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ADAPTIVE INSTITUTIONAL CHANGE IN MUNICIPAL WASTE MANAGEMENT

Purpose. *The paper proposes a new trajectory of institutional change that integrates economic (fiscal) and technical solutions in managing municipal waste.*

Methodology / approach. *The study adopts a model for the study of institutional change. A retrospective, quantitative analysis of institutional change, a legal-historical analysis of formal institutions, and a comparative-institutional analysis are used to substantiate the link between municipal waste quantities and Gross domestic product (GDP) growth. Using correlation and regression analysis, we examine the relationship between institutional change in municipal waste management and recycling.*

Results. *The study proves the impact of institutional change on municipal waste management in the EU and Bulgaria. It can change the relationship between GDP and the amount of waste and stimulate the implementation of more efficient and innovative waste management methods. The relationship between institutional change in municipal waste management are studied. The main idea is that more legal acts regulating municipal waste management and a higher human development index, wich reflects better and more efficient municipal waste management, will lead to higher recycling rates. The study discusses how institutional change aimed at effective municipal waste management can contribute to increased revenues and reduced costs for the government by promoting innovation in the sector, introducing more efficient waste collection and treatment technologies, and encouraging recycling.*

Originality / scientific novelty. *The study highlights the lack of a unified direction in rules and policies for municipal waste management in Bulgaria and its impact on the system's efficiency. It aims to present a new approach to solving the problems related to municipal waste management in Bulgaria that focuses on the importance of institutional change.*

Practical value / implications. *The paper identifies differences between the municipal waste management systems in the EU and Bulgaria. The proposed financial and technical solutions help central and municipal administrations to create new institutions. These actions can be joint and better coordinated. All this should lead to changes in the regulatory framework. The new rules will contribute to stability and less need to change regulations, clarity for individuals and organisations to the optimal solutions for reducing municipal waste costs, and "pressure" on the central and local administration to take the necessary actions for such a change.*

Key words: *municipal waste, institutional change, economic (fiscal) decisions, waste management.*

Introduction and review of the literature. Municipal waste accounts for approximately 10 % of the total waste generated in the EU. The management of municipal waste in Bulgaria is a challenge for the country. The main problems are related to the improper disposal of waste, its low level of recycling and the need for sufficient infrastructure for its treatment. A positive trend is that the number of people

covered by organised garbage collection and transportation of municipal waste is increasing steadily. It is 99.8 % in 2018 [1]. Households are the primary source of municipal waste generation, about 90 % [1].

Bulgaria is a country with an economic system based on free markets. We can see a decline in the production of goods accompanied by a population decline of almost 3 million people over the last 33 years. Higher average incomes and increased individual and aggregate consumption provoke an increase in the import of raw materials and increased consumption of various consumer goods. Due to accelerated urbanisation, waste is constantly generated close to or within settlements, accompanied by low recycling facility capacity. This fact implies the need to analyse 1. the relationship between municipal waste and economic growth and 2. the institutional change in the economic context necessary for the country.

The diversity of municipal waste also creates problems in its management. Municipal waste includes materials such as paper, cardboard, plastic, metal, glass, food waste and others. Each type of material requires a different way of collection, treatment and recycling. The problem is complicated by the fact that some industrial productions are located in settlements and contribute to the different generations of municipal waste [2]. The overall transport and disposal costs in Bulgaria are lower than those for treatment and recycling. This approach is not sustainable and does not lead to optimal municipal waste management.

Understanding the contribution of different sectors is crucial for developing targeted waste management strategies and policies. Agriculture in Bulgaria is a vital sector of the economy, providing food and raw materials for various industries. However, it also generates waste in packaging materials, spoiled products and by-products of agricultural processes. This waste is found in households and contributes to the overall municipal waste stream. In addition, agriculture indirectly contributes to the generation of household waste using chemical fertilisers and pesticides. They pollute water sources and lead to increased consumption of bottled water and other packaged goods. The problem arises because generated agricultural waste is incompatible with existing waste management infrastructure and systems, which are primarily designed to handle municipal and commercial waste. As a result, the inclusion of agricultural waste in the municipal waste stream can lead to increased pressure on waste management facilities and resources, ultimately affecting the overall waste management systems' efficiency and sustainability.

The numerous legislative changes in Bulgaria's municipal waste management sector hinder the adaptation of the state and municipal administration of individuals, households and other organisations. The activities of reporting and measuring the quantities of municipal waste are not always in line with the financial policies proposed at the central and local levels in terms of tax collection, fees, and security deductions.

There is an unclear, contradictory incentive system in which the solutions related to municipal waste do not create conditions for easy adaptation of the entities. Hence, the positives of the economic system are small.

Today, municipal waste management in the country stems from the political

agreement known as the "green transition". Our country is a part of this agreement and the economic doctrine for developing a modern environment – the "circular economy". In 2015 EU adopted the first Circular Economy Action Plan /CEAP/ [3]. It defines the circular economy as an "economy, where the value of products, materials and resources is maintained in the economy for as long as possible, and the generation of waste minimised". The transition to a circular economy creates opportunities to maximise the use of resources and fully decouple them from economic growth. This would ensure a long life cycle of resources, requiring their reuse, recycling and reprocessing. Thus, the amount of generated waste is reduced. The CEAP contains 54 actions and four legislative proposals on waste. As a result, greenhouse gas emissions are estimated to fall by 48 % by 2030 and 83 % by 2050. The annual net benefit for EU 27 is estimated to range between 245 EUR to 604 EUR billion, representing 3–8 % of yearly turnover [4]. Due to the full implementation of the first CEAP, a new one was adopted in March 2020 [5]. It is inextricably linked to the European Green Deal, adopted in December 2019. Its main objective is "to ensure that waste is prevented and the resources used are kept in the EU economy for as long as possible".

There is an understanding of the need for an institutional change that considers municipal waste not only as an effect that negatively affects the health and quality of life but also as a complex of material and energy characteristics that can be used as an economic resource.

"Contradictions" of institutional change. Linkages between economic growth, environmental effects and municipal waste management doctrines. North [6] argues that institutional change is an overarching process that distinguishes allocative and adaptive efficiency. Every change of rules determines a new environmental architecture. In some cases, we will witness a new way of distributing wealth – allocative efficiency, and in others, an evolution of economic processes over time, moving to a new, qualitative system level – adaptive efficiency. On the other hand, Cheung [7] describes the possibility of creating alternative institutions that drive bottom-up processes as an appropriate solution to guide the trajectory of institutional change.

Coase [8] explains that externalities can be managed. Sathye [9]; OECD [10] does not guarantee that the externality management system will only create benefits. The diversity of laws and their repeated changes form an unclear environment, predetermining institutional change that makes it difficult for subjects to adapt [11]. North and Wallis [12] describe institutional change through the integration of appropriate technological solutions as the basis for transforming the different cost levels of the economic system.

North [13] believes that the way of institutional change ultimately determines the level of economic growth. Debref, Pyka, Morone [14] give us an analytical approach to institutional change through a circular economy to reduce uncertainty. The authors analyse the dualistic relationship between economic growth and ecological transition. The latter parallels Ostrom's [15] idea of institutional change and the positive environmental outcomes of resource sharing.

