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GREEN PUBLIC PROCUREMENT AS A TOOL FOR SUSTAINABLE AND SECURE FOOD POLICY: EVIDENCE FROM POLAND

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Abstract. This research article aims to investigate green public procurement as a tool for sustainable and secure food policy on the example of Poland. The practical objective of the study is to present the application of an analyzed wide range policy tool supporting sustainable food consumption in Poland. First, the systematic literature review of regulatory and market-based tools with an overview on policy rationale was carried out. Second, to assess consumers' preferences on green public procurement, the exploratory survey with CAWI method in period from 1.01 to 31.03.2022 was conducted. Third, to quantify the survey results, one-way ANOVA analysis was applied. Fourth, to deepen only statistically significant dependencies between customers and green public procurement, Cluster Analysis was used. There are plenty interesting and applicative findings from the study. In a short time-horizon, the results show that there is a growing interest in market-based instruments on the food market expressed by consumers. Moreover, the consumers favor those that are less coercive and do not directly affect their freedom of food choice. The study found a high degree of match between green public procurement and established consumer clusters, which can be applied by state authorities in a long-time horizon.

Keywords: regulatory and market-based policy tools; sustainable food consumption; green public procurement; quantitative and qualitative research; Poland

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1. Introduction to sustainable food consumption

Food production is a key issuer of greenhouse gas (GHG), which in 2021 is responsible for a third of global anthropogenic emissions (Crippa at al., 2021). Poore and Nemecek (2018) noticed that change in a dietary can bring positive effects on each of us in the world. Willett et al. (2019) indicate that if no change is made in the way and profile of food production and consumption, then central goal of reducing global warming under 2°C or less stated in the Paris Agreement will not be attained (Clark et al., 2020).

Sustainable food consumption, embedded in the strategy From Farm to Fork (F2F) launched for 2019-2024 in the European Union, is understood as safe, healthy, and nutritious for consumers, as well as meeting the

requirements of those of a lower material status (Pietrzyck et al., 2021; Boustani, Ferreira, & Guiné, 2021). *Farm to Fork: Toward a Sustainable and Resilient Food System in Europe*, 2020). From the supply side, sustainable food production allows honest livelihood for farmers, processors, and retailers, hiring workers in a safe and hygienic working environment (Sustainable Agriculture Initiative Platform, 2015; Knoor et al., 2020). Sustainable food consumption draws attention to abide biophysical and environmental limits in its production and processing while reducing energy consumption and improving the wider environment (European Commission Research &Innovation Food, 2011). Moreover, sustainable food consumption points to follow the highest standards of animal health and enhance rural economies out, f. ex. by encouraging purchase of local products (*Sustainable Consumption Food*, 2019). In this view, food consumption is an integral part of the food system, respecting the right to food for all and consumers' soveringuity (Guiné et al., 2020).

The European Commission supports making positive changes to the food system by an access and price reductions for sustainable food and promotes sustainable and healthy eating (FAO, 2018; Wielicka-Regulska, 2020). Galli et al. (2020) confirms that the priority is given to increase of consumers' awareness of a healthy diet, resulting into change in the consumption profile. The long-run effects are as follow an increase of the plant-based food share in a human diet, an increase in prices of certain food categories, promotion of green public procurement, encouragement of fiscal measures, reduction of food waste (Zaharia et al., 2021). The above-described changes in the food system will increase the population in depopulated rural areas and improve the economic situation of farmers in those parts of the world (FAO, 2020; Temme et al., 2020).

2. The role of public food policy tools on sustainable food consumption

Economic policy for sustainable food consumption relies on activities of the state as well as its bodies and active involvement of citizens in its formation (Dabyltayeva & Rakhymzhan, 2019). At the basis of participation lies the cooperation of various interest groups in order to accurately diagnose the needs of communities, design activities to meet them and use land resources and food production efficiently (Phawitpiriyakliti et al., 2020). The economic policy tools of sustainable food consumption can support the choices of food products bought and food products sold in the food market. There are following food policy tools: higher tax rates on junk food, green public procurement, deposit for plastic bottles, VAT exemption for food donated to charitable institutions, waste fee for food consumed by customers in retail outlets such coffee shops, bars, restaurants, etc.

Universal characteristics of the analyzed food policy tools is theirs voluntary (Dawkins et al., 2019) vs. coercive (Acciai & Capano, 2021) nature. Other important characteristics include effectiveness (Nissinen et al., 2015), fairness (Vermeir et al., 2020) and the tool's advisability (Testa, 2016). Baker et al. (2018a) indicate that there is variation in the adequacy of these tools depending on cultural and economic circumstances.

