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## Sustainable Supply Chains in The Food Service Industry

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**Abstract:** This study aims to examine is to derive basic criteria and indicators for measuring the sustainability of the food supply chain, based on which to examine commercial food services in the food service industry and to derive guidelines for building a sustainable supply chain using innovative technologies. Based on the existing theoretical propositions, it has been further developed and applied in the food service industry sector. A survey was conducted in the period from March to May 2022 among 42 establishments in Bulgaria. The results are developed food supply chain relationships in the commercial food service industry can increase back-and-forth supply chain resilience. Research, Practical & Social implications: The study establishes a need for necessary to introduce sustainability measures, through innovative technologies, with a view to bringing them into line with achievements, world trends, and the increased demands of users to provide ecofriendly services. This study reveals for the first time the food supply chain in the field of commercial food services in the food service industry and public catering in Bulgaria and provides guidelines for increasing sustainability.

**Keywords:** food supply chain, food service, innovative, sustainable.

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## INTRODUCTION

The constant change in food tastes and increased consumer demands for quality and safety are observed in food supply chains on a daily basis. The supply chain is also changing in view of innovations and technologies that can enhance customer service in terms of time and place.

The topic of the need for greater sustainability back and forth along the food supply chain is extremely relevant due to the impact on the environment, through carbon emissions, food and packaging waste, energy consumption, impact on financial performance, and social impact. Food is the basis of challenges in the field of environment, society, economy, culture, public health, etc. On the other hand, the European Union world's largest importer and exporter of the food world, and European food have the highest quality standards. All this determines the importance of the topic related to the sustainable food chain of supply and environmental protection, as it has gained more and more importance for humanity in recent decades. The production of biomass everywhere in the world is associated with active human intervention in existing ecosystems, followed



by soil, water, and atmospheric pollution. In order to create and integrate a sustainable supply chain, it is necessary to protect the environment, reduce organic waste in the soil and water, and limit the emission of harmful gases into the atmosphere, but in addition, it is necessary to create conditions for economic and social measures, to ensure sustainability. Overcoming these challenges requires multi-stakeholder innovation aimed at economic, social, and environmental benefits.

The objective of the research problem is on the food supply chain of commercial food services that are part of the food service industry, and the goal is to present opportunities for building an innovative and sustainable back and forth food chain, through the derived criteria and indicators for measuring sustainability.

The current study is interesting because of the attempt to examine sustainability back and forth along the commercial food service food chain. In-depth studies of the food sector supply chain lack service industry on the one hand, and on the other, the sustainability back and forth along the food chain is poorly analysed. According to a number of reports, the food sector has a serious impact on climate change. The food service industry includes the production, serving, and sale of food and drink that is prepared for immediate consumption, or the provision of catering services to public or private end users or take-out and home delivery. This industry is divided into two sub-sectors: 1) commercial food services - street food, cafés, and bars, quick service and full service; 2) non-commercial food services - establishments that perform various food operations that are carried out in hospitals, schools, military bases, etc.

Food supply chains have changed significantly over the past 50 years. Food production has more than doubled, and diets have become more varied and often more energy intensive. According to Accorsi et al. (2019) all economic activities of the food sector have a major impact on the use of natural resources as well as on the environment. Sustainable behaviour is needed that can satisfy human needs with the limited resources available. According to Accorsi et al. (2019) current food supply chains (FSCs) are unsustainable in the long term. Due to the problems in the three dimensions of sustainability: economic, environmental and social, a number of challenges are created for the future of the food industry. Accorsi et al. (2019) propose a shift in farming and grazing and biofuel cultivation, reducing soil and air pollution and improving supply chain infrastructure, through a change in pricing. However, it is difficult to put all these terms under a common denominator, because each of them has its own characteristics and specifics, such as the social aspect in CSR and ethical purchasing, and far from the environmental aspect in green VD, transport and storage. For the purposes of this paper, the sustainability of food supply chains is considered in a holistic sense, which includes triple bottom line with economic, environmental and social aspects / dimensions. Approaches to sustainability in a supply chain that provide an opportunity to fill knowledge gaps are explored by Forslund et al., 2022. In addition, Dimova, 2021 believes that food supply chains differ from other product supply chains because of the continuous and significant change in food quality throughout the chain to the final point of consumption.

Accorsi and colleagues in their research describe supply chain services that include operations, packaging and storage, transformation and distribution of food products. The authors consider the objectives of supply chain network design and operations planning as related to cost and infrastructure constraints (Accorsi et al., 2018). Bhat & Jõudu (2019) described the food-energy-water nexus is vital that effectively manage the agri-supply chain and environmental stewardship. The authors argue that key logistics decisions can be of much help in meeting environmental sustainability challenges faced in the food supply chain (Bhat & Jõudu, 2019). Supply chains at food service industry include supply of raw materials, sourcing of ingredients, manufacturing and assembly, distribution, delivery and returns to customers and inventory management. Yudawisastra et al., 2022) explore green entrepreneurship in Indonesia's culinary sector in relation to sustainable development and green variables and examine green entrepreneurship in Indonesia's culinary sector in relation to sustainable

development and green variables and reveal that the provision of green products affects sustainable development independently of respondents' green entrepreneurship.

Building a sustainable food supply chain requires the creation of lasting and mutually beneficial relationships back and forth along the supply chain. Vodenicharova (2020) describes the main reason for establishing stable relations and achieving high levels of satisfaction and loyalty are perceived as necessary condition is for maintaining a long-lasting competitive advantage. Establishing and maintaining mutually beneficial relations with customers means improving the level of service, whereas the cooperation with suppliers relates that optimising operations along the SC.

The food supply chain encompasses the production of raw materials, processing and processing that delivers to food service industry or retailers and finally reaches consumers. This supply chain is one of the most complex chains, as temperature control of raw materials and products is often required. Food waste and food waste can occur at any stage of the supply chain. This is one of the main issues in the food supply chain in terms of sustainable development. Dora et al. (2021a) state food can be lost or wasted at any stage of the supply chain. Therefore we can recognize several points where food loss and waste are more significant and they are defined by FAO (Food and Agriculture Organisation) of United Nations as on-farm post-harvest operations, storage, transportation, processing and packaging and wholesale and retail (FAO, 2019).

A number of studies have been conducted on the carbon footprint of logistics activities. Stefanov (2020) defines the carbon footprint of the supply chain as a measure of the overall degree of impact of logistics activities carried out in all its phases on climate change. It expresses the combined impact of all greenhouse gases generated in the management of logistics activities in carbon equivalent and is a tool for benchmarking competing chains in terms of their contribution to climate change (Stefanov, 2020).

An important path for sustainable food supply chains is the social issue concerning the employees in the food service industry and society. Here could be included the working conditions, worker's trainings and safety, charity initiatives and others. On the one hand, the working conditions of the employees are important, on the other, their proper training in order to optimally manage food flows and reduce the wastage of resources. On the other hand, for optimal customer satisfaction, it is necessary to respond to new expectations from their side such as offering healthy products from natural farming coming from fair trading and for fair consumption (Gómez-Luciano et al., 2018). Firms today are striving that adopt innovations that ensure their survival, value creation and success (Krishnan et al., 2021). Mendes et al. 2020 compared the logistics strategies FIFO (First In First Out), FEFO (First Expire First Out) or LSFO (Least Shelflife First Out) in order to help determine the price of the product during its life of shelf life, maximising profit and reducing spoilage and therefore waste. Other examples include the use of smart labelling that track (and minimise) food loss, use of machine learning that optimise processes and systems (to repurpose, rethink, and redesign the concept of circularity in business models), blockchain technology that tackle food fraud by using stakeholders data throughout the FSC network (Rogers & Srivastava, 2021) as well as the use of environmentally friendly materials, and intelligent packaging (Subramoniam et al., 2021). Along with technologies having a direct application in the management of food supply chains, among the innovations should also be considered 3D food printing technologies which are already implemented in many developed countries such as the Netherlands, Germany, UK and others. Last but not least the adoption of Artificial Intelligence (AI) in the FSC can address unique challenges of food safety, quality and wastage by improving transparency and traceability (Dora et al., 2021b), which would also improve the economic, environmental and social performance of food supply chains. Just as technology and innovation can be the reason for the development of sustainable food service industry, so in his study Gómez-Luciano et al., 2018 discover, the lack of collaboration can limit the access that innovative technologies for the local and

lower-tier members of the supply chain (Gómez-Luciano et al., 2018). Other authors (Julkovski et al., 2021) have explored diverse research perspectives on the Ecological Modernization Theory.