The institutional change should ensure environmental protection and set sustainability patterns in waste management. Hukkinen [16], Thabit, Nassour, Nelles [17] find that the positive effect of the relationship between waste and economic growth should be measured by Gross domestic product (GDP). Describing the economic impacts of their incineration, they think municipal waste treatment is critical regarding its particular material or energy transformation. With an institutional framework in the context of the circular economy concept, it is possible to strive for GDP growth while reducing the amount of urban waste.

Huang et al. [18] and Jacobsen et al. [19] place establishing a transparent monitoring and control system at the centre of the analysis as a starting point for increasing cost-effectiveness and reducing reporting costs in waste management systems. The coordination effects are highly dependent on the differences in the methodologies for reporting municipal waste quantities. Uncertainty in the reporting system always causes adaptation problems [20]. Proper management of collection costs is crucial in determining the optimal fiscal strategy, i.e., waste collection costs [18; 19]. It can improve the efficiency of waste collection services, minimise costs, and hence reduce municipal waste fee payments [21]. Incentives should be integrated into the waste management system, whereby institutional and technical solutions impose synergies in reducing the amount of waste with the goal of *non-zero marginal cost for waste disposal* [22].

The institutional change in municipal waste management can be related to using monetary incentives as external motivators. These incentives can be positive, such as financial rewards, or harmful, such as taxes or other forms of punishment [23].

Financial rewards are popular among the public and often stimulate behavioural changes in attitudes towards waste. At the same time, punishments may face less political acceptability. This means that people generally respond better to positive incentives regarding waste [24–26]. However, economic incentives may lead to less sustainable changes than those based on informational intervention programs. This is because financial incentives can be temporary and limited in effectiveness, whereas information programmes can create more long-lasting and knowledge-based changes in behaviour [23].

Institutional change in municipal waste management is essential to achieve sustainable management. It involves amending legislation, creating specialised institutions, and promoting partnership and collaboration. The national governments must implement policies and regulations that encourage separate waste collection, recycling and composting [27]. The establishment of specialised institutions helps to regulate and monitor waste [28]. Partnership and collaboration between local authorities, the business sector and civil society organisations are also crucial for the success of sustainable waste management [29; 30].

The literature review examines the institutional change in municipal waste management from different perspectives. It provides a starting point for analysing the institutional change needed in municipal waste management in Bulgaria. The literature analysis of various aspects of the problem sets the stage for posing the research

questions that the paper's authors want to address. Starting from the current state of Bulgaria's municipal waste management system and its main problems and challenges, the institutional changes affecting it will be discussed, and examples of good practices from other countries will be presented. The paper seeks solutions to propose a new trajectory for institutional change in municipal waste management.

Legislation, institutional change and municipal waste. EU law pursues economic, social and environmental objectives [31]. In recent years, European policy documents have changed the approach to waste, particularly municipal waste, to accelerate the transition to a circular economy. The focus is shifting from environmental waste management to a policy of reducing waste generation and integrating it into economic processes [32]. The aim is to break the positive correlation between economic growth and waste increase.

The legislation related to municipal waste can be divided into two parts:

a) Coordination – related to the introduction of a circular doctrine in accounting for quantities, as well as incentives for the opening of technology in activities associated with landfilling, transportation, recycling, and registration regimes for waste management;

b) Financial – introducing clarity in the payment of costs for municipal waste by the polluters, as well as a gradual shift to the concept of making a profit or at least long-term benefits can be derived.

Directive 2006/12/EC on waste [33], establishing a common framework for waste management, introduces key concepts such as waste, recovery and disposal, and the important "polluter pays" principle.

The current legitimate definition of waste is in Article 3 of *Directive 2006/12/EC.* This legal act defines the variety of goods and things we consider as waste and the exceptions (ibid., art. 2). The framework of activities has been formally set. They are related to waste management, collection, disposal, recycling, and the hierarchy of policies that national authorities should conduct after transposing the legal act.

A legitimate definition of "municipal waste" is set out in *Directive (EU) 2018/851* [34]. This definition states that the complexity of managing municipal waste also stems from most of it being generated near where people live. Households and retail outlets, administration, places of education, health services, hotels, catering establishments and many others generate municipal waste. The complex nature of municipal waste poses many challenges already at the level of legislation and when creating efficient measures for its management.

Directive 1999/31/EC [35] on the landfill of waste highlights the objectives and the means of the transition to a circular economy. The strategy is to place waste in the context of the circular economy, i.e., treat garbage as valuable and transform waste materials into high-quality raw materials for the economy. The question is how institutional change should be targeted and what financial policies should be implemented to reduce or at least maintain the quantities of municipal waste generated while at the same time not hampering economic growth.

Directive (EU) 2018/850 [36] tackles the issue of progressively reducing the

landfilling of waste and using it where it is suitable for recycling or another recovery to protect, preserve and improve the quality of the environment and human health. The EU legislation "updates" Directive 1999/31/EU, locating the municipal waste within the doctrine of a circular economy in the wise, efficient and rational use of natural resources. The strategic direction to address the problem changes legislatively. Municipal waste must be imposed as a resource and move towards adaptive institutional change in the economy.

Regulation (EC) No 1013/2006 [37] specifies measures to prevent unwanted and unnecessary waste shipments. Ensuring public participation in plans and programs relating to the environment is guaranteed by *Directive 2003/35/ EC* [38]. These acts set the philosophy for institutional change in the EU.

In Bulgaria, the *Environmental Protection Act (EPA)* [39] outlines environmentally sound waste management guidelines and objectives without specific provisions to ensure their achievement.

The same has been incorporated in *the Waste Management Act (WMA)* [40], but now with the waste management mechanisms. The local responsibility is defined as well as the financing, supervising and controlling waste management, including by-laws the state and local governments must establish. The law needs incentives to introduce simplified forms of technical measurements at the household level.

Local Taxes and Fees Act (LTFA) [41] imposes a decentralised system of policies, empowering municipalities to collect the waste levy. In practice, local authorities – Municipal Councils and Mayors – set the amount of local taxes and fees, in particular the garbage tax, as well as the prices of garbage collection and garbage disposal services; disposal in landfills or other facilities; organise the cleaning of the areas for public use. Municipalities themselves have to solve the problem of implementing institutional change in waste management in the face of a contradiction [42]. On the one hand, local administration should not impose higher taxes and fees to underpin municipal waste decisions. On the other hand, these fees and taxes are the basis of their revenues. The law lacks a clear separation of the financial burden on an individual and household.

Institutional change in municipal waste management should resolve doctrinal contradictions on several levels:

1) A decline in waste generation should not lead to a reduction in overall consumption. Macro growth should increase.

2) Reusing waste as a resource at the micro level should support growth at the macro level. In such cases, the decision-making approach should be linked to immediate feedback in reporting system results.

