UNIVERSITY OF LIFE SCIENCES PRAGUE

FACULTY OF ECONOMICS AND MANAGEMENT

Selected environmental aspects of consumer behavior

PhD dissertation

Author: Ing. David Brož

Supervisor: doc. Ing. Inna Čábelková, Ph.D.

Prague, 2024

Acknowledgements

I would like to express my appreciation and thanks to my supervisor doc. Inna Čabelková Ph.D. I would also like to express my sincere gratitude to my former advisor prof. Luboš Smutka Ph.D. for his guidance and cooperation. I would also like to thank all my other colleagues from the faculty and the university for their support.

Abstract

The dissertation contains three separate published articles examining various aspects of consumer environmental behavior. The first two articles delve into environmentally friendly purchasing and management of resources and waste, while the third article explores the factors influencing the need for labeling of genetically modified foods.

The first article examines the purchasing behavior of households with regard to ecological preferences, analyzing the impact of environmental concerns, perceptions of climate change, trust in EU policies and media exposure to ecological purchasing habits. A study of a representative sample of 904 respondents in the Czech Republic uses principal component analysis, correlation studies, and ordinal regression analyzes to reveal significant findings.

The second article focuses on explaining the ecologically responsible management of resources and waste. It examines the influence of environmental concerns, perceptions of climate change, preferences for EU integration, and media exposure on the propensity to save resources and dispose of waste. Again, the study on a representative sample of 904 respondents in the Czech Republic uses similar methodological approaches to reveal important implications at the conceptual and political level.

The third article examines factors influencing consumer attitudes toward the labeling of genetically modified products. The study analyzes a representative sample of the Czech population (N=884) and examines the influence of various factors such as information about genetically modified foods, environmental concerns, perceived health effects, eating habits and socio-demographic characteristics on preferences for GMO labeling. The findings shed light on the multifaceted dynamics underlying public attitudes toward GMO labeling and provide valuable insights for policymakers and stakeholders in the ongoing debate about genetically modified products.

In conclusion, this dissertation presents a comprehensive survey of consumer environmental behavior in three different articles. Through a careful analysis of various factors such as environmental concerns, perceptions of climate change, media exposure and societal attitudes, significant insights were revealed regarding environmentally conscious purchasing, resource and waste management, and attitudes towards the labeling of genetically modified products.

The findings contribute to a deeper understanding of the complex dynamics shaping consumer behavior in the context of environmental sustainability. In addition, the implications of these studies offer valuable insights for policymakers, stakeholders, and researchers seeking to address environmental challenges and promote sustainable practices in society. As we navigate an increasingly complex environmental landscape, the knowledge gained from this dissertation serves as a foundation for informed decision-making and strategic interventions aimed at promoting a more sustainable and resilient future for all.

Keywords: Consumption behavior, green waste management.

Table of contents

List of abbreviations

ČR Czech Republic

EU European Union

GHG Green House Gasses

GP Green Purchasing

GMO Genetically Modified Organisms

GMF Genetically Modified Food

OECD Organization for Economic Cooperation and Development

PCA Principle Component Analysis

SD Standard Deviation

US United States

EFSA European Food Safety Authority

HBM Health Belief Model

TPB Theory of Planned Behavior

BCM Behavioral Change Model

1. Introduction

In our daily lives, we are surrounded by a plethora of electronics and appliances that have become indispensable conveniences, from televisions to coffee makers. Despite their ubiquity, many consumers often overlook the impact of their choices on the environment. Consumer behavior is influenced by various factors, including personal preferences and available options. Sustainable consumer behavior that aims to meet current needs while minimizing environmental impact is essential to solving environmental problems and mitigating climate change. This dissertation contains three separate articles focusing on different aspects of environmentally responsible consumption.