For the sustainable management of the food supply chain, it is necessary to measure the impact of commercial food services on society and the environment, which can be achieved by using standards. The ESG standard is used to achieve sustainability through effective collection and management of environmental and corporate social responsibility (CSR) data. This standard can help create reports to communicate transparently with stakeholders, suppliers, customers, partners and investors about progress on sustainability goals. The main objective of the standard is to drive overall business improvement through improved sustainability performance. ESG relies on three factors to measure the sustainability of investments – environmental, social and corporate responsibility. This approach stems from the concept of Tripple Bottom Line (TBL), known as “people, planet, profits” (PPP - People, Planet, Profit), introduced in the 1990s. The goal is to focus companies not just on profits, but on every single “P” in the equation that will ultimately lead to the sustainability of any commercial enterprise. Other standards such as: ISO 2600, SA 8000, EMAS, ISO 14001, HACCP are also applicable to commercial food services. They can be successfully integrated into food supply chains service industry, making them more sustainable in a social and societal aspect.

In addition to the specific policies and standards in the field of food, as an important European policy that has an impact in this area, we can also note the role of the circular economy, which aims to reduce the use of fresh raw materials and materials and close supply chains. A leading role here is played by the reverse movement of goods and products, which can occur not only at the end user, but at all stages of movement of material flows (Mihova, 2020). This also applies to food supply chains, where at any stage of the movement of food products, losses can occur as a result of improper transport or storage, improper handling and use, etc.

## METHODS

Due to the peculiarities and specifics of the commercial food sector, an assessment of the degree of sustainability along the food supply chain in food service industry four sets of criteria were used in the present study. The following methodology is consistent with the established scientific methods and with the nature of the problem and reveals the criteria and indicators used, the methods and the information base. The TBL concept of sustainable development is examined in the context of ATM where an assessment of back-and-forth supply chain sustainability is presented. In study, Vodenicharova (2020) proves that the relationships with suppliers in the food supply chain are not strong enough, through the forms of partnership and the back-and-forth relationships in the supply chain.

Based on the described methodologies for researching sustainability in the food supply chain, the present study assessed back and forth sustainability of the supply chain. It is important to identify the actors in food supply chains when determining the structure of their network and the impact they have on the sustainability of the entire chain. Supply chain researchers define members according to their participation in the various flows that are related to the product, payments, information sharing, links and relationships between members back and forth along the supply chain (Dragomirov, 2016; Lambert & Stock, 2001; Hong et al., 2008; Vodenicharova, 2021). Moreover, they attempt to include all units that take part in supply chain activities, regardless of their impact on end customers.

Munir (2022) provides an interesting literature review where he summarizes the most commonly used research methods in the field of food services: method of field observation, interview, questionnaires/surveys (including electronic ones), comparative analysis and mixed methods. Closed-ended questionnaires for food

research industry were used in Filimonau's studies for restaurant management food waste issue (Filimonau et al., 2020) and Chou et al. (2018) who researched commercial food services implementing sustainable practices concerning sustainable food, sustainable management, innovation and social practices related to employees such as training and developing new ideas. Perramon et al. (2022) use a five-point Likert scale and examine food service in hotels in Spain where they view the quality management practices, environmental management practices, and competitiveness dimension items.

Based on literature review and theoretical background the research thesis is derived, namely: the well-developed links along the food supply chain at food service industry can increase the sustainability of the entire chain, which is why it is necessary to introduce sustainability measures, through innovative technologies, with a view to aligning them with achievements, global trends and the increased demands of consumers to ensure sustainability.

### Working hypotheses

**H1/** Forms of back and forth supply chain partnerships in commercial food services are lower than average scores compared to food supply chain scores in manufacturing and processing businesses

**H1:  $\mu > 60\%$**

**H2/** The ecological practices for the sustainability of the food supply chain at food service industry in Bulgaria are applied to a low degree

**H2:  $\mu > 3.5$**

**H 3/** Social measures regarding employees and society at food service industry in Bulgaria has an average level of development

**H3:  $\mu > 75$**

To prove the hypotheses of this article and considering the review of research in the field, the three dimensions will be used to assess the sustainability of the food supply chain in food service industry, with each of the criteria having specific indicators presented in Table 1.

**Table 1 Criteria and indicators for measuring food supply chain sustainability**

Sustainability criteria	Indicators for analysis
Criteria 1. Economic dimension	Indicator 1. Economic indicators of food service industry Indicator 2. Measuring resilience back and forth along the supply chain
Criteria 2: Environmental dimension	Indicator 3: Measuring the possibilities of using energy from renewable sources Indicator 4: Measuring the extent of carbon reporting and the impact it has on organisations Indicator 5: Measurement of environmental practices in the fields of logistics
Criteria 3: Social dimension	Indicator 6: Measuring social impact in relation to employees Indicator 7: Measurement of social impact in relation to society

Each of the included assessment indicators is averaged and based on this the degree of sustainability of commercial food services at food is derived service industry. By using available data from sustainability reports, the applicability of the selected indicators will be tested.

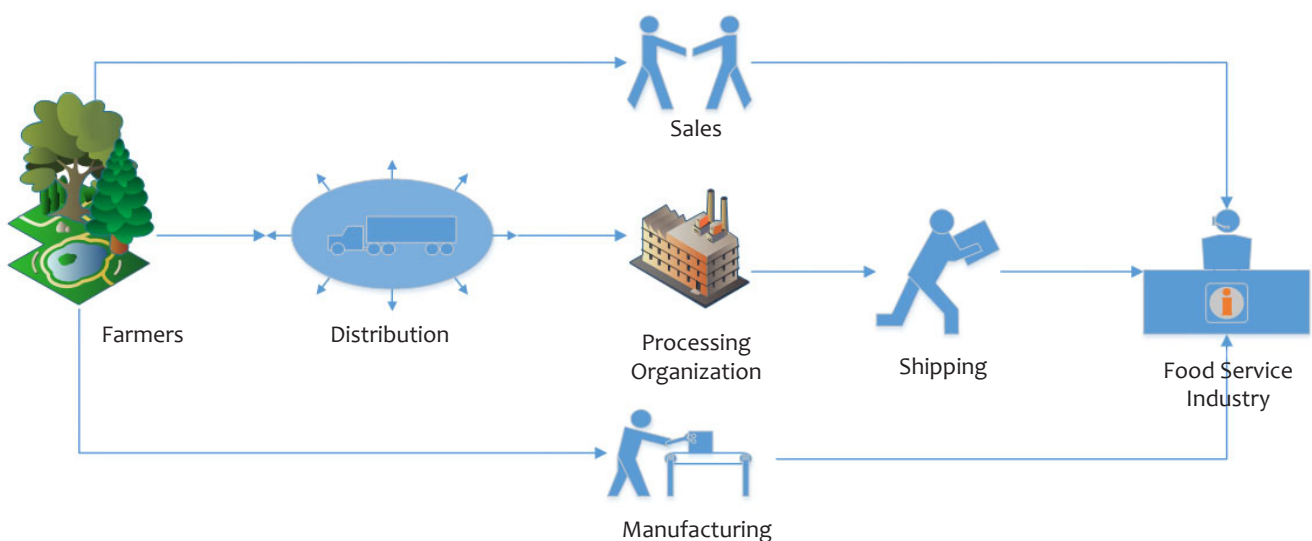
To prove hypothesis 1 ( $H_1: \mu > 60$ ), the economic dimension criterion with indicator 1 (economic indicators of food service industry) indicator 2 (measuring resilience back and forth along the supply chain).

To prove hypothesis 2 ( $H_2: \mu > 3.5$ ), criteria 2: ecological dimension is used, through analysis indicators 3 (measuring opportunities to use energy from renewable sources), indicators 4 (measuring the extent of carbon accounting and the impact it has on organisations) and indicator 5 (measuring environmental practices in logistics areas).

To prove hypothesis 3 ( $H_3: \mu > 75$ ) indicator 6 (Measurement of social impact regarding employees) and indicator 7 (Measurement of social impact regarding society) were used.