One of the main obstacles of their use are the implementation and maintenance costs (Vermeir et al., 2020; EUPH, 2017; Hendriks et al., 2021), the low uptake of tools to stimulate sustainable consumption (Dawkins et al., 2019), as well as potential public resistance to stronger actions and measures to limit the freedom of consumers' buying and retailers' selling behavior (Jürkenbeck et al., 2020).

Important for solving the aforementioned obstacles in implementation of policy tools for sustainable food consumption in Poland is the increasing importance of public institutions and policies at local (Bengtsson et al., 2018; Doernberg et al., 2019), national (Mozaffarian et al, 2018; Prosperi et al., 2016) and international (Sonnino & Coulson, 2021; Saviolidis et al., 2020) levels.

Economic policy tools for sustainable food consumption are defined by Vedung (1998, p. 21) as a different set of techniques by which governmental authorities wield their power in attempting to ensure support and affect or prevent social change. Bemelmans-Videc et. al. (1998) and Vedung (2020) divided tools into three groups: regulative, economic and informative. With reference to these tools, Reisch et al. (2013) made a classification of tools for sustainable food consumption into policy instruments to promote sustainable food systems: information-based, market-based, regulatory, and self-committing. In turn, Acciai and Capano (2021) provide a review of the

most frequently used typologies of economic policy tools and, through a meta-analysis, they indicated how these tools have been differentially adopted to explain real-world phenomena. The results are highly diversified due to the nature and concept of the economic policy tools and a division between typologies focused on governmental resources and those focused on consumers expected behaviour. Further Lehner et. al. (2015, 2020) reviewed the evidence that nudging might be a tool to promote more sustainable consumption behaviors. They concluded that nudges hold a certain potential for reducing environmental impacts in domains of sustainable consumption. Nudge tools are seen as a complement to the traditional policy tools rather than as a substitute for legal, regulatory and economic tools. Nudge comprises four types of tools: 1) simplification and framing of information, 2) changes to the physical environment, 3) changes to the default policy, and 4) the use of social norms (Preuss, 2009).

The study aims to present, analyze and evaluate green public procurement as an economic policy tool for sustainable food consumption in Poland. The **high cognitive and application value of the research** on green public procurement is due to the fact that not all of the tools presented in the introduction, is applied in the Polish economy. For instance, in 2021 a sugar tax was introduced. The new sugar levy charges entrepreneurs who sell products containing sugar (including alcohol) and active substances. Business people pay the tax when they put products on sale. It is designed to encourage the production and purchase of healthy food products. The article tries **to fill the research gap** consisting in a detailed literature review of chosen economic policy tools stimulating sustainable food consumption in order to examine the social acceptance of their implementation in the conditions of the Polish economy. **The scientific novelty** of the manuscript is the presentation, analyses and assessment of the literature on green public procurement from the demand side of the food market in Poland. **The practical novelty** of the manuscript is the presentation, analyses and assessment of the social acceptance of green public procurement carried out on consumers (N = 150) in the municipality of Poznań in the Wielkopolska Voivodship in Poland between 1.01-31.03.2022.

The article examines the differentiation of social acceptance of green public procurement according to gender, age, education, place of residence, material situation. In addition, Cluster analysis to distinguish the profiles of consumer groups was carried out. Based on the collected information, general and specific recommendations were made for economic policy in terms of sustainable food consumption. The hypothesis in the paper are as follow:

$\mathbf{H_0}$ Female and male are equal in terms of the acceptance for green public procurement in public institutions.

$\mathbf{H_1}$ Female and male are not equal in terms of the acceptance for green public procurement in public institutions.

3. Materials and methods

To assess the multi-faced issue of social acceptance for green public procurement variety of research methods and tools are used. Quantitative methods in the form of CAWI questionnaire, ANOVA analysis and Cluster analysis were used to assess whether examined gender acceptance for green public procurement reflects a relatively homogeneous group of consumers. Consequently, the carried out segmentation makes it possible to identify interest groups, effectively communication of the state with the interest groups through the optimal choice of media and argumentation, in order to achieve higher social welfare. Qualitative methods in the form of full-structured interviews with respondents responsible for analyzed issues in the municipality of the city of Poznań, Poland, as well as case-studies, were carried out (Table 1).