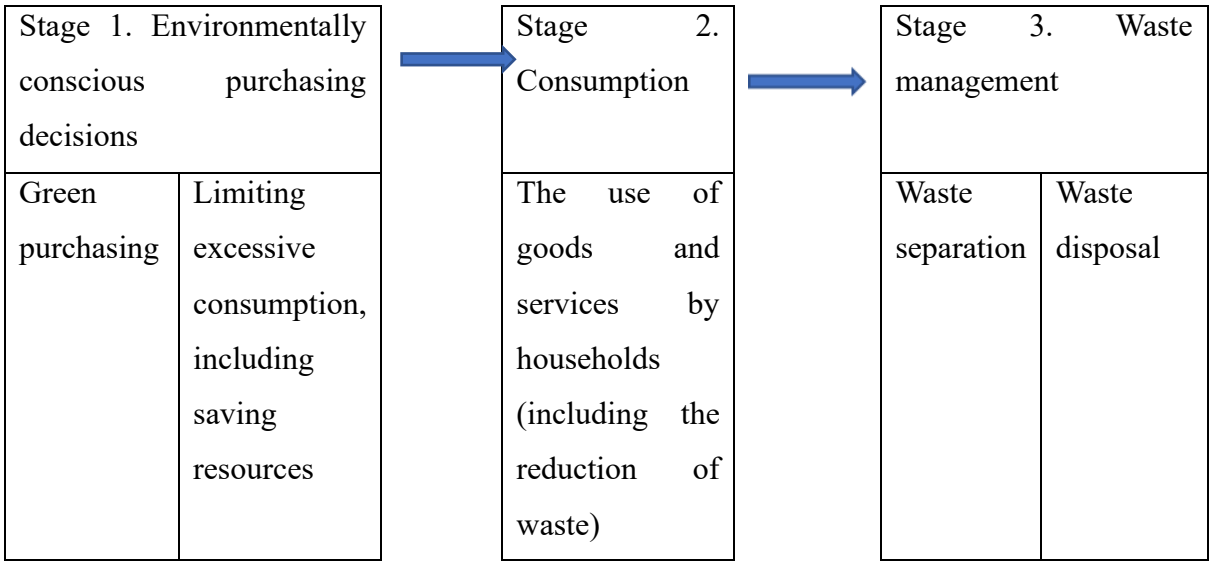
The first two articles deal with green consumption and include environmentally conscious purchasing and management of resources and waste. Environmentally responsible resource and waste management plays a vital role in reducing environmental damage by minimizing resource consumption, waste generation and adopting responsible waste disposal practices. In addition, the dissertation delves into the public's view of the labeling of genetically modified food products and sheds light on the complex interplay of factors shaping the ongoing GMO debate. Despite scientific evidence supporting the safety equivalence of genetically modified foods, public perception remains a significant factor influencing regulatory action and consumer attitudes.

In the European Union, regulatory bodies such as the European Food Safety Authority (EFSA) play a vital role in assessing the safety of genetically modified foods. However, regulatory processes face challenges, including high approval costs and public skepticism. Understanding consumer attitudes and behaviors towards environmentally responsible consumption and genetically modified foods is essential to inform policy initiatives and promote sustainable practices. Through empirical research and analysis, this dissertation contributes valuable insights to the ongoing discourse on sustainable consumer behavior and environmental stewardship.

2. Stages of environmentally responsible consumption

Environmentally responsible consumption starts with purchasing decisions, follows with consumption, and closes with waste management (Stern, 2000, Graph 1).

Graph 1 Stages of environmentally conscious consumption.



Note: "Green" products effectively include products that produce less waste. Thus, we do not include waste reduction in choosing the product to waste management (stage 3). Modified from Stern (2000). See Broz et al. (2023)

Ecologically responsible management of resources and waste includes all three components of ecologically conscious consumption. In the initial phase, which involves choosing "green" products and reducing excess consumption, resources can be saved by choosing items with lower resource input (such as energy or resource-efficient products), by choosing items that create less waste (such as products without packaging) , or simply by limiting excessive consumption, thus reducing the overall use of resources. During the consumption phase itself, waste can be minimized by using appropriate storage technologies and efficient utilities. Finally, in the phase of waste sorting and disposal, waste can be seen as a potential resource, and the separation of waste materials offers a way to create additional resources and reduce overall waste production.

3. Environmental consumer choices in the literature

Consumers make choices between products virtually all the time. Unfortunately, they are not very aware of the impact. It's not just information about the price of the product, but rather information about other aspects that become apparent after the product is purchased and are harder to obtain (Nelson, 1970). Consumer behaviour is often presented with preferences on the one hand and possibilities on the other Decision-making, however, is often influenced by possibilities. Because the decision-making process has its limits in the possibilities. (Deaton and Muellbauer, 1980). Sustainable consumer behaviour is behaviour that seeks to meet current

needs while benefiting or reducing environmental impact. Moreover, understanding sustainable consumer behaviour is essential to any paradigm shift in society's approach to environmental issues (Trudel, 2019). The consumer decision-making process involves a very wide range of personal and situational variables (Teo and Yeong, 2003).