3) The local administration should not seek short-term benefits. Easy methods of accounting and collecting higher waste charges may increase revenues in local budgets in the short term, but this should be considered a negative effect. In the long run, the solutions should incentivise individuals and organisations to take personal actions, including those of an investment nature, to "plug" municipal waste into a new economic cycle. In this case, municipal waste charges should not increase.

4) The central government should integrate regulations to create a unidirectional impact. Regulations should be fewer, and changes should be infrequent, making them more transparent. Economic growth must be determined by the institutional implications of these acts at the micro level through the micro impact mechanisms.

Research questions determining the structure of the study. All these arguments draw attention to several research questions the paper sets: 1. How can institutional changes alter the relationship between gross domestic product and the amount of municipal waste, and what are the possible implications for waste management and the economy? 2. What are the opportunities for introducing more efficient and innovative waste collection, treatment and disposal methods that institutional changes in waste management can stimulate? 3. What is the role of institutional change in municipal waste management, considering both the number of legal acts related to municipal waste management and the Human Development Index as a measure of socio-economic conditions? 4. How can institutional changes influence the government's financial (fiscal) policies and lead to increased revenues and reduced costs related to municipal waste management?

The purpose of the article. The article proposes a new trajectory of institutional change integrating financial and technical solutions in managing municipal waste in Bulgaria. In this way, we achieve the following:

1) Clarity and stability of the regulatory framework – some of the subordinate legislation could be constructed in a new way;

2) An opportunity to introduce more efficient and innovative methods of waste collection, treatment and disposal encouraged by institutional changes in waste management;

3) The flexibility of the financial (fiscal) framework – volume-based and weight-based solutions in the imposition of fees and taxes;

4) Specifying the technical solutions – the polluter pays principle should be "combined" with recycling and composting actions.

Methodology. Ostrom [43] proposes a conceptual model for studying institutional change. It combines the specificities of resource management, little organisations' participation in change, rules and the need for synergy between economic and environmental effects. The study incorporates formal institutions and their evolution into the model.

Figure 1 illustrates the conceptual integration of the different theoretical frameworks with the bioeconomy doctrine, how institutional impact should occur, and the desired effects of institutional change.

The paper reviews the current literature on waste management and the effectiveness of economic incentives. This literature review is essential as it summarises the state of research in this area and the main trends. Studies that examine the socio-economic implications of institutional changes in waste management are included, covering aspects such as legislation, regulations, policies and institutional reforms. The analysis of these implications is essential as it allows us to understand the impact of changes in waste management on societal and economic development and

how they can be optimised to achieve more sustainable and efficient outcomes.

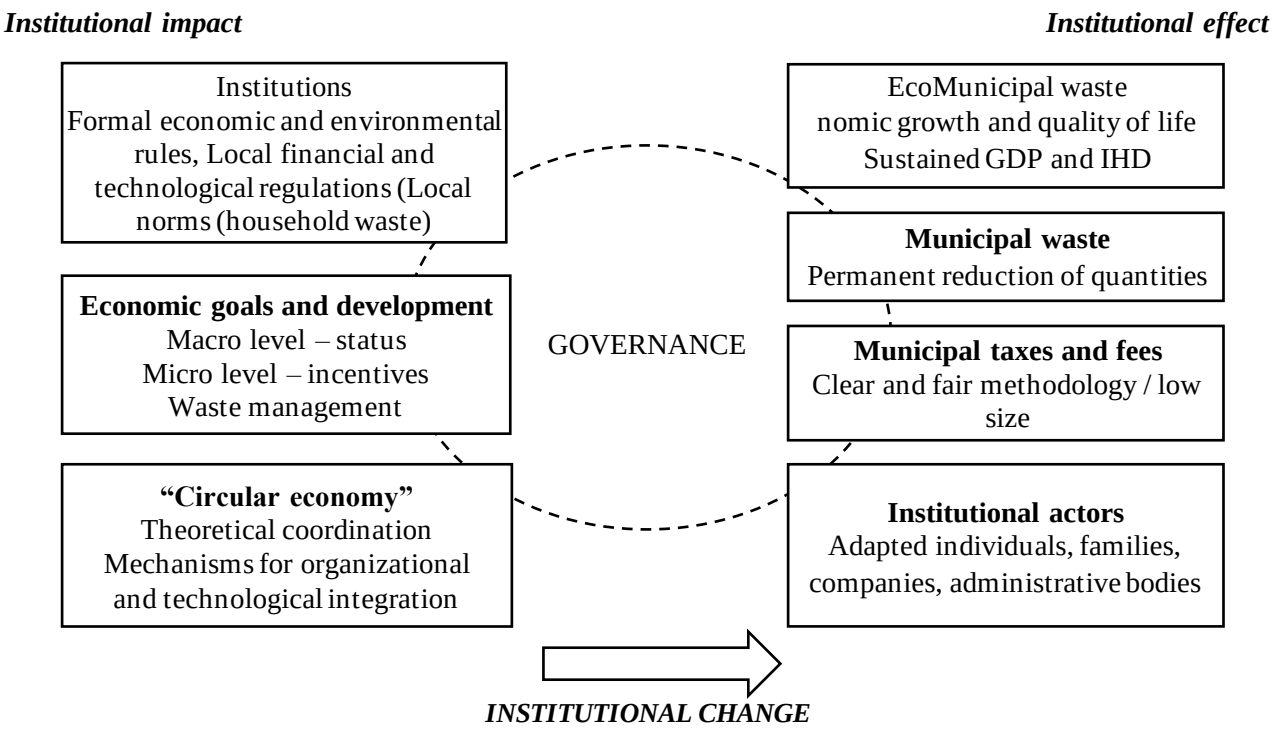

Figure 1. A conceptual framework for the institutional impact-institutional effects relationship

Source: own research adapted from Hagedon et al. [44].

The analysis of the legislative framework can help to understand the existing legal foundations, identify weaknesses and potential problems in the legal system, and suggest recommendations for improvements and reforms. This analysis is an essential tool for assessing the existing legislative framework and identifying areas requiring changes or additional regulations. Policies and strategies for municipal waste management can be developed using legal-normative analysis. They align with the legislation and aim to achieve more sustainable and effective waste management outcomes.

The paper uses a retrospective, quantitative analysis of institutional change. A legal-historical analysis of the formal institutions accompanying it is carried out. In some of the paragraphs of the study, the institutional environment is presented synthetically. We can see some of the "mistakes" in the legislation with the adapted in this way method derived from American legal realism – in a simplified form.

The paper uses correlation and multiple regression analysis to examine the interaction between municipal waste recycling and two independent variables – the number of legal acts related to municipal waste management and the Human Development Index. These indicators are chosen because they provide information on institutional change and municipal waste management. The recycling of municipal waste indicates the effectiveness of the waste management system and its ability to minimise adverse environmental impacts. The increased number of legal acts related to municipal waste management suggests a growing interest and commitment by

institutions and society to address this area's problems and create an appropriate institutional framework. The Human Development Index is a valuable indicator that reflects a country's progress in well-being, education and health. A higher Human Development Index is associated with better institutions and more efficient use of resources and waste management.