Table 1. Presentation of research characteristics

Subject	Objects, Country, Time	Measurement Methods and Tools	Goal
Assessment of social acceptance on green public procurement	Full-structured interviews (N = 150) in the municipality of the city of Poznań (Poland) in 2022	Quantitative: CAWI questionnaire, ANOVA analysis, Cluster analysis	A comprehensive study on the social acceptance of green public procurement in Poland
		Qualitative: full-structured interviews, case-studies	A case-study on the classification of the interest groups on green public procurement in Poland

Source: authors' own preparation

To best present the research issue under study, the article uses primary and secondary research sources. The search of database collection is 95. The secondary research sources were identified, screened, and finally included in the process of creating the article. Figure 1 presents the selection of secondary sources according to PRISMA guidelines.

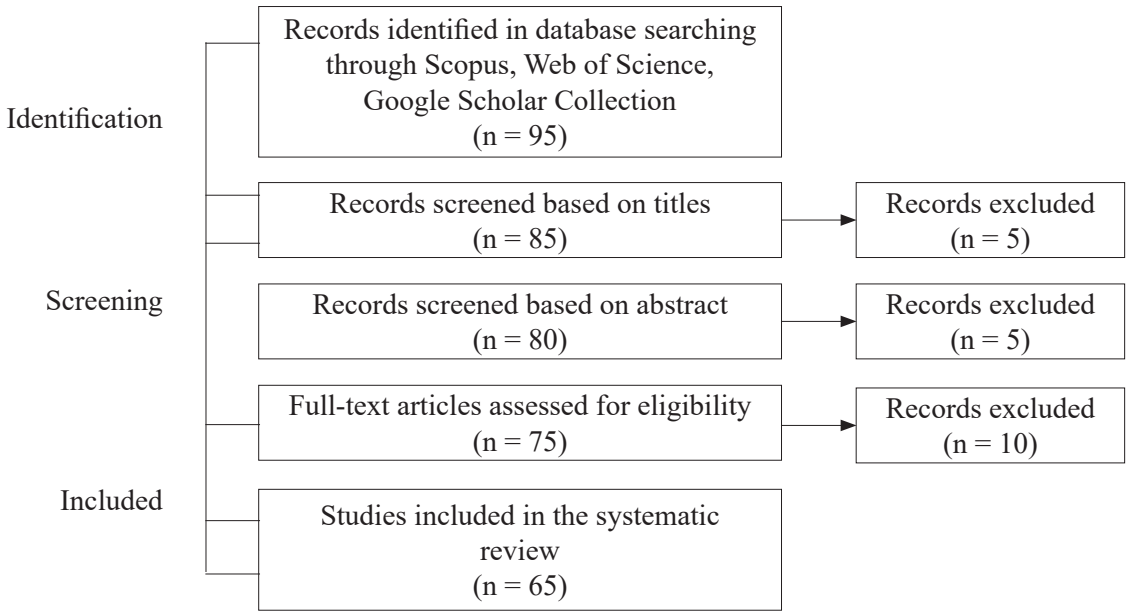

Figure 1. Selection of the secondary sources according to PRISMA guidelines

Source: authors' own preparation

Sample and Procedure

The research was comprehensive (full) for the population of the municipality of the city of Poznań (the capitol city of the Wielkopolska Voivodship, Poland). The sample is representative (N = 150). It means that the number of all residents subjected to the research was equal to the number of residents in the entire population. The study met the criterion of representativeness. The basic criterion for a research selection sample were:

- Municipality residents: Poznań,
- Gender: female /male,
- Age: 20-34; 35-49; 50-64, 65+,
- Education: vocational, secondary, post-secondary/baccalaureate, higher
- Number of people in the household,
- Number of children in the household,
- Source of income,
- Amount of a disposable income in the household per month.

The research was conducted by the SW Research Sp. z o. o. Agency. The agency applies the standards set forth in the Program for Quality Control of the Work of Interviewers (pl. PKJPA) in the CAWI survey category, in accordance with the quality audit of the Professional Responsibility Commission and the Board of Directors of the Organization of Opinion and Market Research Firms. The SW Research Sp. z o. o. is entitled to use the PKJPA quality mark in the awarded category. The analyzed group of 150 respondents aged +20 were divided into females (N_f = 46%), males (N_m = 54%). The test sample was divided into four age categories: 20-34 years old (N = 29%), years old 36-49 (N = 27%), years old 50-64 (N = 25), 65+ years old (N = 19%). The sample was categorized by education levels, which are: vocational (13%), secondary (23%), post-secondary/baccalaureate