Environmentally responsible consumption offers a significant avenue for safeguarding the environment and addressing climate change, particularly given that consumers currently contribute to over 70% of urban greenhouse gas (GHG) emissions (Hertwich and Peters, 2009; Lee and Lee, 2014; Ding, et al., 2017; Wiedenhofer, et al, 2017). This underscores the pivotal role of individual choices in shaping environmental outcomes. For example, research indicates that by reducing the household-based carbon footprint in certain countries, such as Japan according to its National Strategy by 2030 (Oshiro et al., 2017), it's possible to mitigate nearly 40% of national GHG emissions. Such findings highlight the immense potential of consumer behavior adjustments in effecting substantial environmental benefits at a societal level.

Recognizing and harnessing this potential can lead to transformative changes in environmental sustainability efforts. Empowering consumers with information and incentives to make environmentally responsible choices can catalyze shifts towards more sustainable consumption patterns. By promoting initiatives that encourage resource efficiency, waste reduction, and low-carbon alternatives, policymakers and stakeholders can further amplify the impact of individual actions on mitigating climate change and reducing environmental degradation. Ultimately, fostering a culture of environmental stewardship among consumers is crucial for achieving long-term sustainability goals and ensuring a healthier planet for future generations.

Environmentally responsible consumption has become central to many policy initiatives at EU and national level, as evidenced by studies such as Fischer and Geden (2015), Skovgaard (2014) and Calabro (2007). The population usually embraces such initiatives because of the promise of a cleaner environment and the potential to mitigate climate change. However, the adoption of environmentally friendly policies varies across regions and countries. For example, in the Czech Republic, EU policies focused on environmental sustainability often arouse controversies, an example of which is research by Cabelková et al. (2020, 2022). This opposition stems from the perceived adverse effects on the economies of coal regions and the imposition of additional financial and non-financial burdens.

Managing these tensions requires a nuanced approach that balances environmental imperatives with socioeconomic considerations. Policymakers must seek to address concerns about

economic change in affected regions while meeting sustainability commitments. Emphasizing the potential for job creation in emerging green sectors and providing support to affected communities can help mitigate resistance to environmental policies. In addition, fostering dialogue and collaboration between stakeholders is critical to developing inclusive and effective strategies that promote both environmental protection and economic prosperity. By addressing these challenges, policymakers can encourage greater adoption and implementation of environmentally responsible consumer practices, thereby advancing the twin goals of environmental sustainability and economic well-being.

As pointed out by Sahakian and Seyfang (2018) and Xu et al. (2018). Influenced by a myriad of individual factors such as attitudes, emotions, motivations, perceptions, values and norms (reviewed by Wijekoon and Sabri, 2021), these stakeholders together shape the trajectory of sustainable practices. The role of education and mass media, including traditional, social and emerging platforms, is paramount in disseminating knowledge and shaping social attitudes towards environmental issues. Existing literature underscores the significant influence of media agendas on the formation of group norms and subsequent intentions and behavior, as evidenced by studies such as Moore and Moschis (1983), Willnat and Weaver (2018), and Chen et al. (2019). Despite the recognized importance of the media in shaping perceptions and behavior, research specifically focused on its role in promoting sustainable action remains largely underexplored (Chen et al., 2019).

3.1. The theories of Green Consumption

Early theories of green consumption, such as Fisk's (1974) theory of responsible consumption, Henion and Kinnear's (1976) ecological marketing, and Kardash's (1974) theory of environmentally concerned consumers, laid the foundation for understanding environmentally responsible behavior. Initially, theoretical and empirical studies focused on identifying factors influencing such behavior in order to predict and improve environmental outcomes. Early research primarily delved into sociodemographic predictors of market segmentation. However, subsequent studies have suggested psychological and institutional factors as primary determinants of pro-environmental behavior, as evidenced by the work of Kilbourn and Beckmann (1998) and Van Dam and Apeldoorn (1996).

As research has progressed, attention has shifted to examining the roles of environmental knowledge, economic rationality, attitudes, beliefs, and values in shaping environmentally responsible behavior, as suggested by studies conducted by Bartkus et al. (1999), Jackson

(2005), Eriksson (2004), Carrus et al. (2008) and Han et al. (2007). More recent literature has begun to examine media influence on environmental attitudes and behaviors (Jain et al., 2020; Wagdi et al., 2022). Despite these advances, there is still a lack of comprehensive research in this area, with studies highlighting the need for further investigation of the media's role in promoting environmentally responsible actions (Chen et al., 2019).

There are a number of models of the consumer decision-making process in the consumer behavior literature. These models depict the various stages that pass through the mind of a consumer from initial unfamiliarity with a particular brand or product or service to actual purchasing behavior (Hansen, 2005). Agyeman (2014) found that consumer willingness to pay for green products is low despite good awareness. The perception of price is about the same as for conventional products. Neoclassical consumer theory provides a mathematical explanation of the law of demand in relation to the quantity and price of a product (Taylor, et al, 2009). With increasing global interest in sustainability and eco-friendly behavior it leads to motivation to change traditional products to environmentally friendly products – green purchases (Mostafa, 2007). Sustainability and green purchasing becomes a priority for customers (Shao, 2019). Environmentally friendly consumption decisions are influenced by a growing awareness and inclination towards sustainability (Panda, 2020).