A comparative-institutional analysis is used to justify the relationship between municipal waste quantities and GDP growth. The position of the EU countries and Bulgaria concerning the current part of the transition is established. On the other hand, the collection of municipal waste, the burden of the cost paid by entities and organisations, and incentives for institutional change are discussed normatively in the paper.

The proposed solutions seek the synergy of change. The specific provisions that should tolerate adjustment are identified in places, which means that *de lege farenda* has been carried out.

Sources for data collection are Eurostat, NSI, and MEW. The legal information systems "CIELA" and "LEX" provide information in a non-synthetic form on the legal side of the research.

Results and discussion. *Municipal waste and economic effects in EU countries*. According to a World Bank report [45], in 2012, the world produced 2.02 bln t of municipal waste per year. Of these, 33 % are not treated in an environmentally safe manner. The 2018 update of the report predicts an even more dramatic increase to 3.4 bln t over the next 30 years.

Some studies show the relationship between economic growth and municipal waste generation [46–50]. This link is essential in the institutional change in municipal waste management. A high level of municipal waste can indicate an intensive and unsustainable economic growth model that does not consider environmental and social needs. When analysing the relationship between the GDP as a measure of economic growth and the amount of waste generated in kg per day per capita in Figure 2, the following becomes clear: Luxembourg and Ireland, which are among the countries with the highest GDP per capita, also have some of the highest amounts of generated municipal waste. Although Bulgaria has the lowest GDP per person, it is not the lowest compared to other members' waste generators.

According to the World Bank's classification, Bulgaria is the only EU country in the group of *Lower Middle-Income countries*. Lithuania, Latvia, Poland and Romania are the other four exceptions from the High-Income countries. These four countries are still better classified than Bulgaria as Upper Middle-Income countries. In Poland and Romania, higher economic growth is also associated with a significantly lower level of waste generated. Lithuania and Latvia have more waste combined with a much higher GDP.

All other 22 EU countries are in the High-Income Countries category. The most common problems of the Poor and Lower Middle-Income countries are similar. Some of them relate to lower levels of waste collection, particularly in rural and remote areas. Evidence suggests [52; 53] that *in Lower Income Countries*, the collection rate is 41 %

versus 98 %, typical for the Rich, 68 % of Lower Middle-Income countries and 85 % of Upper Middle-Income countries.

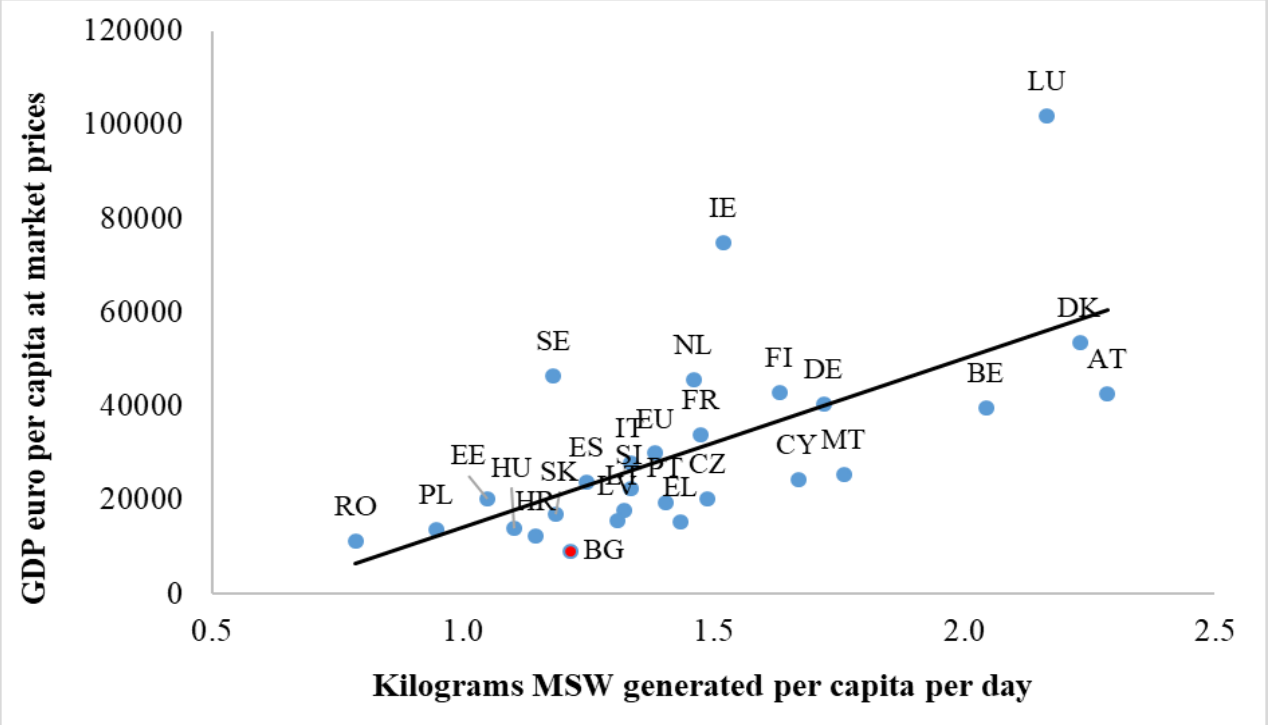

Figure 2. GDP per capita and municipal waste generated per day in EU-27 in 2020

Source: authors' interpretation of Eurostat [51].

Many factors can influence the relationship between GDP and the amount of municipal waste. The relationship may be weaker in countries with a well-developed recycling and waste management infrastructure because less waste is sent to landfills. In other countries with less developed waste management infrastructure, the link may be more robust because more waste is disposed of in landfills, which can negatively affect the environment and reduce GDP. Institutional changes, such as better waste management, can affect the relationship between GDP and the amount of municipal waste. In countries where more effective recycling and waste management programmes are put in place, the relationship may change and become weaker. For example, Japan is one of the most prosperous countries in the world in terms of waste management, with a high percentage of waste being recycled and reprocessed. A study examined the effect of Japan's waste management program between 2000 and 2017 [54]. The results show that Japan reduced the amount of waste disposed in landfills from 56 % in 2000 to 19 % in 2017. Also, waste recycling increased from 17 % in 2000 to 37 % in 2017.

One of the main objectives of institutional change in waste management is to reduce the negative impact of waste on the environment and to promote effective waste management. Reducing the adverse effects on the environment can be achieved by introducing more efficient and innovative methods of waste collection, treatment and disposal and promoting recycling and renewable energy sources. In this context, waste generation is invariably considered alongside how it is treated. These dynamics over

the last 26 years can be seen in Figure 3.