(21%), higher (43%). The sample was described by the number of people in the household, which were: 1-person (10%), 2-person (29%), 3-person (23%), 4-person (25%), 5-person (11%), 6-person (1%), 7-person (1%). The number of children in the research sample was as follow: no children (53%), 1-child (22%), 2-children (19%), 3-children (5%), 4-children (1%). In the research sample the respondents disclosed the source of income: contract work (61%), self-employment in non-agricultural economic activities (13%), self-employment in agricultural economic activities (3%), retirement/pension (16%), unearned sources of income: unemployment benefits, property income, dependent on parents, pupil, student (7%). The amount of a disposable income in the household per month in PLN presents as follow: no more than 2.000 PLN (5%), 2001-4000 (19%), 4001-6000 (26%), 6001-8000 (23%), 8001-10.000 (19%), more than 10.000 (8%).

In the first step full-structured interviews with the use of questionnaire on chosen aspects of social acceptance on green public procurement in the municipality of Poznań in 2022 were conducted. As Czakon (2009, p. 16) draws attention "the magnitude and the change of the impact" on the consumers perception of green public procurement was considered (Czakon, 2009, p. 16) were considered. Once the most suitable aspects of the social acceptance were determined, the case-study method on social acceptance of green public procurement in the municipality of Poznań was implemented.

In the second step a statistical one-way analysis of variance (ANOVA analysis) to examine observations that depend on one factor acting simultaneously was used. A one-way ANOVA compares the effects of an independent variable on multiple dependent variables.This method explains with what probability the extracted factor can cause differences between the observed groups. There are a few limitations of ANOVA analysis (*ANOVA (Analysis of Variance): Definition & Methods // Qualtrics*). The first one is that the groups have the same, or very similar, standard deviations. The second limitation concerns its restrictive assumptions (Davies, 2022).

In the third step grouping a set of objects in such a way that objects in the same group are more similar to each other than to those in other groups, known as Cluster analysis, was performed. The Cluster analysis was achieved by appropriate clustering algorithm and parameter settings, including distance unction and data set. After calculating correlations, it turned out that such food policy instruments as green procurement, higher VAT on junk food and bottle deposit are created by respondents with similar purchasing behavior patterns

4. Results and discussion

Inland authorities use green public procurement as a buying power to promote health, environment, animal welfare objectives (Badell & Rosell, 2021; EPHA). In highly developed countries, green public procurement in food plays a very important role and its importance increases with the wealth of the population (Slemrod et al., 1995).

In 2021 spending on public procurement represented on average 12,6% of GDP of OECD countries. The COVID-19 pandemic led to a spike in public procurement relative to GDP in 2020. Among 22 OECD-EU countries, public procurement increased from 13.7% of GDP in 2019 to 14.9% of GDP in 2020. Other countries also saw significant increases such as Norway (from 15.8% to 17.1%) and the United Kingdom (13.2% to 16.1%) (OECD). The growing importance of the public sector leads the public to expect that the public sector can be an example of good practice in sustainable food consumption (Pacheco-Blanco & Bastante-Ceca, 2016).

In the underdone research, several significant differences in the acceptability ratings for green public procurement across analyzed groups based on socio-economic variables such as: gender, education, financial situation, have been confirmed. Table 1 provides the results of ANOVA analysis with Mean Rank, Median (+/- quarter deviation), Mean. A decision criterion is p ($p < 0{,}050$), which check whether there is a significant difference in the social acceptability in the analyzed groups (Table 2).

Table 2. Differences in acceptability of green public procurement by gender

Variable	N = 150	Mean Rank	H	*P*	Median (+/-quarter deviation)	Mean
Female	81	82,14	4,747	0,029 *	4 (1)	3,94
Male	69	67,71			4 (0,5)	3,67
Significance*	$p < 0,05$					
H_1	Gender differentiates significantly the level of support for a green public procurement					
Interpretation	The acceptability of green public procurement was significantly higher for women than for men. Females displayed higher support voting 4 with quartile deviation 1 and males demonstrating lower acceptability voting 4 with quartile deviation 0,5					
Conclusion	Females are more supportive for green public procurement, especially in catering services in public institutions					
Decision on H_1	Accept					

Source: authors' own calculations

The research supports the findings of well-known authors that green public procurement stimulates demand and supply of healthy, organic products and drive food reformulation (Baker et al., 2018b) while securing stable demand for small scale producers (De Schutter, 2014). Green public procurement in food can lead to structural changes in agriculture by an increase in organic farmland (Lindström et al., 2020), and contributes to decreases in GHG emissions (Cerutti et al., 2015; Wickramasinghe et al., 2016). The undoubted benefits of the introduction of green public procurement on a state level are health and environmental issues of consumers. Nevertheless Bucea-Manea-Tonis et al. (2021) indicate that multi-objective measure on green public procurement to public institutions (f. ex. via catering services) did not receive enough policy attention and institutional uptake.