## RESULTS AND DISCUSSION

The object of the present study are commercial catering establishments at food service industry, including a survey conducted among 42 of the commercial food service providers in Bulgaria. Commercial food suppliers occupy a significant market share of food service industry worldwide. According to Eurostat data (Eurostat, 2022) in 2019, one out of every ten enterprises in the non-financial sector of Bulgaria belonged to those related to food service industry economic sectors. In terms of type of activity, about 61% of enterprises work in the field of commercial food services, accounting for 36% of turnover in the tourism sector and 58% of employment. Figure 1 shows the food supply chain service industry, which illustrates the main participants in the logistics processes.



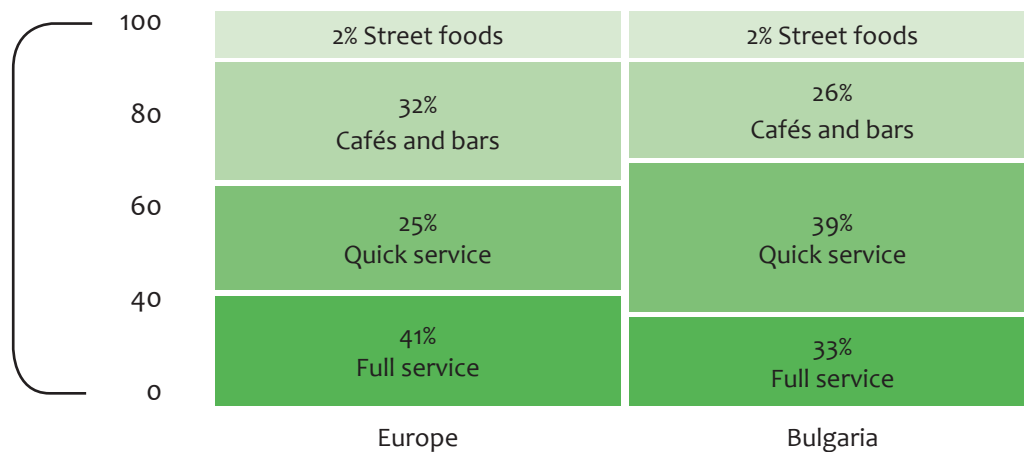
**Figure 1 Supply chain Food service industry (SCFSI)**

Food service industry on the territory of the Republic of Bulgaria is carried out only in establishments categorised under the Law on Tourism. Categorisation is carried out by the Minister of Tourism and by the mayors of municipalities or by officials authorised by them - for the types of objects and categories.

The survey research is aimed at commercial food services, which are a sub-sector of the food service industry. Commercial food services include street food, cafés and bars, quick service and full service, and the

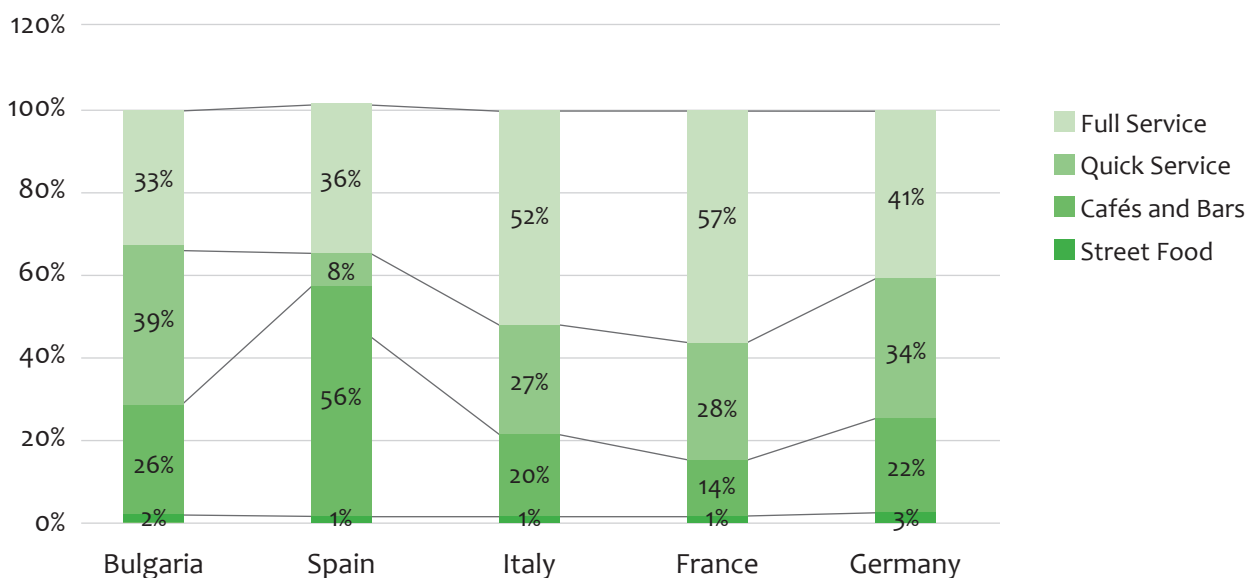
survey was conducted in the period March-May 2022. Survey data is benchmarked against European commercial food service providers. Data from October 2020 of Deloitte for was used Foodservice Market Monitor, which represent Foodservice industry presented in Figure 2. According to the Deloitte report, the segmentation of the commercial food service market is divided into the following types: Full service restaurant, Quick service restaurant, Cafés and bars and Street food.

In EU countries (Germany, France, Italy, Spain, and Bulgaria), by type of establishments, the data is presented in Figure 3. France and Italy have the largest number of full-service restaurants, and Bulgaria is in last place, with the largest share have the quick service establishments.



Source: Deloitte, Euromonitor, Allied Market Research and Statista, (Deloitte, 2020)

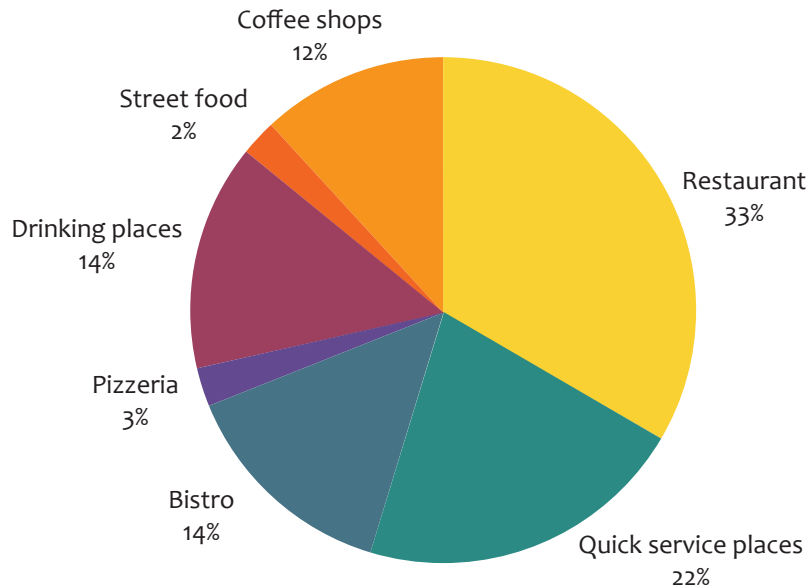
**Figure 2 Foodservice commercial food supplier data industry by type of restaurant for Europe and Bulgaria**



Source: Deloitte, Euromonitor, Allied Market Research and Statista, (Deloitte, 2020)

**Figure 3 Food service industry by type of establishments in EU countries (Germany, France, Italy, Spain and Bulgaria)**

For the purposes of this study, a total of 42 commercial food establishments were investigated in Bulgaria, including full service, quick service, cafés and bars, and street food. Figure 4 shows the distribution of the researched commercial food enterprises from the food service industry.



**Figure 4** Distribution of the investigated commercial establishments under food service industry included in the survey

According to the segmentation of the food market service industry restaurants are affordable dining and entertainment establishments that offer culinary and confectionery products, alcoholic and non-alcoholic beverages. Quick service establishments offer a limited typified assortment of culinary products and/or ready-made packaged goods, desserts, drinks - non-alcoholic and alcoholic, mainly through self-service. A combined form of service may also be offered. At the bistro, the kitchen production in the establishment is limited to cold and hot appetizers, grill and ala minuti, salads, soups, desserts. The preliminary process of food preparation is missing, i.e. pre-ready foods are used - semi-finished products. The a la carte menu includes hot drinks, soft and alcoholic drinks and beer. A pizzeria as a type of establishment differs from restaurants in that it offers different types of pizzas, spaghetti, lasagna, pasta, salads, desserts, etc., as well as alcoholic and non-alcoholic beverages. Drinking establishments offer a wide range of alcoholic and non-alcoholic drinks and snacks. Tipi restaurants street food offer a limited assortment of culinary products - salads, cold appetizers, fries, semi-finished grilled meats, sandwiches, burgers, sugar and chocolate products, nuts, ice cream. Cafe-patisseries are restaurants for additional meals, which offer confectionery, ice cream, pasta, non-alcoholic and alcoholic drinks.