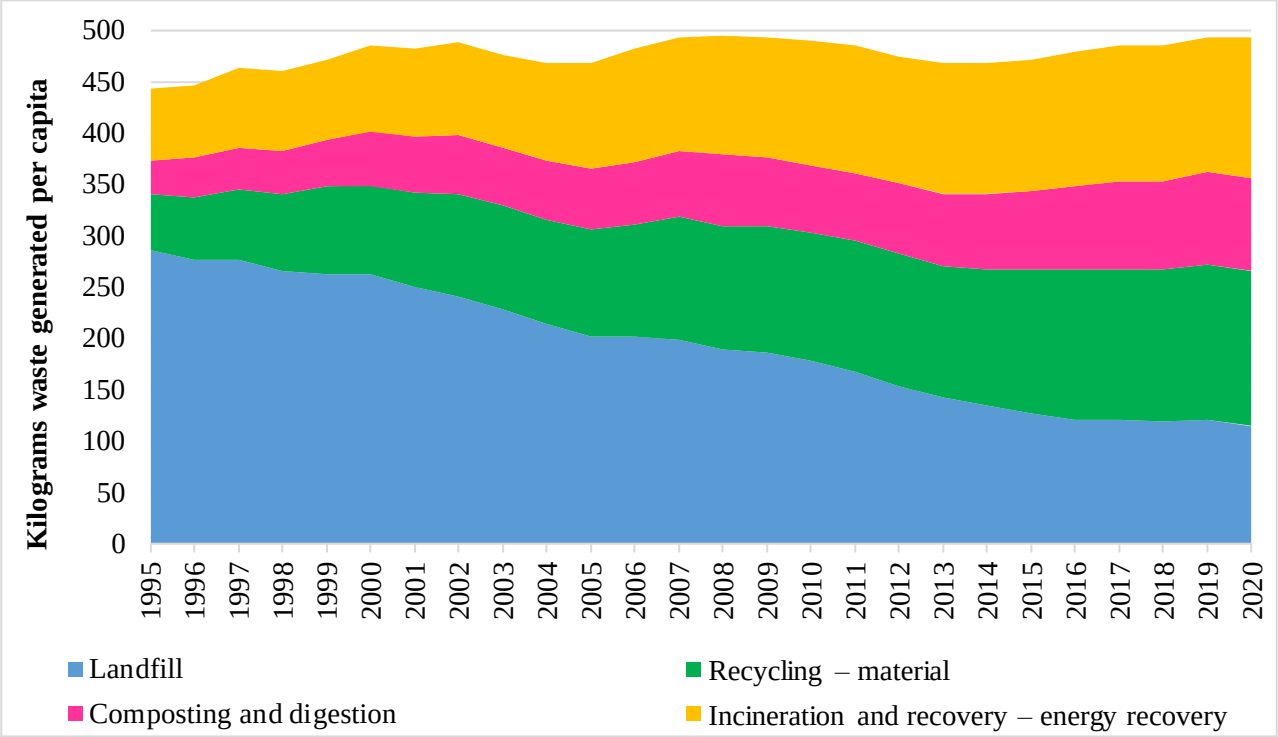

Figure 3. Treatment of municipal waste in EU-27, kg per capita, 1995–2020

Source: authors' interpretation of Eurostat data [51].

The amount of generated waste is increasing in the EU-27 over the period. At the same time, there is a clear trend towards a decrease in landfilled waste at the expense of an increase in the share of alternative treatment options such as recycling, composting and others. Thus, the percentage of recycled and composted waste increased from 19.64 % to 48.69 %. This dynamic reflects the green policy that has been implemented in the last few years. According to the EU Landfill Directive, Member States must reduce the amount of municipal waste landfilled to 10 % of the total amount generated by 2035 [55]. For comparison, the treatment of municipal waste in Bulgaria over the same period can be traced in the following Figure 4.

In Bulgaria, the total amount of generated municipal waste tends to decrease gradually – from 531 kg per person per year in 1995 to 442 kg per person per year in 2020. The total amount of municipal waste landfilled per capita has decreased over the reference period from 100 % in 1995 to 62 % in 2020 of the total waste generated (23 % EU average). In parallel with the decrease in landfilled municipal waste, landfills and disposal installations are decreasing from 164 in 2011 to 73 in 2020 [56].

The share of recycled municipal waste in the total amount generated per capita is low but gradually increases – from 20 % in 1998 to 27 % in 2020 (30 % EU-27 average). The amount of composted municipal waste per capita in Bulgaria is the lowest compared to other European countries – 8 % in 2020 compared to EU-27 for the same year – 28 %. The use of municipal waste for energy in Bulgaria is 3 % per capita against 15 % for the EU-27.

Some of the problems of the current municipal waste management system in Bulgaria can be summarised as follows:

1) Irrational use of resources: the current waste management system encourages people to produce more waste than necessary because of the insufficient incentives to recycle and reduce waste.

2) Environmental pollution: large amounts of municipal waste end up in landfills and dumps, decomposing and releasing hazardous substances into the soil, air and water.

3) Resource losses: resource losses and unnecessary economic expenses incur when municipal waste is not recycled or used as raw materials or an energy source. Therefore, an institutional change in municipal waste management that promotes recycling, waste reduction and the use of waste as a source of energy and raw materials is needed.

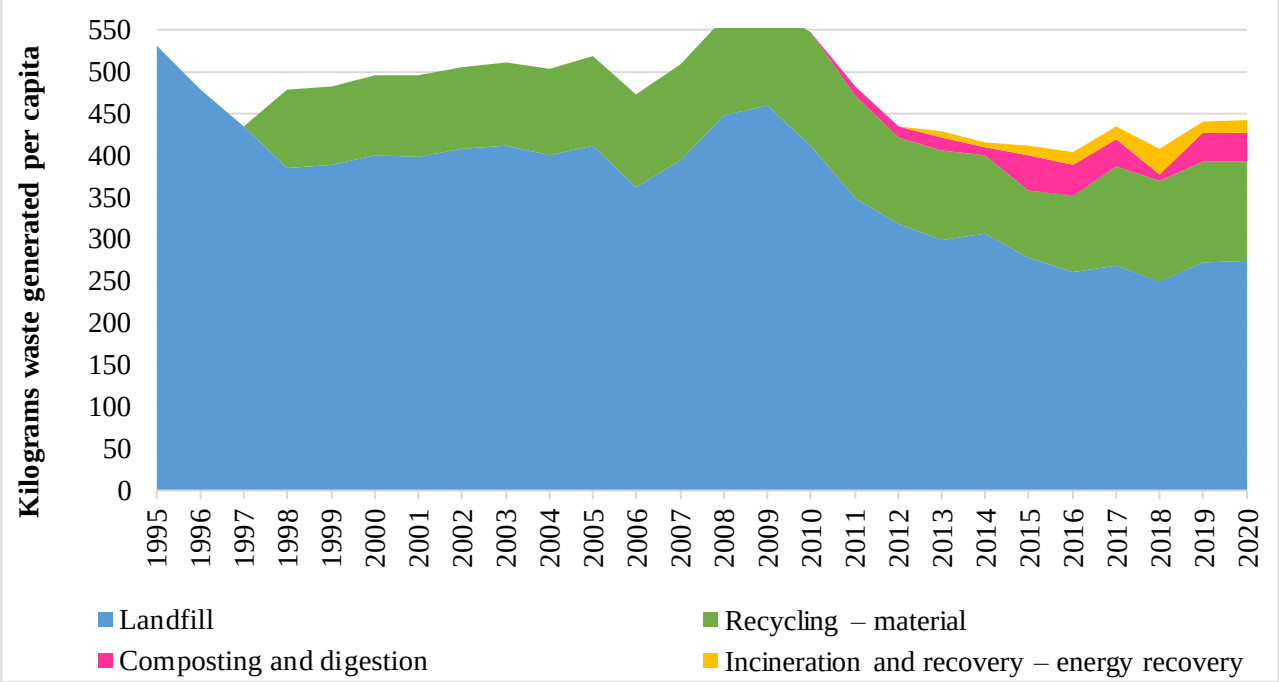

Figure 4. Treatment of municipal waste in BG, kg per capita, 1995–2020

Source: authors' interpretation of Eurostat data [51].