3.2. Factors affecting environmentally responsible consumption in the literature

The beginning of green consumption dates back to the 1970s in the United States, coinciding with the emergence of "social marketing" that addressed environmental concerns. During this time, key theories such as Fisk's theory of responsible consumption (Fisk, 1974), Henion and Kinnear's ecological marketing (Henion and Kinnear, 1976) and Kardash's Ecologically Concerned Consumer (Kardash, 1974) were developed, which laid the foundations for the categorization of green consumer behaviour. Initially, research focused mainly on energy consumption and pollution related to industries such as automobiles, oil, and chemicals. Topics such as recycling, energy conservation, and consumer response to advertising and labeling earned significant attention during this period (Kilbourne and Beckmann, 1998; Henion and Kinnear, 1976; Peattie, 2010).

The 1980s saw a resurgence of interest in environmental protection, catalyzed by major events such as the Exxon Valdez oil spill, along with mounting evidence of environmental degradation. This era also marked a significant shift in consumer awareness of environmental issues, as evidenced by market research data, the popularity of green consumer guides, and

global boycotts against chlorofluorocarbon (CFC) aerosols. Such developments not only increased consumer awareness but also presented lucrative business opportunities for companies, prompting further investigation into green consumer behavior (Henion and Kinnear, 1976). As studies have progressed, there has been a shift from simply understanding consumer attitudes and actions to delving deeper into motivations, psychological drivers and the influence of institutional factors (Kilbourne and Beckmann, 1998; Van Dam and Apeldoorn, 1996; Peattie, 2010).

The early literature on environmentally responsible consumption offers insight into the development of research on green consumer behavior and highlights the key role of various factors in shaping consumer decisions. From the basic theories of the 1970s to the growing interest in motivations and institutional influences in the following decades, understanding the drivers behind environmentally conscious consumption has been a dynamic and evolving field.

Table 1 The theories of environmentally conscious consumers and affecting factors as presented in the literature

Theory/Factor	Author/Source
Early theories of environmentally conscious consumption (1970th)	
Theory of Responsible Consumption	Fisk, (1974)
Ecological Marketing	Henion and Kinnear (1976),
Ecologically Concerned Consumer	Kardash (1974)
Early studies focusing on understanding green consumer attitudes and conduct evolved into efforts to comprehend their motivations, psychology, and the influence of institutional factors.	Kilbourne and Beckmann (1998); Van Dam and Apeldoorn (1996);
Factors affecting environmentally responsible consumption	
Economic Rationality: green consumption as affected by economic incentives. However, consumers need to be aware of the incentives and understand the impacts.	Jackson (2005), Eriksson (2004), Bartelings and Sterner (1999), Shen and Wang (2022), Wang et al. (2021).
Socio-demographics: market segmentation of green consumers according to sex, age, presence and number of children, educational level, and socioeconomic class	Laroche, et al., (2001), Robinson and Smith (2002), Jenkins, et al. (2003), Walia et al (2020)
Income and spending: more affluent households produced considerably higher environmental footprint but can afford more green consumption	Lenzen and Murray (2003), Cymru (2002), Huang, et al. (2022).
Environmental knowledge. The results are controversial. Some authors report positive effect of more environmental knowledge on green consumption. The others report no or unclear effect.	Positive effect of knowledge on green consumption (Bartkus et al., 1999) No or unclear effect of knowledge on green consumption (Davies, et. al., 2002; Pedersen and Neergaard, 2006). Rustam, et al., (2020),