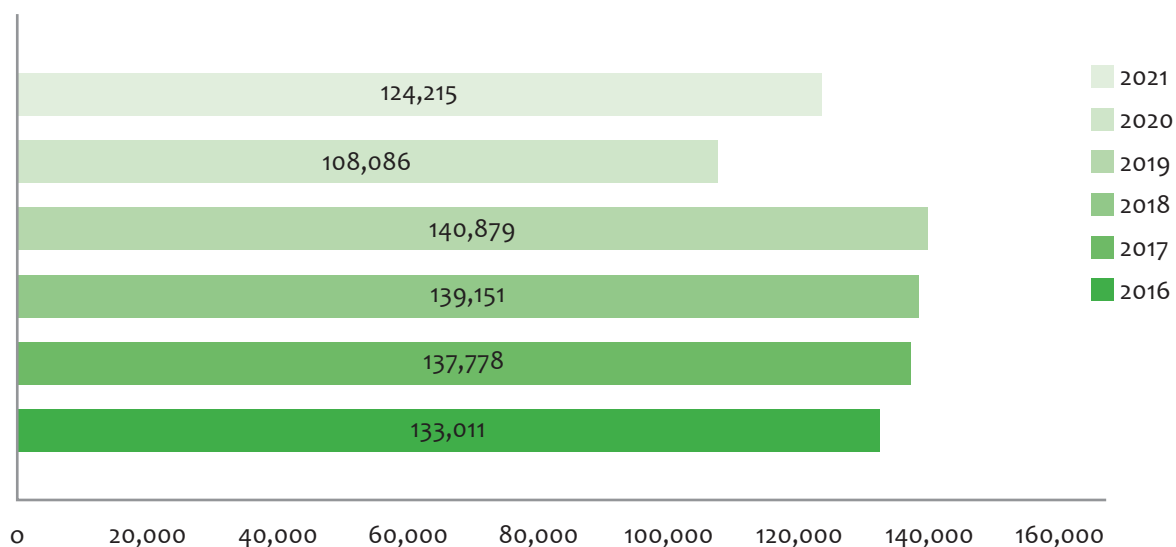
Constant changes in consumer eating habits are forcing changes across the entire food industry's supply chain, but food service industry is most affected by this. It is difficult to create a single, common food supply chain at the European or even national level. In recent years, logistics companies have been trying to form associations to provide food supply chain services across Europe. Despite this trend, the drive to cut costs at ever-increasing prices to which food suppliers are subjected along the distribution chain creates conditions for engaging small subcontractors and shortening the chain. As a result, a significant proportion of food deliveries to foodservice retailers are carried out by possibly small suppliers and private drivers, which significantly increases

the environmental impact not only in terms of emissions burned, but also covers materials, production, vehicle costs etc. To prove hypothesis 1 ( $H_1: \mu > 60$ ), the **economic** dimension criteria with indicator 2 (measurement of back and forth sustainability along the supply chain) is applied.

### Criteria 1: Economic dimension

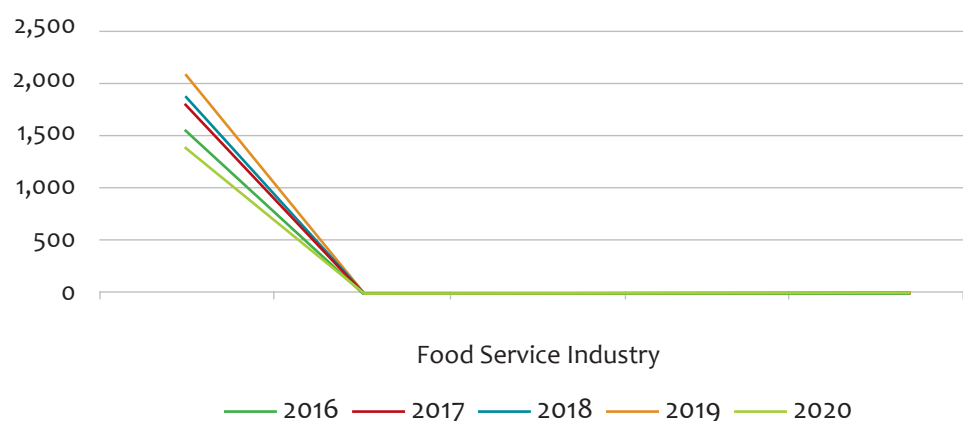
The economic aspect of sustainable development is seen as part of overall supply chain sustainability and includes the ways in which natural resources can be used efficiently and responsibly to ensure a decent standard of living without causing harm to the environment. The criteria of the economic dimension are related to the sector's potential for development and is aimed at achieving the economic viability of commercial food services in the food sector service. These criteria are a combination of the profitability of economic activity in the sector, GDP, employed persons and achieved turnover.

According to preliminary data, Bulgaria's GDP grew by nearly 4.0%, and GVA by 3.9% in the first quarter of 2022. compared to the same quarter of the previous year, according to seasonally adjusted NSI data. On average, 4,800 BGN per person of the population fall from the value volume of the indicator (National statistical institute, 2022). Food service industry is among the group of sectors that brought the highest GDP for Bulgaria in 2019, and in the period 2020-2022 the pandemic has significantly changed the sector and reduced economic growth. For 2020 the data show that the relative share of enterprises from the Food service sector industry have a decrease, correspondingly, a decrease in the number of employed persons in the sector. The overall contribution of food service industry to GDP amounted to 3.6% in 2020. Figure 5 presents data on the number of employed persons in the Food service sector industry for the period 2016–2020 for Bulgaria. The drastic reduction in 2020 is due to the consequences caused by the Covid-19 pandemic, which strongly affects commercial food services, due to the measures of a direct ban on working with customers on site for a long time and the impossibility of working remotely. In 2021 there is an increase and smooth recovery of commercial food service positions and the number of employed persons. The forecast for the dynamics of employment in 2022 is mainly influenced by the expected development of the economy, as well as by the flow of Ukrainians who have sought temporary or international protection on the territory of Bulgaria.



**Figure 5** Number of employed persons in the Food service sector industry in the period 2016–2021 in Bulgaria according to NSI data

In the Food service sector industry in total, a negative financial result of BGN 40 million was reported for 2020 in Bulgaria, presented in Figure 6. This is caused by the continued restrictive measures caused by the Covid-19 pandemic.



**Figure 6 Added value - BGN million in the Food service sector industry in the period 2016-2020 in Bulgaria (according to NSI data)**

The Food service sector industry began to recover from the pandemic at the end of 2021, but the conflict in Ukraine has an impact on the recovery of the economy in Bulgaria. The problems in this case are of a different nature and directly affect the production of food resources and strongly influence food prices. According to estimates made by the Institute of Economics and Policy (2021), the increase in the cost of final consumption of products produced by the Food service sector industry, leads to growth of gross output in the economy by 1.67 units. From the point of view of added value, every additional BGN that is spent in the Food service sector industry, leads to an increase in the added value in the economy by BGN 0.73, of which BGN 0.34 represents compensation for employees. In terms of employment, every BGN 1 million additionally spent in the sector creates 110 new jobs (Institute of Economics and Politics, 2021).