Institutional changes and recycled municipal waste. The relationship between recycled municipal waste, the number of legal acts related to municipal waste management and the human development index can give us insight into institutional change in municipal waste management. These factors are related to different aspects, such as the system's efficiency, the legal framework, the social and economic development of the country, etc. Municipal waste recycling is a good indicator of the efficiency of a waste management system since one of the main objectives of such a system is to optimise waste management and minimise its negative effect on the environment. Recycling is one of the ways to achieve this objective, allowing waste materials to be reused instead of disposed of in landfills. Therefore, if the waste management system is efficient and well-organised, it can support and encourage municipal waste recycling. The number of legal acts – regulations, directives, decisions, reports, international agreements and other official documents related to municipal waste management – can give us an idea of the institutional framework

regulating this area. The increase in the number of legal acts may indicate a growing interest and commitment on the part of institutions and society to address municipal waste issues and achieve a better management institutional structure. The Human Development Index (HDI) is an indicator that measures a country's progress concerning the three main aspects of human development: well-being, education and health. These interrelated aspects depend on a country's institutions and governance systems. As one of the critical aspects of environmental protection, municipal waste management is of great importance for human health and well-being. Therefore, regarding institutional change in municipal waste management, HDI can be a helpful indicator to assess progress. A higher HDI is usually associated with better governance and more efficient use of a country's resources, including municipal waste management. Countries with higher HDI are expected to have better waste management institutions and systems, including developing the waste collection, treatment and recycling infrastructure. Also, the HDI can be a helpful indicator for assessing the effectiveness of a country's municipal waste management measures and policies. If a country has a high HDI but still has waste management problems, this may indicate the need for institutional change in this area.

The correlation analysis between the amount of recycled municipal waste, the number of legal acts related to municipal waste and the human development index is done. The research is based on European Union data from 1995–2020. The coefficient for "Recycled municipal waste million tonnes" and "Number of normative acts" is 0.7916. Hence there is a relatively strong positive correlation between these two variables – a higher amount of recycled waste is associated with more normative acts. The "Recycled municipal waste million tonnes" and "Human Development Index" coefficient is 0.7396. Hence there is a strong positive correlation here as well – a higher Human Development Index is associated with a higher amount of recycled waste.

Regression analysis can help us understand the impact of legislation and socio-economic conditions on waste recycling efforts (Figure 5). The results show that the regression model is reasonably good. The multiple correlation coefficient (Multiple *R*) is 0.84, which means that there is a strong positive correlation between the variables. The coefficient of determination (*R* Square) is 0.71, which means that changes in the independent variables can explain 71 % of the variation in the dependent variable. This result is good since, as a general rule, the coefficient of determination must be at least 0.5 to be considered a good model. The adjusted correlation coefficient for the number of independent variables (Adjusted R Square) is 0.68, which means that 68 % of the variation in the dependent variable can be explained by changes in the independent variables, given the number of independent variables.

The standard error of the regression is 7.52. It measures the accuracy of the estimates made with the regression model. The *F*-statistic is 27.6377, and the *p*-value is less than 0.05. This result means that the model is statistically significant. The regression equation has the following form: $y = -208.90 + 0.08x_1 + 273.44x_2$, where: *y* is the amount of municipal waste recycled, x_1 is the number of normative acts and x_2 is the human development index. The regression coefficients show that the number

of regulations and the Human Development Index positively correlate with municipal waste recycling. When the number of rules increases by one, the amount of municipal waste recycled increases by 0.08 mln t. When the Human Development Index increases by one, the amount of recycled waste is expected to increase by 273.44 mln t, holding the number of regulations constant.

