario approach** also has methodological significance. It demonstrates that:

- public policies cannot be viewed as deterministic processes;
- uncertainty is a structural element of governance;
- sustainable solutions are those that remain effective under different assumptions.

In this way, the scenario approach enhances the analytical value of the study and contributes to its methodological maturity.

Of particular importance is the use of three discount rates (3%, 4% and 5%), which allows for an assessment of the model's sustainability at different levels of risk and time value of money.

The results show that:

- at a lower discount rate, social benefits have a higher weight;
- at a higher rate, the model remains economically justified, but with a lower marginal value;
- the sustainability of the net present value at different levels shows the stability of the model.

The analytical results from the three chapters of the dissertation allow for the formulation of an integrated management model for applying the principles of the circular economy at the municipal level. This model represents a systemic structure in which regulatory, financial, institutional and social mechanisms function as interdependent components. The integration between these components is the key condition for the sustainability of the circular transition.

The integrated model includes four main subsystems:

1. Regulatory subsystem, which includes: local regulations; control mechanisms; clear distribution of responsibilities; compliance with European regulatory frameworks. The regulatory subsystem sets the formal rules for the functioning of the circular model. Without regulatory clarity, financial instruments lose their effectiveness and social participation remains fragmented.

2. Financial subsystem. It is implemented through the developed methodology for determining the household waste fee. Its function is to:

- to create an economic incentive;
- to introduce proportionality between behaviour and expenditure;
- to direct resources towards sustainable activities;
- to ensure the financial sustainability of the system.

The financial subsystem acts as a regulator through a market mechanism rather than through administrative sanctions.

3. The institutional subsystem includes: administrative expertise; organisational coordination; control mechanisms; information infrastructure.

The analysis shows that institutional effectiveness mediates between regulatory requirements and actual results. With weak institutional capacity, even well-designed financial instruments can prove ineffective.

4. The social subsystem covers: public participation; environmental culture; behavioural responses; trust in institutions.

It is the most sensitive component of the model, as financial and regulatory mechanisms can only function effectively if they have social legitimacy. The integrated model is not a hierarchical structure, but a dynamic system of interrelationships:

- The regulatory framework defines the parameters of financial instruments.
- Financial instruments influence social behaviour.
- Social participation increases the effectiveness of the financial mechanism.
- Institutional capacity ensures coordination between all components.

This interdependence means that the absence of one component can compromise the entire system. The analysis allows three consecutive stages of implementation to be formulated:

- Regulatory structuring – harmonisation of the local regulatory framework.
- Financial implementation – implementation of the incentive methodology.
- Social legitimisation – information and education campaigns.

This sequence ensures a manageable transition from a linear to a circular system. Scenario analysis shows that the integrated model maintains economic sustainability at different levels of risk. The key conditions for sustainability are: transparency; gradualism; adaptability; continuous monitoring.

Thus, the model is not a static construct, but an adaptive management framework. The results of the quantitative analysis and scenario synthesis allow the following general conclusion to be drawn:

The circular economy at the local level cannot be achieved through isolated regulatory or financial reform. It requires an integrated management model in which the financial instrument functions as a catalyst, the regulatory framework as a stabilising factor, institutional capacity as a mediator, and social participation as a legitimising force ( ). The integrated management model confirms the main thesis of the dissertation that the sustainable development of the circular economy requires permanent analysis of political, regulatory, economic and social factors and their synchronisation in a specific institutional context.

#### **4. Guidelines for future research on the topic of the dissertation**

The results of the dissertation outline the circular economy as a dynamic and multifaceted field of research, in which the present study represents a stage in a broader scientific process. In the course of the analysis, a number of directions for future research have been identified, which logically follow both from the results achieved and from the limitations characteristic of empirical research in a municipal context.

Firstly, an important direction for future scientific developments is the expansion of the empirical base through the application of the developed models and tools in other municipalities characterised by different demographic profiles, economic structures and spatial characteristics. Such comparative studies would allow for an assessment of the degree of adaptability and transferability of the proposed solutions and would contribute to the development of typologies of municipalities according to their potential for applying circular models.