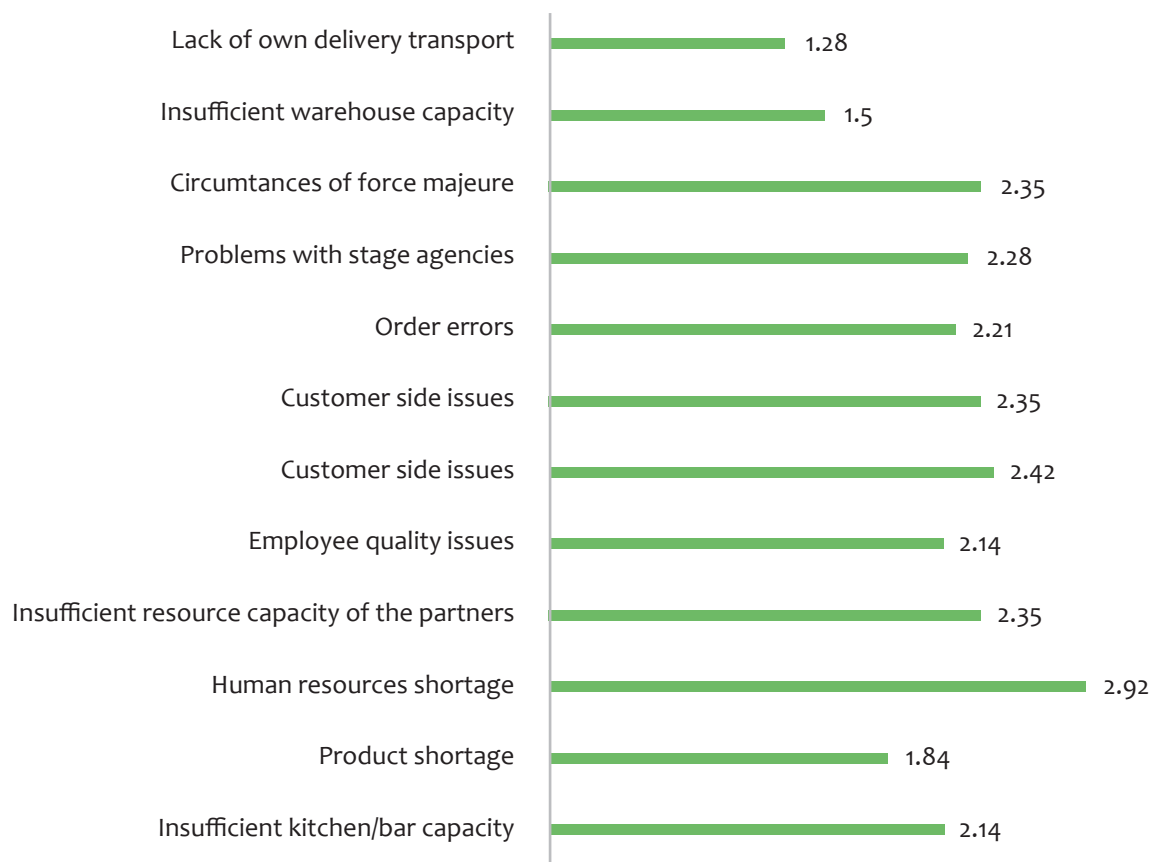
Compared to EU member states in April 2020, Bulgaria reported a lower decline in the Food service sector industry, measured by the turnover index. It is a basic indicator for evaluating the current state and short-term trends, tracking the dynamics in the demand and supply of food services, taking into account the influence of the current economic processes in the country. According to the latest data published by Eurostat for the second quarter of 2022, the turnover index in Bulgaria is 26.1%, compared to 2021, where, according to calendar adjusted data, the index shows a decrease of 31% in the Food service sector industry. Only Romania reports a lower decline of 23.2% (Institute of Economics and Politics, 2021).

The application of sustainable economic practices in commercial food services in Bulgaria is poorly developed, as there is a lack of a comprehensive strategy to support the sector and achieve equality back and forth along the food supply chain. It is necessary to direct economic measures to investments in environmental protection and improving the positions of commercial food chains, by using new technologies to increase customer satisfaction and improve the quality of services.

In order to achieve economic sustainability in commercial food chains, it is necessary for companies to have greater efficiency, which includes the application of innovative technologies and modern methods of supply chain management.

Looking at the food supply chain, its participants represent all the companies and organisations with which foodservice traders interact directly or indirectly through their suppliers and customers (back and forth) from the moment of supply of raw materials and products to the moment of consumption/consumption of the product. The relationships they have back and forth along the supply chain in commercial food services can help determine sustainability through interrelated commercial relationships. According to the main and specific characteristics of commercial food services, they can be considered to have balanced inbound and outbound logistics, which means that they receive supplies from multiple suppliers from different locations and create products for a large set of customers with different locations and with high requirements on the service.

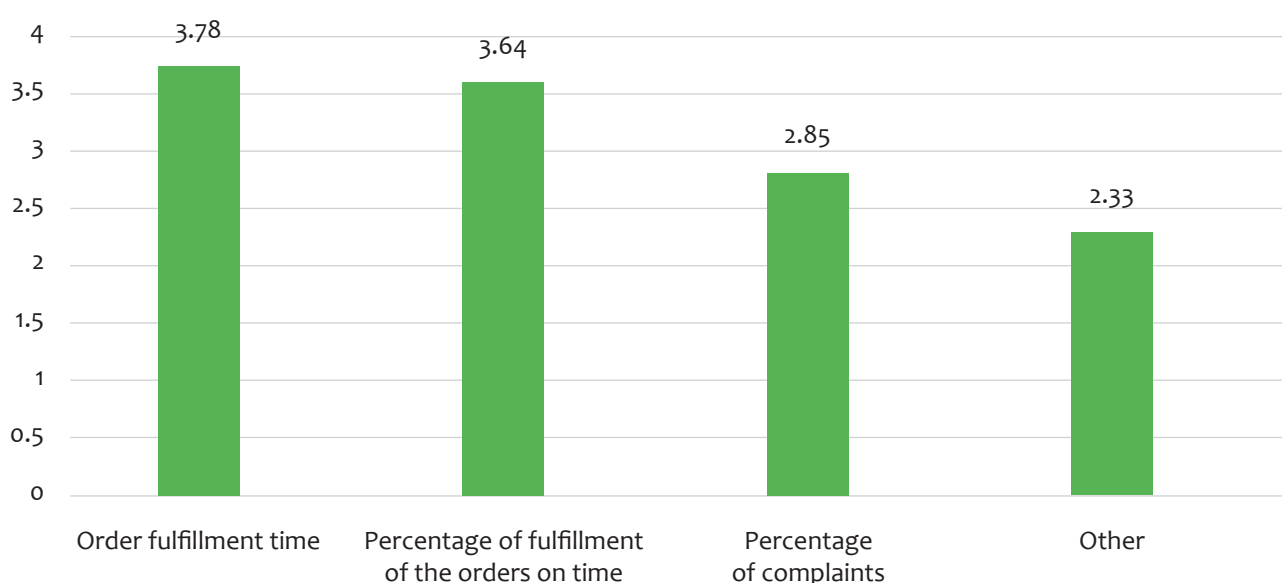
To measure the sustainability of the food supply chain, an indicator will be used to assess partnership and cooperation forward in the food supply chain. Forward supply chain relationships in commercial foodservice encompass customer relationships and reflect sales to customers. It is important to identify who are the actors further along the supply chain. These are the commercial food service customers. Every food establishment maintains regular customers which are close to 25–45% of customers. The main customers of food service industry are adolescents, young people, families and employees of organisations and enterprises. Consumer foodservice recorded a significant increase globally in 2021 compared to 2020, driven by the Covid-19 pandemic. Cooperation further along the food supply chain is determined by customer satisfaction and customer service level ratings. According to the analysis of the survey data, customer dissatisfaction is not caused by factors related to logistics activities, but due to the shortage of human resources and service personnel, which is presented in figure 7.



**Figure 7 Reasons for customer dissatisfaction**

The demand for personalised innovations in food is growing service industry, the trend is the use of QR codes for menus. Customer service is the ultimate goal of the logistics process and as such is crucial to optimising the results of the previous phases. Critical to sustainable customer service in commercial foodservice are logistical decisions related to product availability, freshness and turnaround time. It is also necessary to implement indicators for planning and evaluating the level of customer service, as well as systems for effective customer response (ECR) and quick response systems (Quick Response). This shows the need to increase customer satisfaction, which will create the conditions for sustainability further along the commercial foodservice supply chain.

Figure 8 shows the extent of the indicators used for planning and evaluating the level of customer service in commercial food services, according to which the included indicators are poorly applied into practice.



