The Role of Food Sharing Applications (FSAs) in Supporting Food Waste Mitigation in Cities – Examples from Poland and Czechia

Magdalena Pączek, Mateusz Rusin, Filip Bolicki, Daniel Straub, Magdalena Kubal-Czerwińska
Institute of Geography and Spatial Management
Jagiellonian University, Kraków, Poland
email: magda.paczek@student.uj.edu.pl, mateusz.rusin@student.uj.edu.pl, filip.bolicki@student.uj.edu.pl, d.straub@doctoral.uj.edu.pl, magdalena.kubal@uj.edu.pl

***Abstract*— The current problem of reducing food waste is becoming the subject of frequent political debate in the international arena. Researchers of global changes in the natural environment, as well as representatives of national, local, and non-governmental organizations, realize, as part of their activities, that a large amount of food cannot be saved. This increased attention is not surprising, as food is a basic need. Online platforms and mobile applications contribute to the redistribution of food saved thanks to modern information and communication technologies. Online platforms and application connect local entrepreneurs and the catering sector with their customers directly, changing the way food distribution works. Our research includes a food sharing application (FSA) as one of the practical solutions, in the business to customer (B2C) model, which directly connects catering or food retail facilities with the customer, supporting food waste mitigation in cities, on the example of FSAs used in Poland and Czechia. Based on data on localization and the type of food saved in specific areas of selected cities, it was possible to determine the regularities of the spatial distribution of food places and their relation to socio-demographic characteristics. Using their localization pattern, we were able to draw a picture of the food saving opportunities of catering facilities, operating through the B2C (business to customer) marketing model. Additionally, attitudes and opinions about joining FSAs, will be discussed along with the benefits and disadvantages of participating in similar initiatives.**

Keywords-food sharing applications (FSA); food waste; food waste mitigation; Poland; Czechia.

I. INTRODUCTION

Today, the problem of reducing food waste is becoming the subject of frequent political debate in the international arena. Researchers of global changes in the natural environment resulting from the waste of food products, as well as representatives of national, local governmental and nongovernmental organizations, realize, as part of their activities, that a large amount of food wasted can no longer be saved. This increased attention is not surprising, Despite being a basic need food is wasted in large quantities at all stages of the food supply chain [1]. Local initiatives to collect, manage, and share surplus food have been facilitated by the development of emerging information and communication technology, such as online platforms and food sharing applications (FSA). Although food sharing is often discussed as a potential improvement to the food system, empirical research is still scarce, and few researchers have explored the reasons why practitioners, including trade and service entities, join food sharing initiatives. Food sharing initiatives are often considered transformative at various scales (national and regional food banks, church organizations, or small local eateries).

Geospatial information systems support many aspects of geospatial data collection, presentation, processing, visualization, sharing, and management, and provide information on many geo-environmental hazards and how to manage them sustainably. GIS (Geographic Information System) environments today enable food waste management and modelling [2][8][9] by providing actors focused on food waste management tools for mapping food waste locations based on waste types, waste quantities, and other variables, which will improve the management of this problem on a daily basis and in the long run [3][4]. A database or GIS system can provide information on waste locations on large scales ranging from general city maps to detailed maps of food waste in specific areas [5]. By using GIS tools on a regional to national scale, it is possible to combat food insecurity and promote social justice [6][7][11]. GIS (Geographic Information System) tools, such as geotagging, geofencing, cluster analysis, and geoprocessing frameworks, can solve the social and environmental problems of food waste [9][10]. Through GIS (Geographic Information System) environments, food waste application developers assist in localizing specific entities that offer food at a reduced price, while users of those applications can see what food they can purchase and where it is available, helping to minimize food waste.

With the development of modern information and communication technologies, such as online platforms and mobile applications, food is being redistributed online by connecting local entrepreneurs and the catering sector with their customers directly, e.g., TooGoodtoGo (the United Kingdom, Denmark, Germany, Poland), Foodsi (Poland), Karma, (the United Kingdom), Nesnezeno (Czechia), Olio (the United Kingdom), as well as donors with charities (Italy: BringTheFood, the United Kingdom: Olio). FSAs, whether profit and non-profit orientated [12], change the way food distribution works, from linear (production to supermarket/restaurant to consumer) to network (e.g., customer to producer) [13]. In the market, there are already various digital platforms for reducing food waste and sharing food (internet platforms, mobile food applications) and their essential relates, among other, to communication [14].