Secondly, future research should focus on deepening the analysis of the social and behavioural aspects of the circular economy, including through the application of sociological and behavioural methods to measure changes in the attitudes and behaviour of households and businesses over time. This would allow for more precise modelling of the effects of financial incentives and a better understanding of the relationship between regulatory measures, economic instruments and actual behaviour.

Thirdly, there is significant potential for future research in the development and application of methods for quantifying the long-term environmental and social benefits associated with the implementation of circular models at the local level. The limitations identified in this study regarding the availability and quality of data point to the need to improve indicator systems and develop combined approaches for assessing tangible and intangible effects.

Fourthly, a promising direction for future scientific research is the further development of the concept of circular urban agriculture and its integration into spatial planning and green infrastructure management systems. Future research could analyse the interaction between circular urban agriculture, climate change adaptation policies and sustainable urban development strategies, as well as the possibilities for scaling up the model.

Fifth, an important area for future research is to track the effects of the regulatory validation of the developed models over time. Analysing the actual functioning of the adopted regulatory changes and their impact on management practices and public behaviour would allow for an assessment of the sustainability of the transfer between scientific developments and regulatory practice and would contribute to the improvement of policies at the local level.

Sixth, further research could focus on developing methodological approaches for the integrated assessment of public policies in the context of the circular economy, including combining cost-benefit analysis with tools for assessing social impact and environmental effects. This would allow for a more complete account of the complex nature of circular policies and would increase their analytical and managerial soundness.

In conclusion, the outlined directions for future research show that the circular economy as a model for sustainable local development represents an open and promising field of scientific inquiry. This dissertation creates a conceptual, methodological and applied basis that can be built upon and further developed through subsequent interdisciplinary research aimed at increasing the effectiveness and sustainability of public policies.

### **III. Reference to the scientific and scientific-applied contributions in the dissertation**

The scientific and applied scientific contributions of the dissertation stem directly from the research thesis, the formulated goals and objectives, as well as the theoretical and empirical results obtained. They are the result of an integrated approach combining conceptual analysis, comparative research, empirical testing, and practical validation in a real management environment. Given their specificity, the contributions can be systematized into two main groups: scientific contributions and scientific-applied contributions.

#### **1. Scientific contributions**

An original author's definition has been put forward

A personal interpretation of the circular economy as an integrated socio-economic model for sustainable development of the modern Bulgarian city has been developed and argued, which goes beyond its traditional consideration as an environmental or resource policy. Within the framework of the dissertation, the circular economy is conceptualized as a system of interconnected normative, economic, institutional and social mechanisms, the effectiveness of which depends on their coordination and adaptation to the local context. An original approach has been applied

An in-depth theoretical and normative analysis of the development of the circular economy concept has been carried out, allowing the identification of key problem areas that hinder its sustainable implementation. On this basis, the need for permanent and multifaceted analysis, including political, economic, regulatory and social dimensions, is argued as a condition for the sustainable development of circular models at the municipal level.

An analytical framework has been developed to study the social dimensions of the circular economy and their relationship with the concept of Society 5.0. In the dissertation work, the human-centric approach is highlighted as a key factor for the sustainability of circular policies, which contributes to overcoming the technocratic and reductionist approach in some of the existing research.

The concept of circular urban agriculture has been developed as an integrative model that connects bio-waste management, green system development, social inclusion and local production. The concept is theoretically justified and positioned as an innovative tool for closing resource cycles in urban environments.

An original approach has been applied

The methodology for studying the circular economy at the local level has been

enriched by combining qualitative and quantitative methods, including cost-benefit analysis, scenario analysis and sensitivity analysis, which allows for a more precise assessment of the economic and managerial rationality of public instruments.

## **Scientific and applied contributions**

### **First scientific and applied contribution**

A new methodology for determining household waste charges has been developed, in line with the principles of the circular economy and the polluter pays principle. The methodology is positioned as a management and financial tool for introducing economic incentives aimed at reducing waste generation and increasing resource efficiency.

### **Second scientific and applied contribution**

An empirical test of the developed methodology was carried out in a specific municipal context by applying cost-benefit analysis, scenario analysis and sensitivity analysis to different discount rates. The results confirm the applicability and sustainability of the model under different management and economic assumptions.

### **Third scientific and applied contribution.**

The analytical theses and practical models developed in the dissertation have been institutionally and normatively validated through their use as an expert basis for the preparation, discussion and adoption of amendments and additions to subordinate legislation of the Municipality of Troyan in the field of:

- waste management;
- the protection and development of the green system;
- management of municipal forest areas.