**Figure 8 Degree of indicators used for planning and evaluating the level of customer service in commercial food services**

To the greatest extent, the sustainability of the forward supply chain is determined by assessing the level of service in commercial food chains. Commercial food services show an extremely low rate of indicators used for planning and evaluating the level of customer service in commercial food services. According to the data, the order fulfillment time and on-time order fulfillment rate are used. It is observed that many of the commercial food services are trying to reach the customers closer by preparing meat food at affordable prices. Food service industry is becoming increasingly digital by using modern technologies. For example, using a digital menu will give a better return on investment as it is easily updated and does not incur additional costs. According to the research data, 42.9% of deliveries from the establishment to the customer are made with own transport, 28.6% use hired transport, and 28.6% use the supplier's transport. The use of digital menus is implemented by only 10% of the restaurants surveyed. Data from NSI show that 89.7% of food service market provide Internet access to

their customers in 2021, of which 32.1% provide a connection with a data download speed  $\geq 100$  Mbps. Creating an online ordering system will also create an opportunity to track the order and make them more accurate, reducing the risks of errors. In 2021 according to NSI data, deliveries to customers' homes from restaurants, fast food chains and catering ranks in fifth place with 18.9% of e-commerce in Bulgaria.

Partnership and collaboration backward in the supply chain is used to measure the sustainability of the food chain. This mainly includes relationships with food suppliers. Commercial food services at food service industry use various sources of supply of raw materials and products, the most common practice being the inclusion of intermediaries for supplies, and a small number use direct contacts with manufacturers from the country and abroad. A large percentage of deliveries are also carried out through the commercial chain in the country. This shows a lack of lasting contacts and a lack of resilience further down the food supply chain. According to the length of their relationships, commercial food services at food service industry strive for long-term relationships, which can create resilience back down the chain, but still supplier relationships are 57% over three years. The delivery of food products to commercial food establishments is done every day or every other day of short-life and long-life food products. In addition to food products, in commercial food services, packaging materials, additives, spices are delivered (every week), and tableware is delivered every month. According to the research data, nearly 93% of deliveries are made by supplier transport.

A trend that is increasing supply chain resilience is chain shortening. This can create advantages in building direct links and lasting relationships with producers, by sharing information about product quality and food durability. It can also increase the supply of fresh and healthy food. Producers often do not share information with commercial food service providers, their development and growth plans, and do not take joint planning actions. Information sharing can increase the resilience of the food supply chain. On the other hand, increasing customer requirements for a healthy way of eating necessitates the introduction of gluten-free foods, low-fat or organic products, which can lead to an expansion of the food supply chain service industry. Well-developed forward and backward food chains can increase the sustainability of commercial food services, so it is necessary to carefully consider the relationships backward in the chain.

Research data shows that commercial food services they do not use one-off suppliers, but look for longer-term cooperation, which is an indicator of the sector's desire to increase sustainability in the supply chain. Only 7% of respondents use one provider, 28.6% use between 2-5 providers and the same number use between 5-15 providers. With 21.4% of respondents using more than 20 suppliers, this probably creates difficult control of incoming materials and products, and it would be difficult to create lasting relationships with all suppliers and long-term sustainability.

In terms of the methods used to purchase the products, 85% of the retailers surveyed order based on available stock, followed by ordering at periodic intervals. Based on a predetermined optimal size and based on past experience, a small number of food establishments order the products, and in practice no schedule is applied. This can create conditions for food waste to be lost, which will have an impact on the environment. The carbon footprint of food waste is highly valued by various organisations. Inadequate transport networks or incorrect conditions of temperature control and humidity can cause spoilage during transport of food products. One of the common causes of greenhouse gas emissions is the distribution and transportation of food. Therefore, food loss not only means that resources are wasted, but the greenhouse gas emissions it produces also have dangerous effects and would be one of the main areas of focus for socio-economic development. With good cooperation back along the supply chain, transport routes can be significantly optimised and greenhouse

gas emissions can be reduced accordingly. With regard to sustainability from ch.t. food wastage and food waste were evaluated at the level of marriage and complaints. According to the research data, marriage is greatest in product sourcing and delivery and significantly less than customer complaints. Expired product is rarely discarded in commercial food services. This shows that there is a need for enhanced inbound logistics in commercial food services. Food waste along the food supply chain service industry are mainly due to poor transport networks, lack of storage techniques, improper temperature and humidity conditions, unplanned longer routes and delays in transit.

To prove indicator 2 (measuring sustainability back and forth along the supply chain), Table 2 presents a comparative description of the forms of partnership and cooperation in commercial food services and the food industry in Bulgaria.

**Table 2 Cooperation forms back and forth along the food supply chain**

Cooperation forms	Commercial food service (%)	Food industry (%) (2019) (Vodenicharova, 2020)
With similar companies	49	51
With customers	21	56
With suppliers	59	62
With freight forwarding and transport Companies	13	22
With sales and distribution companies	32	43

The areas in which commercial foodservice collaborate back and forth in the supply chain are best developed in collaboration with similar companies and suppliers. Poorly developed relations with customers are due to the peculiarities of food service industry. The low degree of indicators of planning and evaluation of the level of customer service, and of the forms of partnership and cooperation back and forth along the supply chain, prove hypothesis 1 that economic practices for sustainability in the food supply chain at food service industry and commercial food services in Bulgaria are below 60%, which means that they have a low degree of application. The hypothesis is proven that at the present time the sustainability of the food supply chain at food service industry are not sufficiently developed. No lasting links and relationships have been established back and forth along the food supply chain. Transport costs are also high due to the frequent deliveries that need to be made. From the research, it can be concluded that well-developed links along the food supply chain in commercial food services at service industry can increase the sustainability of the entire chain.

### **Criteria 2: Environmental dimension**

Criterion 2 considers the environmental dimension and emphasises three indicators. The first indicator is related to the degree of use of energy from renewable sources, the second to the degree of accounting for carbon emissions, and the third to the application of ecological logistics practices among food service industry. These three indicators are directly related to each other and their purpose is to show to what extent the considered establishments are committed to the ecological aspect of sustainable development in food supply chains and whether they apply innovative solutions in this direction.

The extent to which renewable energy is used in commercial food services at food service industry according to the research data is extremely low. The average score given by the respondents was 1.71. This result indicates a very low use of energy from renewable sources, or no mention of the extent of such use, as there are required legal minimums for the use of such sources by legal entities. Of these, half of respondents said they use no renewable energy at all, and 45% said they use a little. Only 5% indicate a high level of use, which may be a sign of business innovation and initial adoption of such sources, which may also be enhanced by fuel supply uncertainty in the past year. This 5% can also be considered for the organisations that actively use energy from renewable sources. For comparison, according to statistics from Eurostat for 2020 in Bulgaria, the average level of energy used from renewable sources is 23.3%. This shows that in commercial food services at food service industry in Bulgaria, the use of energy from renewable sources is not only very low, but also significantly below the national average. In order to improve the sustainability of these services, it is good to use innovative technologies that can be applied in different areas such as the use of alternative fuels in transport, the use of energy from renewable sources in specialised modes of food storage and production processes, etc.

Along with a very low rate of renewable energy use, commercial food service providers do not account for the carbon emissions of their operations. This is very worrying given the fact that in many sectors of the economy, similar measurements are already observed, for example in transport, food production, etc., which are part of the food supply chain. Measuring carbon emissions or the carbon footprint of a given activity is becoming a trend in many sectors such as transport, banking, tourism, manufacturing, etc. In food service industry in some countries even measuring the carbon footprint of a particular food or drink. In this regard, it would be beneficial for the sector in Bulgaria to start developing this kind of innovative and sustainable service, which is supposed to become more and more demanded by customers as well. Short supply chains are a prerequisite for reducing precisely this carbon footprint, as well as organic and local production of certain foods.