 ISBN: 978-1-68558-079-7

Our research includes food sharing applications as one of the practical solutions, in the B2C model, to food waste. Food sharing applications communicate about available food for consumption, directly connecting catering facilities or food retail facilities with the customer, supporting food waste mitigation in cities, on the example of such applications from Poland and Czechia.

II. RESEARCH QUESTIONS

In our analysis of the FSAs used by gastronomic facilities (e.g., restaurants, cafes, etc.) and food stores, located in selected cities of Poland and Czechia, the following research questions emerged:

- What is the access to food from the apps in the selected cities in Poland and Czechia?
- What kind of food is saved in those cities?
- What are the regularities of the spatial distribution of gastronomic facilities in the selected cities (and the connections with the socio-demographic aspects and functions of the city)?
- What picture of food-saving opportunities in the city emerges from their spatial distribution?
- Are there city districts where the food cannot be saved from waste through the use of food apps?

III. METHODOLOGY

To provide the answer to these research questions, two-step data collection methods were implemented. In the first stage, the investigators, trained to prepare a required database, collected data for analysis using three FSAs: Foodsi and ToGoodToGo for Poland; Nesnezeno for Czechia. The data was collected between September 2022 and January 2023. The investigators collected 1246 records corresponding to broadly understood facilities from the catering industry (e.g., restaurants, hotels, cafes, bars, etc.) and establishments related to the food trade (gas stations, grocery stores, bakeries, confectioneries, etc.) from 4 urban regions in Poland: Warsaw, Cracow, Poznan and cities that are part of the Upper Silesian-Zaglebie Metropolis and 2 cities from the Chechia: Prague and Brno. All the records collected from selected urban regions were merged into one database. During this process, some facilities repeated in the database because they were present in both Polish FSAs. This was the case with 51 records, The duplicates were removed from the final dataset. This means that the final database contains in total 1195 records. Regarding the study area, these are all large urban centres of a multifunctional character, to which Poles and Czechs migrate, among others, to study and remain, supplying the labour market. These are well-known international centers, cosmopolitan centers with the rank of European cities, whose inhabitants are usually characterized by higher education and employment in the service sector. Warsaw, Cracow, Prague, and Brno are also well-known urban centers, historical cities with long tourist traditions, visited year by year by an increasing number of domestic and international tourists. A large group of residents of these urban centres are also expats who come to Warsaw, Cracow, or Prague to join the ranks of employees of international corporations [15; 16]. The collected databases were combined for further quantitative and qualitative analyses. In the data collection process, special attention was paid to obtain information on the location of catering facilities and grocery stores, the type of facility, the type of food saved from waste, the characteristics of the facility in terms of ownership, etc.

As part of the second stage of research, qualitative data will be augmented with quantitative data to identify attitudes and opinions among owners of catering facilities and food entrepreneurs. In addition to the benefits and disadvantages of participating in similar initiatives, we discussed attitudes and opinions about joining the food protection program through food sharing applications.

IV. RESULTS

The current stage of research ended with the acquisition of information on the location and characteristics of facilities participating in food-saving activities by selling products that are past their best-before date directly to customers using mobile application channels. Based on data on localization and the type of food saved in specific areas of selected cities, it was possible to determine the regularities of the spatial distribution of food places and their relation to sociodemographic characteristics. Using their localization pattern, we were able to paint a picture of the food-saving opportunities of catering facilities operating through the B2C marketing model. The most numerous restaurant facilities in the food sales program that use the FSA are those providing services for the preparation and sale of ready meals, such as restaurants, cafes, and buffet hotels. Another group of facilities are shops, including neighborhood greengrocers, bakeries, and large-area stores (so-called supermarkets). Most often, facilities that sell food through the FSAs are in central districts (e.g., Cracow, Warsaw, Prague, Brno) with diverse functions (e.g., tourist, administrative, entertainment). There are also facilities joining the FSA in typically residential areas, often revitalized,: e.g., in Warsaw, Cracow, Poznan, or Brno (Fig. 1)

Prague is a special case, since FSA-using facilities are concentrated in the city's central tourist district, and their occurrence decreases with distance from the centre to residential areas (Fig. 2).