The results of the author's research summarized in this way fulfill the entire cycle: scientific research → applied development → normative practice". The systematized scientific and scientific-applied contributions show that the dissertation work is not limited to theoretical analysis, but offers original conceptual developments, innovative management tools and actually validated practical solutions. This positions the research at the intersection between scientific value and social significance and gives it a sustainable contribution character.

#### **IV. List of publications by the doctoral student**

During the preparation of the dissertation, the doctoral student has published scientific papers and studies on the research topic, as follows:

##### ***1. Scientific articles (4)***

1. Todorov, N. (2022). *The Japanese model of transition to a circular economy*. National Economic Archive.
2. Todorov, N. (2022). *Japanese regulatory decisions for imposing the circular economy model*. Doctoral Scientific Session , D. A. Tsenov Academy of Economics – Svishtov.
3. Todorov, N. (2023). *Methods in the methodology for determining household waste fees*. Doctoral Scientific Session, D. A. Tsenov Academy of Economics – Svishtov.
4. Todorov, N. (2024). *Circular urban agriculture*. Journal of Mountain Agriculture on the Balkans, Troyan: Institute of Upland Stockbreeding and Agriculture.
- 5.

##### ***2. Reports from participation in scientific conferences (3)***

5. Todorov, N. (2022). *The circular economy in the context of the Industry 4.0 – Society 5.0 relationship: dependencies and social aspects*. Scientific conference. , SA "D. A. Tsenov" – Svishtov.
6. Todorov, N. (2023). *The circular economic model in the smart city*. Conference "Challenges in Finance". , D. A. Tsenov Academy of Economics – Svishtov.
7. Todorov, N. (2024). *Circular urban agriculture*. Scientific conference "Mountain Agriculture 2024". IPZH Troyan.

##### ***3. Developments from the dissertation, applied in officially adopted normative acts (8)***

8. Drafting and adoption of a Regulation amending and supplementing the Regulation on the management of municipal forest areas – Municipality of Troyan. (Decision of the Municipal Council of Troyan No. 306/28.03.2013, as amended and supplemented).
9. Draft Law amending and supplementing the Forestry Act (2023).

10. Study and analysis of the institutional framework of the Municipality of Troyan in the field of environmental protection (2023).
11. Results of a round table discussion on "Environmental Policies in the Municipality of Troyan" (2023).
12. Survey and analysis of the results on environmental policies in the Municipality of Troyan (2024).
13. Opinion on the prospects for the development of the green system of the Municipality of Troyan and amendments to Ordinance No. 9 on waste management (2024).
14. Drafted and adopted proposal for amendment and supplementation of the Ordinance on the Construction and Protection of the Green System of the Municipality of Troyan (2024).
15. Draft and adopted proposal for amendment and supplement to Ordinance No. 9 on waste management in the territory of the Municipality of Troyan (2024).

**Summary:**

During the doctoral programme, four scientific articles and three scientific reports were published, which carry a total of 80 points, in accordance with national requirements and the regulations of the D. A. Tsenov Academy of Economics – Svishtov. A significant part of the results of the dissertation have been normatively validated through adopted amendments and additions to subordinate legislation, which emphasises the high scientific and applied value of the research.

## **V. REFERENCE FOR COMPLIANCE WITH NATIONAL REQUIREMENTS UNDER THE RULES FOR THE APPLICATION OF THE LAW ON THE DEVELOPMENT OF ACADEMIC STAFF IN THE REPUBLIC OF BULGARIA**

This dissertation has been developed and presented in accordance with the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (ZRASRB) and the Regulations for its implementation, as well as with the internal rules of the D. A. Tsenov Academy of Economics – Svishtov.

The doctoral student has fulfilled the requirements for obtaining the educational and scientific degree of "doctor" by:

- developing and presenting an independent dissertation containing original scientific and applied scientific contributions, in compliance with the requirements for academic ethics and originality, with the sources used correctly cited in the dissertation.
- published scientific papers on the topic of the dissertation in refereed and non-refereed scientific publications, as well as participated with scientific reports in scientific conferences, which exceed the minimum requirements by 3 times;