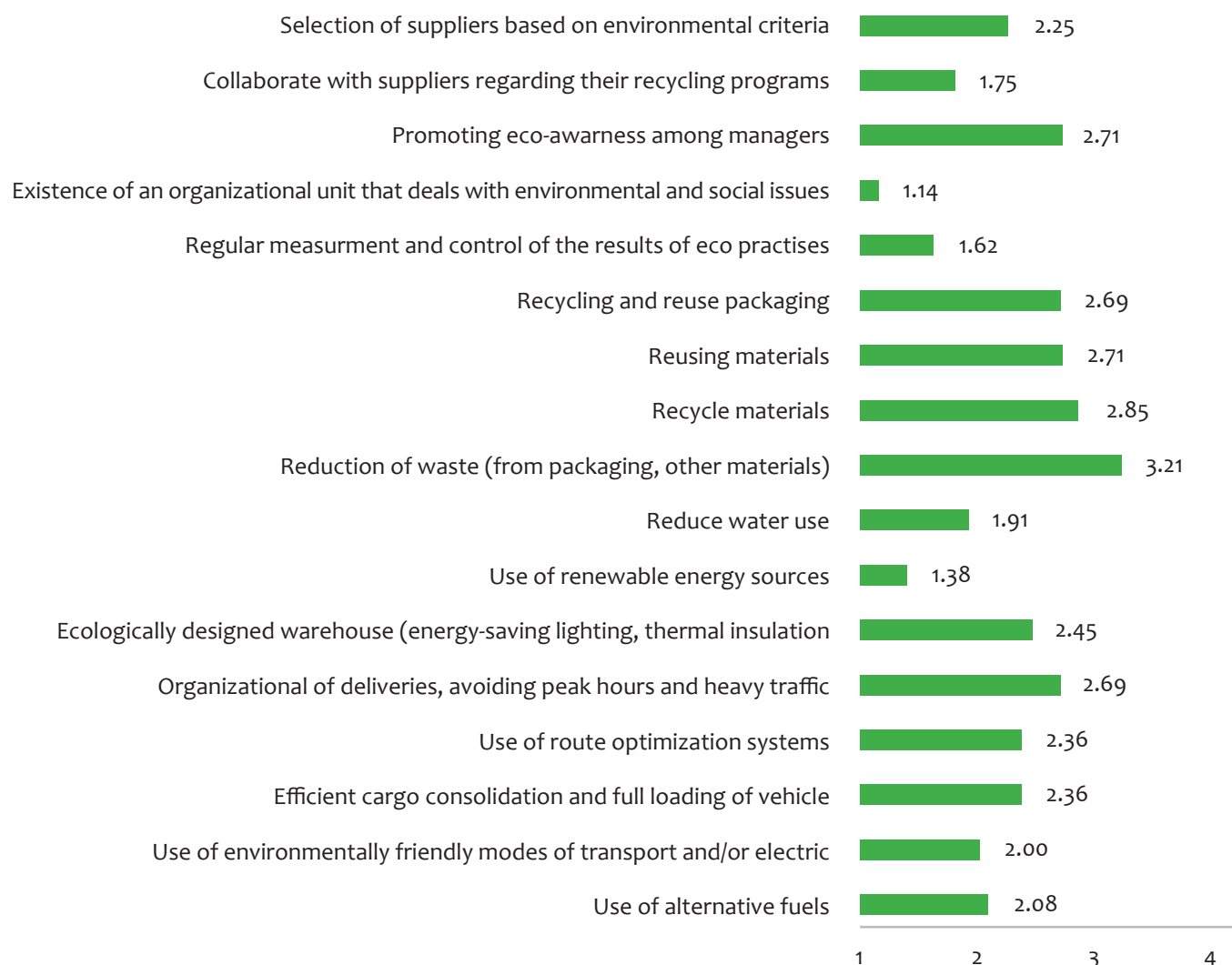
However, 29% of respondents indicate that they have a strategy to reduce harmful emissions. This may mean that some food service retailers are beginning to understand the importance of sustainable development strategies and have the desire and intention to introduce and implement them, but do not carry out activities to measure them.

The lack of a strategy for sustainable development in the food sector service market can be a problem because without a clear long-term vision and measurement indicators, it would be difficult to assess the progress and effect of implementing sustainable practices. According to the data, indicator 4 (measuring the degree of carbon accounting and the impact it has on organisations) also shows a low level of carbon accounting and a corresponding lack of a clear strategy for the sustainability of commercial food services.

Figure 9 shows that ecological practices in food service industry in the field of logistics are applied to a weak degree. The only practice with an average score above 3 is reducing waste from packaging and other materials.

This shows that the sector is lagging behind in the implementation of environmental practices and there is little interest in this area. These results also show the wide opportunities for the development of the sector through the introduction of some of the practices or the strengthening of their use. Simple organisation of deliveries and use of route optimizations systems for example can significantly increase the degree of sustainability in food service industries, simultaneously reducing costs and the level of carbon emissions from the activity.

All the low average scores according to criterion 2 (environmental deminsion) also confirm hypothesis 2 about the low application of environmental practices in food supply chains.



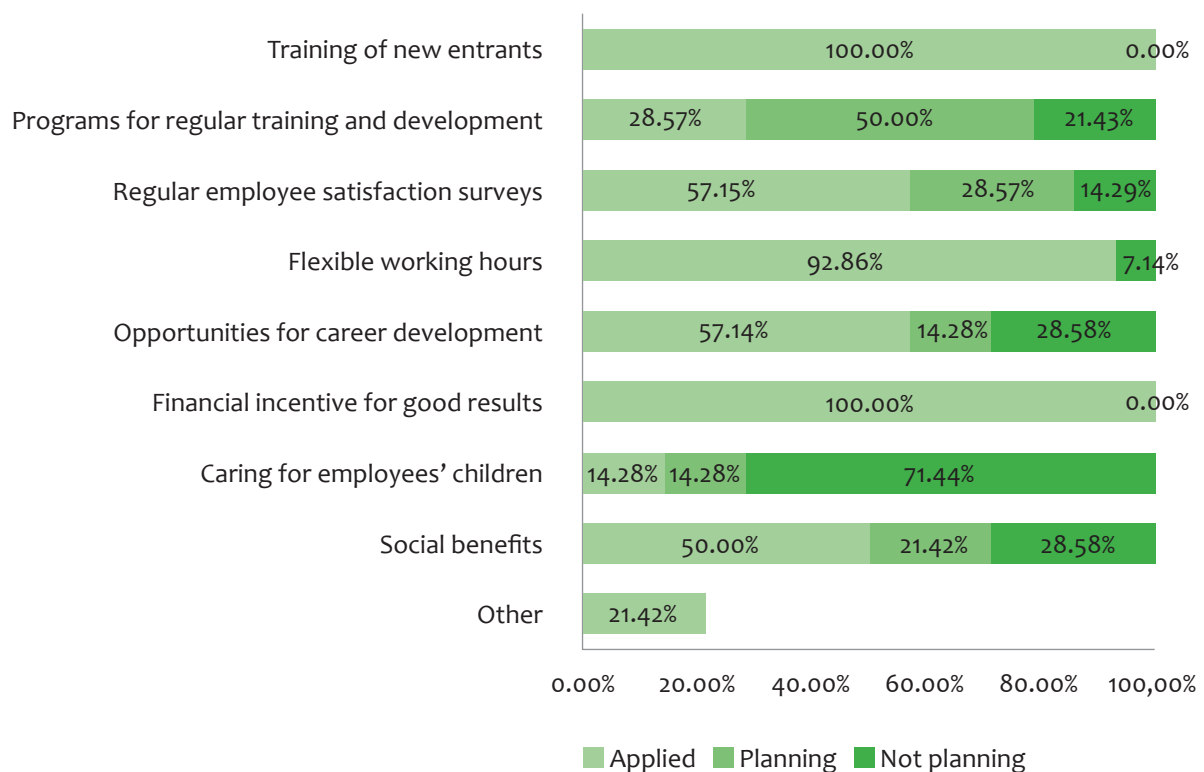
**Figure 9 Degree of application of ecological logistics practices in commercial food services in Bulgaria**

### Criteria 3: Social dimension

Regarding the social dimension, two types of indicators are taken into account, which are related to employees and society. Figure 10 presents the measures that commercial food service providers apply to their employees in terms of whether they do or plan to do so in the future. The most applied measures that are observed are training of new entrants, financial incentives for good results and flexible working hours. The training of new employees is a mandatory element according to the Bulgarian legislation, but on the other hand it can be seen that only about 29% of the respondents have programs for regular training and development of the staff. However, the trend is to improve this indicator, as half of the establishments are planning such programs, which can help to retain and develop staff in the sector, which traditionally has a higher turnover and seasonality. Such staff retention and development would lead to increased levels of customer service and employee satisfaction in the long run. More than half indicate that they give employees the opportunity for career development, which is a good indicator, but about 21% of those surveyed do not foresee such an opportunity, which can be

demotivating for staff. Figure 10 presents the measures applied to employees in commercial food services in Bulgaria. Impressive is the very high percentage (around 71%) of establishments that do not offer and to a very small extent plan for future care for employees' children. This sustainable social practice is characteristic of highly skilled and highly paid sectors of the economy, which shows the still lower positioning in this respect of food service industry.