 ISBN: 978-1-68558-079-7

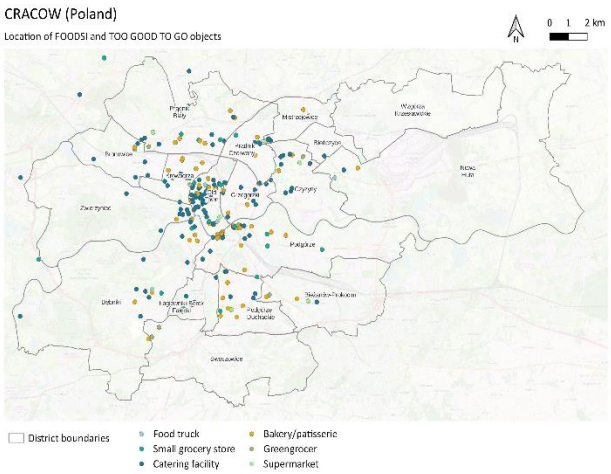

Figure 1. Distribution of gastronomic premises that save food from waste using FSAs in Cracow (Poland)
Source: own elaboration.

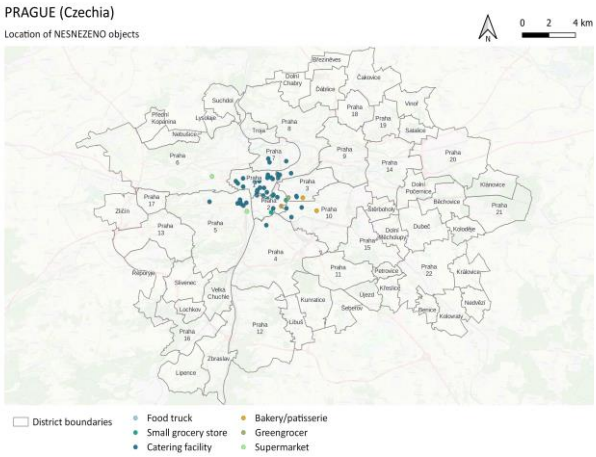

Figure 2. Distribution of gastronomic premises that save food from waste using FSAs in Prague (Czech Republic)
Source: own elaboration.

V. Conclusion and Future Directions

The use of data from mobile applications dealing with the reduction of food waste from catering facilities allowed some preliminary conclusions. Both in the central districts of large cities, with various metropolitan functions, and in districts far from the center (mainly residential), there are facilities that use FASs to reduce food waste. Residents of both types of districts are, therefore, equipped with tools that allow them to participate in this effort to reduce food waste. It might be assumed that the owners of the premises, located in those areas, represent pro-environmental attitudes to food waste and that the young residents of these districts, Millennials and Generation Y, are the main users of those services. Since the above-mentioned services and products sell quickly, it is assumed that there is a demand for them in these city districts, both among sellers and consumers.

In the future, in addition to spatial analysis of the distribution of entities joining FSAs in the selected cities in Poland and Czechia, the benefits and disadvantages of participating in similar initiatives, as well as attitudes and opinions about joining FSAs, will be discussed. Participants in food sharing have a variety of motivations and objectives that can mutually strengthen each other. We are interested in determining whether entities can simultaneously participate out of moral imperative and with a desire to make quick money. However, there can be tensions between individuals participating in collective action because of their diverse motivations and expectations. Some participants see their participation as a reflection of certain values (morality), while others see it primarily as an opportunity for personal gain (for example, by using the application as an additional distribution and sales channel). From the perspective of the methods introduced, the analysis pinpoints the need to search for unified and general motives of the owners of such premises to help residents of neighbourhoods participate in food waste mitigation practices, using phone applications.

Open questions remain about the discrepancies between different individual views on what food sharing should and can achieve using FSAs. From the point of view of new owners, for whom both values: pro-environmental attitudes and environmental responsibility are important, it is extremely important crucial to determine what motivations drive the owners of catering facilities and entrepreneurs when joining the above-mentioned applications. Also, as documented, gastronomic facilities tend to appear in clusters, therefore, the therefore question of whether joining FSAs is subject to policy diffusion remains to be addressed.