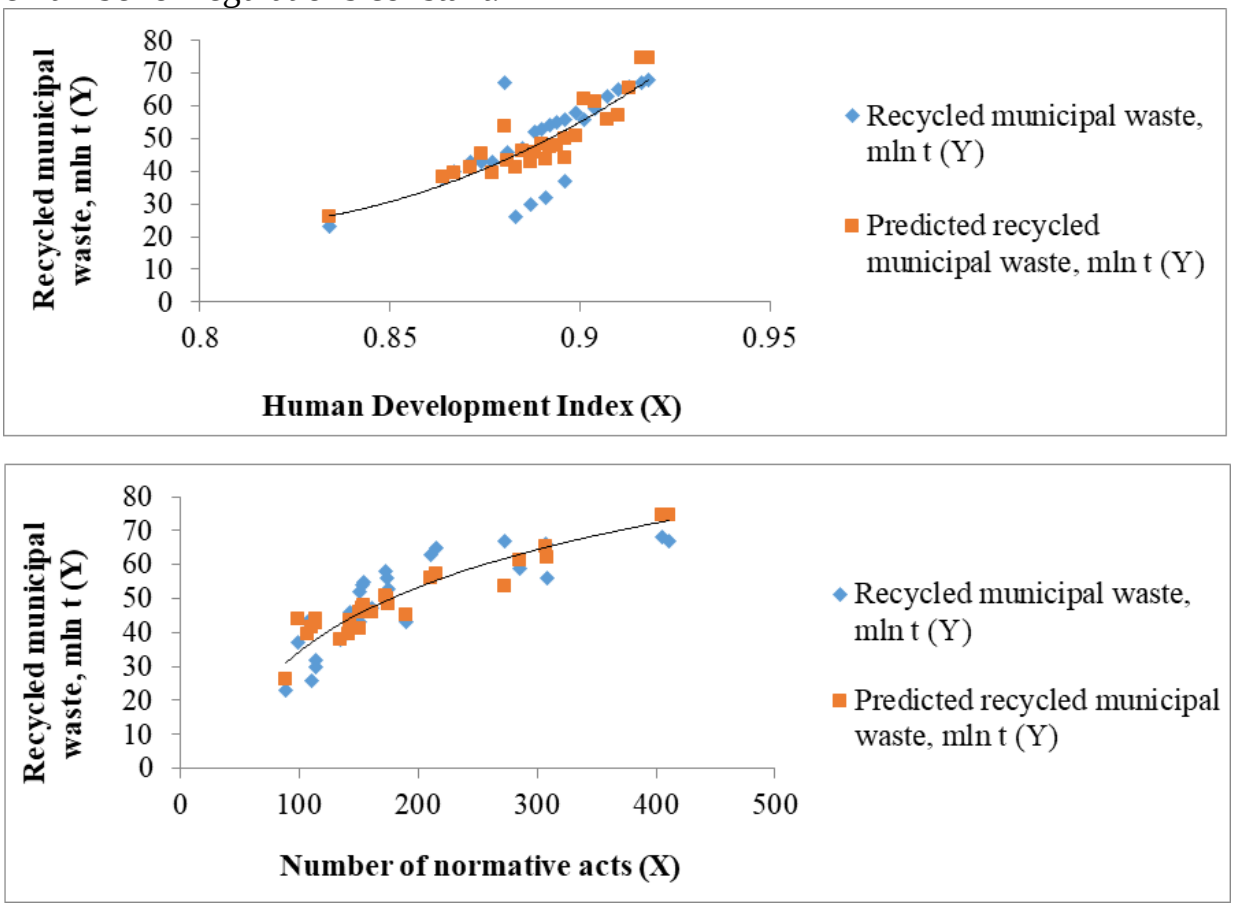

Figure 5. Correlation of recycled municipal waste, HDI and number of normative acts in EU-27, 1995–2020

Source: own calculation.

This model is a starting point for further research in municipal waste management and for identifying effective institutional measures to improve the waste management system and stimulate innovation and improvement in this area.

Financial (fiscal) policies in municipal waste management. Taxes, fees and incentives. The institutional change impacts municipal waste management's financial (fiscal) policies. It includes the creation of new financial mechanisms that will incentivise efficient waste management and impose penalties for negligent waste management. They can influence the state's financial policy by increasing revenues or reducing waste management costs. The share of municipal waste collection costs in rich countries is approximately 10 % of local budgets, while waste collection rates are higher than 90 %. Studies indicate that these costs in low-income countries can amount to 80–90 % of municipal budget expenditures [18; 19].

Bozhikin et al. explore success factors for effectively implementing fiscal and economic instruments that lead to sustainable and efficient municipal solid waste

management [57]. According to them, three of the most important factors include an appropriate legal framework, robust control, and the everyday use of fiscal and economic instruments. Complete control at all levels (national, regional, municipal and organisational) is essential for the successful implementation of not only taxes and fees but also other necessary policy instruments in municipal waste management.

The practice varies from country to country. Some countries rely on a tax increase on municipal waste storage to reduce landfill. Others impose bans on the storage of specific municipal waste. Third countries combine both instruments to reduce the amount of municipal waste landfilled. The countries with the best results in terms of storage have a tax higher than 100 EUR/t and a ban on the storage of specific waste (Sweden, Denmark, Netherlands, Germany). A study shows that countries where the landfill tax has a rapid rate of progression, combined with a landfill ban, have reached less than 2 % of directly landfilled waste. Countries where the warehousing tax has a slow progression show weaker results [58].

The primary purpose of municipal waste taxing is to cover all the costs of municipal waste management services. These are most often the responsibility of the local authorities. There are various ways the authority can levy the charges. Some create incentives to reduce the amount of waste, and the ways to treat it, while others do not. One standard option is to pay an absolute amount depending on the size of the household, the property or its value. Paying a lump sum is one of the easiest ways to collect fees, characterised by its simplicity, low costs for servicing administrative fees and compliance costs. Sometimes this fee is collected at the same time as paying utility bills for electricity or water. In both cases, there is no link between the charge and the amount of municipal waste. Hence, this type of fee does not incentivise households to reduce their waste, mainly because of its zero marginal cost of garbage disposal. A key point in designing such economic instruments for waste reduction is to impose a non-zero marginal cost for waste disposal. The polluter pays principle, and measurement of waste quantities should be enforced when paying the fee. The amount could be measured in litres or kilograms.

Hence, there are two types of programs – volume-based and weight-based programs. In the first case, the fee payment is determined by the capacity of the waste containers and the frequency of their removal. It is also possible to provide for the purchase of unique bags or stickers, the purchase price of which includes the fee itself. It is also the cheapest and less administratively costly way of accounting for the quantity. That is why most municipalities impose a volume-based measurement model.

A disadvantage of this approach is the excessive quantity compression [59]. The households try to fill as much garbage as possible into bags or special containers, having an obligation to pay for more bags. Most garbage increases the weight of the collected bags. At the same time, households have no incentive to reduce waste.

The optimal option is the weight-based, where the weight of the generated waste itself is taken into account, as this indicator has an actual link to its disposal. It also incentivises households to reduce waste, resulting in fewer payments [60]. In this case, the waste is already measured at the collection, and a fee is paid for each kilogram.

This way of accounting needs the equipment of the garbage trucks with scales, making the process more expensive. Municipalities provide the containers in some cases, while in others, they are allowed to use their containers. Applying these two systems in small settlements with predominantly family houses is more realistic. However, linking the amount of waste to the fee payment is a real challenge for large cities.

In Bulgaria, we find economic instruments for municipal waste management in the EPA. Each landfill owner provides a bond to cover future closure and aftercare costs. EPA deductions aim to reduce the amount of landfilled waste, encouraging its recycling and recovery. The deductions per tonne of garbage increase each year. Another economic instrument is the municipal waste tax, payable by households and companies generating municipal waste. It should materialise the "polluter pays" principle. However, it is currently set as a pro-rata on the taxable/reportable value of the properties. The payment has no link with the generated waste by the individuals. A good option is to set the levy in an absolute amount on a pay-as-you-go basis only for two categories – a household with one member and one with more than one. This solution would resolve another inequity in Bulgarian legislation. Under the LTFA, the owner of the property pays the fee. The exceptions apply only to users under an established right of use and concessionaires. In all other property renting cases, the fee is charged to the owner, not the person using the services. Despite its presence in the legislation, the postponement of applying the "polluter pays" principle is due to the municipalities' lack of information and capacity. The transformation of the municipal waste charge into a functioning economic instrument for managing municipal waste is delayed.

Figure 6 shows the revenues from municipal waste fees for 2014–2020 and the expenditures of the Bulgarian municipalities in municipal waste management.