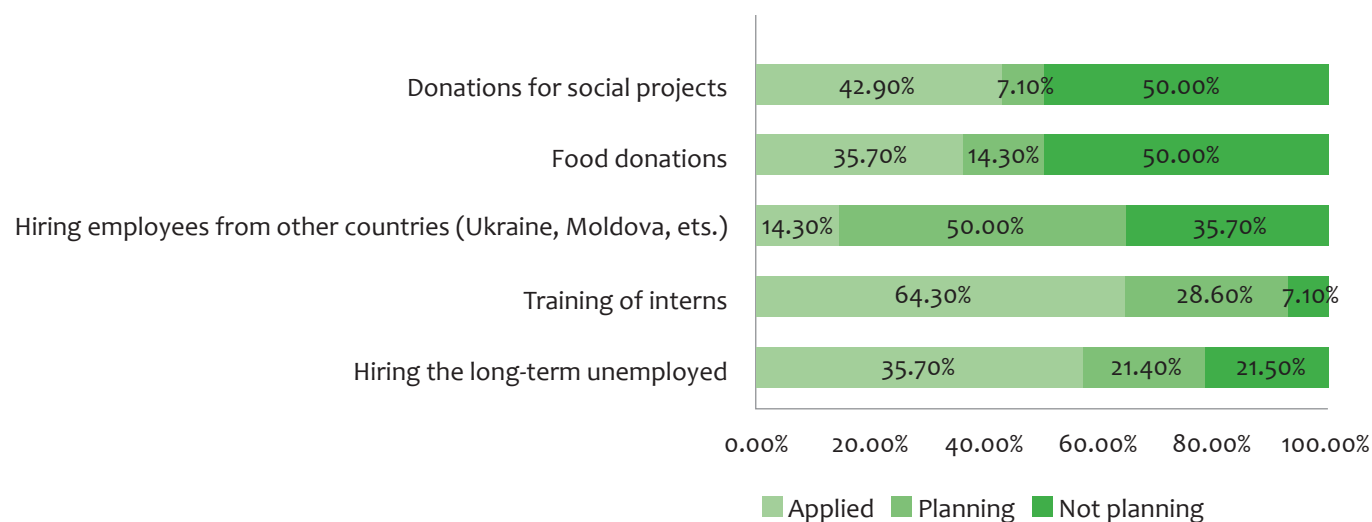
Indicator 6 (measuring the social impact in relation to employees) shows that establishments implement some of the measures in relation to employees to a very large extent, but there are also very large opportunities to improve social sustainability through the application of innovations in employee training, supply of social benefits to improve employee satisfaction and others.



**Figure 10 Measures applied to employees in commercial food services in Bulgaria**

The second important group of social indicators is related to society and the influence of food supply chains in the public sector. A lower level of implementation is noticeable here, but nevertheless training trainees and hiring the long-term unemployed are implemented by more than half of the respondents, and a large proportion of the rest plan to introduce these measures. It is noted that half of the respondents are not inclined to donate to social projects and food products (Figure 11), which would contribute not only to better social contribution and market positioning, but also help to reduce possible food waste resources.

Indicator 7 (measurement of the social impact in relation to society) shows that to a certain extent measures are implemented in favour of society, but here too opportunities for improvement in the social aspect are revealed by increasing food donations and for specialised projects that would help to reduce food waste and reduce food waste.



**Figure 11 Measures applied to society in the commercial food service sector in Bulgaria**

Regarding criterion 3 related to social dimension we can conclude that measures are implemented that directly affect the fulfillment of legal requirements, increase access to personnel for companies and contribute to employee satisfaction. However, there are many opportunities to improve working conditions and contribution to society so that the sector is socially sustainable.

Most researched authors are united around the belief that the goal of a sustainable supply chain can increase competitiveness and profitability for food chain organisations (Beske-Janssen et al., 2015; Ansari & Kant, 2017; Govindan, 2018). Therefore, back and forth collaboration along the supply chain aims to increase the overall efficiency and effectiveness of the supply chain and sustainability in the three dimensions. From the research, it can be concluded that the implementation of sustainable economic practices in commercial food services in Bulgaria is poorly developed, as there is a lack of a comprehensive strategy to support the sector and achieve equality back and forth along the food supply chain.

Analysis shows that from the sustainability assessment made in commercial food services back and forth in the supply chain, it is necessary to implement the logistics decisions related to the availability of the products, their freshness and the time to replenish stocks. It is also necessary to implement indicators for planning and evaluating the level of customer service, as well as systems for effective customer response (ECR) and quick response systems (Quick Response).

Research data shows that there is a need to increase customer satisfaction, which will create the conditions for sustainability further along the commercial foodservice supply chain. The wide scope of the supply chain and the introduction of new technologies are the reason for the development of various forms of cooperation. The more important ones that have a significant impact on food service industry are the relationships with companies providing services for the management of quality and safety systems, the wide application of tracking and tracing systems in the supply chain. This indicates that well-developed food chain linkages can increase resilience back and forth along the chain.

It becomes clear that the pressure from consumers and legislation towards food service industry to be more sustainable in terms of the environment, economic development and social responsibility (Yudawisastra et al., 2022).

Many companies have adopted sustainable development as part of their strategic vision, but implementation measures need to be stepped up.

The research proves the thesis that the well-developed links along the food supply chain in commercial food services at food service industry can increase sustainability back and forth in the chain, which is why it is necessary to introduce sustainability measures, through innovative technologies, with a view to aligning them with achievements, global trends and the increased demands of consumers to ensure sustainability. The results show that the lack of commitment and social responsibility of stakeholders in the supply chain may limit the application of sustainable food supply chain model. Additionally, a lack of cooperation within the food service industry may prevent some participants from accessing innovative technologies.

## CONCLUSION

The consequences of an ever-changing global world set guidelines for new approaches and methods to achieve sustainability in the food supply chain. These approaches and methods are related to new technologies, digitalisation, back and forth of the supply chain. The food service industry can receive funding from the National Plan for Recovery and Sustainability of the Republic of Bulgaria (NPVU), approved by the European Commission. The plan is structured in four pillars with an implementation period of 2022-2026. Each of the pillars is aimed at sustainability and includes an innovative, green, connected and fair Bulgaria. Given the context of the energy crisis that is conquering Europe and the world, it is necessary to take measures to use renewable and sustainable sources of energy in the sector. The Recovery and Resilience Plan envisages the construction of sustainable capacities and the service food industry may be a potential beneficiary. Another measure under the Plan is increasing energy efficiency in buildings in the trade and services sector, which is also a good opportunity for the food service industry. The economic dimension of sustainability in the supply chain in the food service industry needs to be improved using modern innovative approaches. Under the “Innovative Bulgaria” pillar, it is planned to provide targeted support in the form of grants and financial instruments to Bulgarian enterprises to facilitate their transition to a digital, low-carbon and resource-efficient economy. The creation of Fund 1 “Recovery and growth” and “Innovations”, the opening of a procedure for technological modernization, a grant scheme for ICT solutions and cyber security in SMEs, the creation of Fund 2 “Green transition and circular economy” aimed at improving energy efficiency is foreseen. These are all opportunities that the food service industry should use to build a sustainable and innovative supply chain. Limitations are related to the research object. The conducted study is directed only at the supply chain of commercial food services in the food service industry in Bulgaria, excluding from the study non-commercial food services. Future research by the authors on commercial food services in the food service industry is related to a more in-depth examination of food fraud and food waste, where the emphasis is on waste generation and its reduction in food supply chains. A more specifically crucial area of study for sustainability is efficient reuse, recycling, excess sale, and byproducts from the food supply chain. The evaluation of food miles and carbon effect of logistics activities could offer options for environmentally friendly food distribution, logistics, warehousing, and transportation. The authors believe that the present study could be extended by examining all European countries, comparing them, and delineating trends. Due to the broad importance of the subject of food supply chains, interdisciplinary research could be done on the interaction between the food service industry and health and social services, farmers, local non-governmental organisations, and others. And last but not least, the authors are interested in researching food fraud in supply chain management.

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