The authors' findings are consistent with studies of do Prado & Moraes (2020) concerning green public procurement in food purchases and socioeconomic underpinnings for choice of organic food. Gundala & Singh, (2021) proved that being a female gives a higher probability of buying organic food. It can be assumed that females can be more open to policy interventions introducing more preferable conditions for green public purchases in public institutions. Additionally, females are more often responsible for catering services in public institutions as: nurseries, kindergartens, primary and secondary schools, hospitals, day and 24-hour care homes, and canteens of the state workplaces (Grandia & Voncken, 2019). Lachat et al. (2009) hold a similar opinion that green public procurement in food can increase supply and consumption of health food categories, improve the attitudes towards healthy eating and triggers healthy eating habits. Niebylski et al. (2014) say that when it is paired with information campaign, it leads to change in food related behavior and positive health effects in population. Roehrich et al. (2017) indicate that health benefits are evenly distributed, which means they are not limited to the particular societal group. Miyamoto et al. (2020) sought answers to the question of the role of local municipalities in Japan in implementing green purchasing policies.

Unfortunately institutions do not receive additional budget for green public procurement in food due to the voluntary nature of this tool. Lundberg et al. (2015) notes that green public procurement in food is strongly influenced by locality, bargaining power of suppliers, and price sensitivities of consumers and public buyers.

Equally important, and addressed by the authors (Bucea-Manea-Tonis et al., 2021), an issue positively influencing the increase of green public procurement is educating the public towards "green" attitudes.

Table 3. Presentation of clustering variables for green public procurement

Clustering variables	Intergroup variability (SS)	Within-group (class) variability (SS)	F
Price	80,17	68,82	85,6220
Health	67,98	81,01	61,6819
Carbon footprint	61,34	87,66	51,4222
NEP Index	56,45	92,54	44,8360
Involvement in Food Index	50,62	98,37	37,8275
Interest in Food Journey	56,84	92,15	45,3426
Frequency of eating fruits and vegetables	45,47	103,52	32,2901
Expenses on organic food	99,19	49,80	146,4011
Household's financial situation	41,95	107,04	28,8088

Source: authors' own calculations

In order to see if there is a pattern of consumer behavior, a Cluster analysis was carried out. Table 3 shows measures of total factor variability in the sample, SS intergroup variability (effect) and intragroup variability (error), from which mean squares and F statistics were calculated.

The choice of variables for cluster analysis resulted from the literature (Fuentes-Bargues et al., 2018; Simón-Rojo et al., 2020; Grandia & Voncken, 2019) and methodological considerations, as the presence of a high degree of correlation, where Spearman's rho > |0.35|. The set of nine variables: price, health, carbon footprint, NEP index, Involvement in Food Index, Interest in Food Journey were supplemented by variables related to a household's financial situation, organic food spending along with fruit and vegetable purchases. Using the k-means method with 5.times cross-validation on standardized variables, 3 clusters in the study population were identified. The first, most numerous segment accounted for 48.6% of the sample, the second, least numerous, counted 19.3% of the research, and the third represented 32% of the study population (Fig. 2).

The results of the segmentation made it possible to conclude that all characteristics were statistically different between clusters, i.e. in at least one pair of clusters there was a significant difference between the averages.