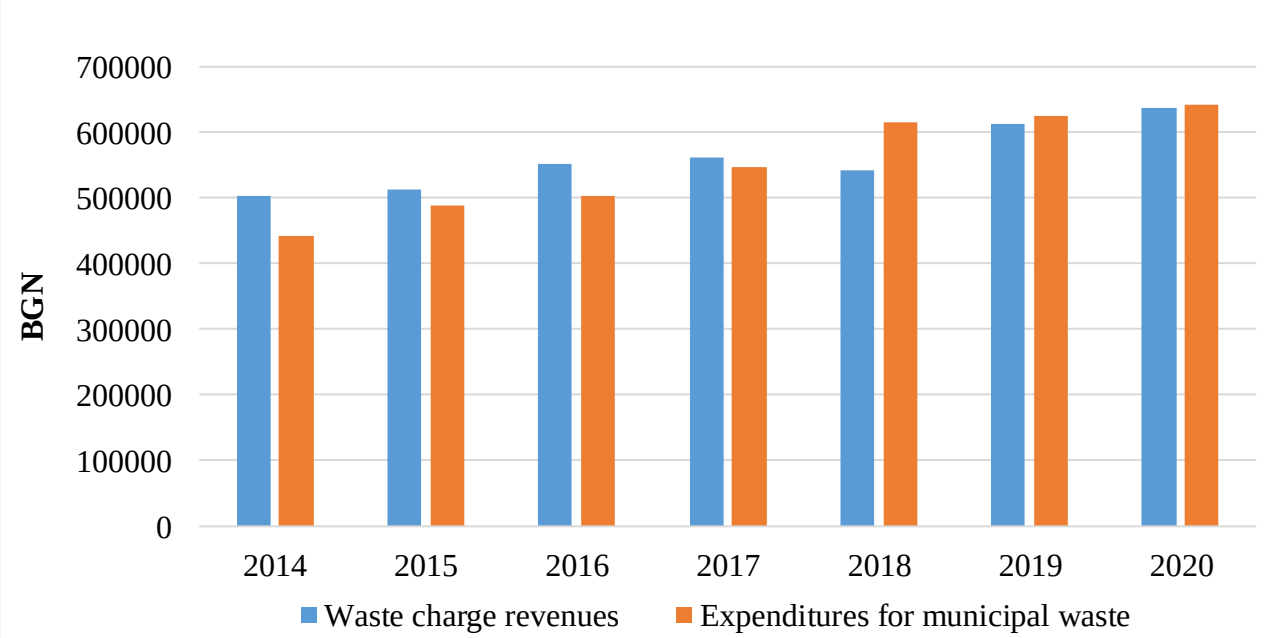

Figure 6. Revenues and expenditures in BGN for municipal waste management in Bulgaria, 2014–2020

Source: authors' interpretation of NSI (2022).

While in the first years, the revenues exceeded the expenditures related to municipal waste, after 2017, the trend reverses. This dynamic is precisely in response to the increased demands related to municipal waste management. Insufficient revenues may lead to a reduction in the quality of waste management services or an increase in fees for citizens and businesses. On the other hand, if the costs of waste management are high, this may lead to unnecessary costs for local municipalities and put additional strain on the budgets of citizens and businesses. Thus, the optimal relationship between revenues and expenditures for municipal waste management in Bulgaria is for these revenues to cover the costs of efficient collection, transport, treatment and deposit of waste without unnecessary burdens on local municipalities and citizens. We may see an optimisation in municipal waste management expenditures in different ways [61; 62]. Improving waste separation and recycling processes can reduce waste transportation and disposal costs and improve the environmental situation in the country.

Combining the theories of institutional change, economic growth, and the circular economy doctrine is challenging, as solutions must be sought simultaneously at both micro and macro levels. The centralised solutions are usually quick and offer high social returns. However, their implementation does not always consider an accurate assessment of local needs, leading to adaptation problems and diversions of the expected effects. It is, therefore, essential to adopt a systematic approach that incorporates all relevant aspects and interactions between different factors to achieve sustainable and practical solutions.

Conclusions. The results of the study, which answer the research questions, can be summarised as follows: 1. Institutional changes can change the relationship between GDP and the amount of municipal waste. Hence the decisions of government institutions regarding waste management can significantly impact the economy as a whole; 2. Implementing more efficient and innovative waste management methods can be stimulated through institutional changes. These methods can lead to a more efficient waste management system and increased waste recycled and reused as a resource; 3. The regression analysis results show that the number of legal acts related to municipal waste management and the Human Development Index have a statistically significant relationship with municipal waste recycled. This result highlights the importance of institutional change as a mechanism to stimulate innovation and improvements in waste management; 4. The institutional changes can majorly impact a country's fiscal policies, contributing to increased revenues and reduced costs associated with municipal waste management. This process will enable the state to manage its resources more efficiently and better manage its costs; 5. Understanding the contribution of different sectors, such as agriculture in Bulgaria, is crucial for developing targeted waste management strategies and policies. Policymakers and stakeholders can develop more effective and sustainable waste management solutions by considering the specific types of waste generated by the agricultural sector and the different ways these waste materials can enter the municipal waste stream.

Taking into account the experience of other countries, we propose the following

solutions for the successful management of municipal waste in Bulgaria:

Economic (fiscal) solutions: 1. The proposed solutions should not hinder economic growth but seek adaptive options that can be implemented locally. These solutions should admit that municipal waste is a valuable resource, encourage the separation of municipal waste at source by households and organisations, and promote its reuse. However, implementing a payment system based on the amount of waste generated is a challenge, considering the different conditions in urban and rural areas, in large and small settlements.

2. The methodology for reporting the amount of waste should be enforced at the household level [63]. It requires some aspects of managing the institutional change in municipal waste to be devolved to the central government. The "integration" of municipal regulations will lead to "economies of scale" in measurement and reporting and facilitate the adaptation of the subjects.

3. Coordinating legal provisions concerning separate mandatory waste collection should be imperative [64]. It would be appropriate for the country to set the charge in an absolute amount on a cost-covering basis. There could be only two categories – single-person households and multi-person households. Such a measure would be much more in line with the "polluter pays" principle, with more significant polluters looking for ways to recycle municipal waste. The municipalities should introduce a cheaper and less administrative costly volume-based method of accounting for the waste in small settlements.

Technical solutions: 1. The weight-based approach involves reducing the incentives to landfills by charging a fee for each kilogram of generated waste [65; 66]. Waste is measured at the time of collection. The charge depends on the container's capacity and the collection frequency. Unique bags, containers or stickers may include the charge in their purchase price. This approach will reduce the amount of municipal waste and result in lower charges for households.

2. Integrating a waste collection system with digital tracking of measurements, including weighing bags and containers before the transfer, a micro-analytical mechanism can be created to accurately report the amount of waste that has been exported and disposed of [67; 68].

3. The proposal is to integrate the deposit system with metering by installing scales on garbage trucks for accurate assessment, reducing the cost of implementing this change [69]. The integration should be done in LFTA and provide a link to the proposed economic (fiscal) incentives (Articles 62-67) to ensure a smooth process.

In conclusion, the topic of institutional changes in waste management is essential for the following reasons: first, the proper implementation of the institutional changes can lead to more efficient and innovative waste management, with increased recycling and resource-saving activities; second, this impact can affect not only the economy as a whole but also the social and environmental sustainability of society, creating a cleaner and healthier environment and reducing the burden of landfills. Exploring and implementing institutional changes in this area can have long-term positive consequences for society and the environment. As a result of the importance of the

agricultural sector for Bulgaria highlighted in the study, the authors aim to investigate and detail the waste generated from this sector in a future study.

Research limitations: the paper cannot fully cover all aspects of the institutional change needed to improve municipal waste management. The study lacks research on alternative institutions that can improve bottom-up processes and facilitate the adaptation of subjects. There is no analysis of the impact of technological solutions in municipal waste management on economic growth. There is also a lack of analysis of the dualistic relationship between economic growth and environmental transition and the opportunities for institutional change that can lead to positive ecological outcomes from resource co-use. These issues are relevant and could be the subject of further research by the authors.

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