Acknowledgment

This research is part of the Twinning project “Building excellence in research of human-environmental systems with geospatial and Earth observation technologies” that has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 952327.

References

[1] A. S. Stenmarck, C. Jensen, T. Quested, G. Moates, M. Buksti, B. Z. Cseh, D. Juul, A. Parry, A. Politano, and B. Redlingshofer, “Estimates of European Food Waste Levels”. IVL Swedish Environmental Research Institute, 1996.

[2] H. V. Raut, A. D. Nagne, and K. V. Kale, “Management of food waste by using GIS environment: a review”, International Journal of Computer Sciences and Engineering, vol 3., issue 7, pp. 144-151, 2015.

[3] S. Karsauliya, “Application of remote sensing and GIS in solid waste management: a case study of surroundings of River Yamuna, India”, International Journal of Environmental Engineering and Management, , Vol. 4, pp. 593-604, 2013.

[4] Draper/Lennon, Inc. “Identification, characterization, and mapping of food waste and food waste generators in Massachusetts”, http://www.mass.gov/eea/docs/dep/recycle/priorities/foodwast.pdf, 2002, September.

 ISBN: 978-1-68558-079-7

[5] "Geographic Information Systems for Organics Recycling", BioCycle, https://www.biocycle.net/2010/03/23/geographic-informationsystems-for-organics-recycling/, 2010, March.

[6] J. Baumann, "GIS project helps with food insecurity and waste", https://www.esri.com/about/newsroom/wp-content/uploads/2020/11/foodinsecurity.pdf, 2020.

[7] L. Mabe, "Food Waste Geographies: a GIS-based spatial analysis of food waste in Los Angeles County" UC Davis, ProQuest ID: Mabe_ucdavis_0029M_20464, 2021, ark:/13030/m5rc439s.

[8] A. Singh, "Remote sensing and GIS applications for municipal waste management", Journal of Environmental Management, Vol. 243, pp. 22-29, 2019, https://doi.org/10.1016/j.jenvman.2019.05.017.

[9] E. Mati Asefa, K., Bayu Barasa, and D. Adare Mengistu, "Application of Geographic Information System in solid waste management" IntechOpen, 2022, doi: 10.5772/intechopen.103773.

[10] S. K., Gurjar and A. Gaur, "21 - Application of remote sensing and GIS in integrated solid waste management - a short review", Editor(s): Ch. Hussain, S. Hait, Advanced Organic Waste Management, Elsevier, 2022, pp. 351-362, https://doi.org/10.1016/B978-0-323-85792-5.00001-0.

[11] M. Mathenge, B. G. J. S. Sonneveld, and J. E. W. Broerse, "Mapping the spatial dimension of food insecurity using GIS-based indicators: A case of Western Kenya" Food Security, vol. 15, pp. 243–260, 2023, https://doi.org/10.1007/s12571-022-01308-6.

[12] J. Harvey, A. Smith, and D. Golightly, "Giving and sharing in the computer-mediated economy", Journal of Consumer Behaviour, vol. 16, pp. 363– 371, 2016, doi: 10.1002/cb.1499.

[13] J., Harvey, A. Smith, J. Goulding and I. B. Illodo, "Food sharing, redistribution, and waste reduction via mobile applications: A social network analysis", Industrial Marketing Management, vol. 88, pp. 437-448, 2020, https://doi.org/10.1016/j.indmarman.2019.02.019.

[14] A. Rýparová, "Digital food sharing: motivation and practice of sharing in Czechia" Geografie, vol. 126, pp. 263-287, 2021, https://doi.org/10.37040/geografie2021126030263.

[15] National Statistical Office. "Narodowy Spis Powszechny Ludności i Mieszkań 2021 [National Population and Housing Census 2021]", Polish Statistical Office, 2022.

[16] Czech Statistical Office, "Statistical Yearbook of Prague – 2022", Czech Statistical Office, 2022.

 ISBN: 978-1-68558-079-7