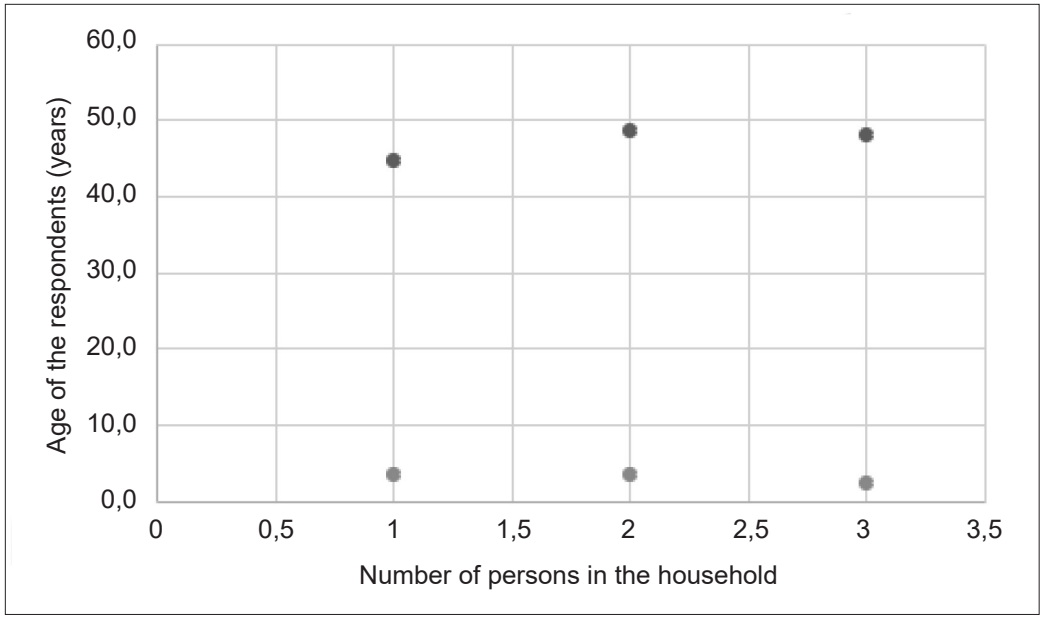

Figure 2. Presentation of the consumers' clusters for green public procurement by the age of the respondents (in years) and number of persons in the household.

Source: authors' own preparation.

To sum up, the first cluster was moderate in the sense of consumers attitude towards green public procurement along with health and environmental issues, the second cluster was formed by people paying attention to health and environmental aspects relative to food consumption. The third cluster was distinguished by a consumers' instrumental attitude toward food, which means that people were price-sensitive. Moreover, consumers in the third cluster did not pay attention to health and environmental issues and they showed no interest in the place of food origin and its production methods.

5. Conclusions

To summarize, public entities can make an excellent contribution to the realization of sustainability goals by exercising enormous purchasing power by green public procurement in green products, processes and services. The involvement of green criteria in public procurement can encourage a gradual shift toward green products and processes. It will provide an impetus to increase the quality of goods, services and consecutive production stages. Furthermore, it will force a new approach to corporate quality management. At the same time, the application of the life-cycle cost criterion will enable economic benefits to be achieved by the contracting authorities. Despite increased economic and political interest in green public procurement economic there is a considerable lack of articles referring to social acceptance of green public procurement in catering services in a consumer setting. Countries for which the issue of sustainable food policy has become an undisputed element of securing food abundance, shaping consumer behavior, influencing food styles, green public procurement can build a competitive advantage in reducing the negative effects of the use of environment. Green public procurement, firstly make it possible to raise the quality of goods and services, and secondly, the life-cycle cost of a given procurement can be lowered.

In the article, the hypothesis has been confirmed. The outcomes allow the following general conclusions to be drawn. In particular:

1. People are taking care of their health by following diets tailored to their health and lifestyle.
2. Food safety is increasingly important, especially compliance with production and processing hygiene regulations in the food chain linking producers, processors, wholesalers, retailers and consumers.
3. Strategic areas supporting the development of agriculture, food production and processing are transport, distribution and logistics.
4. Governments around the world should take tangible post-pandemic measures in the area of the food system to make it more resilient to supply and demand shocks.

The difficulties of implementing green public procurement are as follow:

1. Legal shortfalls at the country's level and shortages of skillful and well-trained staff in this area may contribute to the implementation failure of green public procurement. The improvement of technical knowledge of government procurement officials will make it easier to implement green public procurement with a good influence on the environment.
2. Specific green public policy provisions and procedures should be implemented in various potentially interested country's branches, i.e. construction, healthcare, agro-food, in order to have a coordinated and focused impact on its implementation.
3. Researchers on green public procurement state that the objective difficulty is the imprecision and lack of clearness and homogeneous environmental measures.

Nevertheless, the difficulties of applying green public procurement in Poland should not be reasons why it will not be used. For instance, in the Netherlands, sustainable procurement has become a practical tool in multifaceted policies, such as: green food procurement, supportive procurement for biotechnology, supportive procurement for innovation, supportive procurement for social development, closed-loop economy.

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