Attitudes, Beliefs, and Values:	
Emotions and habits are more important than rational choices	Carrus et al, (2008), Han, et al. (2007), Wang, et al (2019).
Existing models of values - Schwartz's value model. Altruist values are positively related to pro-environmental behavior	Pepper, et al., (2009), Ahmad, et al. (2020).
Specific environmental values and beliefs influence pro-environmental behavior	Leiserowitz, et al. (2006), Dietz, et al. (2005), Sivapalan et al (2021)
Pro-environmental values increase consumers' willingness to pay a premium for green products such as organic food or green electricity tariffs and engange in recycling	Nixon et al., (2009), Krystallis and Chryssohoidis (2005), Laroche et al. (2001), Saraiva et al. (2021).
Pro-environmental values increase product reuse and waste-minimization intentions and behaviors but not recycling, where practicalities were more influential	Barr, (2007).
Pro-environmental values increase the intention to recycle and conserve water but not to buy organic food or avoid leaving appliances on standby.	Lyndhurst, B. (2004).
Cultural/ethnic group norms impact pro-environmental behavior	Kilbourne et al, (2002), Johnson (2004), Halder et al. (2020).
Dominant social paradigm (DSP) impacts pro-environmental behavior, which reduces the role of the value factors above. For example consumerism reduces willingness to engage in green consumption	Kilbourne and Polonsky, (2005), Fischer et al. (2021).
Responsibility, Control, and Personal Effectiveness – understanding personal responsibilities for both causing and solving environmental problems and believing that the action they take can have a meaningful impact	Gupta and Ogden (2009), Yue et al (2020)

Lifestyles and Habits Lifestyles and habits may be able to explain the inconsistencies in in consumers' behaviors	Leiserowitz et al. (2010), Empacher and Götz (2004), ElHaffar et al. (2020), Vita et al (2019)
Green Consumer Identities and Personalities (consumer's sense of self-identity)	Fekadu and Kraft (2001); Mannetti et al (2004), Sharma et al. (2020).
Contextual factors – green consumption is not a homogeneous phenomenon and policies need to depend on context	Moisander (2007), Vermeir and Verbeke (2006), Nair, and Little (2016).
Spatial Dimensions (local, urban/rural, regional, and national)	Munksgaard, et al. (2000) – urban/rural difference in waste infrastructure Hines and Peattie (2006) – style of housing, agricultural systems, and specific mix of energy sources Tang, et al. (2022) – models for urban and rural localities
Consumption as a Social Process - the importance of the social, political, and historical context and conditions of our lives and lifestyles	Moisander, (2007), Connolly and Prothero (2003), Fischer et al. (2021), Beatson et al. (2020)
Social Norms about the Environment	Zukin and Maguire (2004). Fischer et al. (2021), Beatson et al. (2020) Barr (2007) – recycling is adopted because it is perceived as normal Krystallis and Chryssohoidis (2005) - existing prices are the norm and that greener products represent an expensive luxury.
The Media	Haron (2005), Jain et al (2020), Wagdi et al (2022)

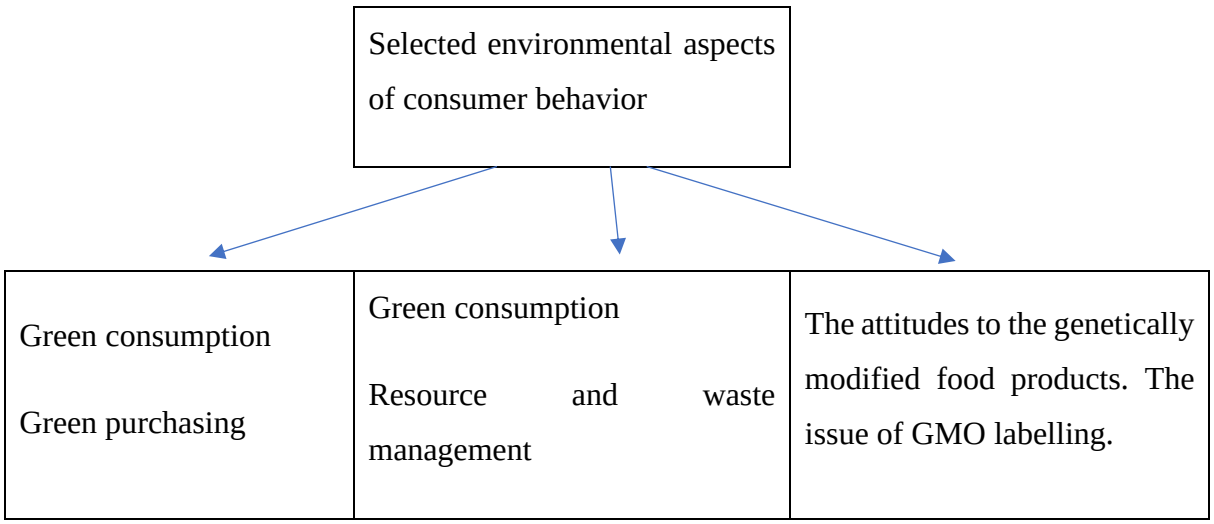
Source: the table is based on structure presented in Peattie (2010) and existing literature. See Broz et al. (2023)

4. Objectives of the thesis

The primary objective of this dissertation is to examine the key determinants of environmentally friendly consumer choices, focusing on green consumption practices, household resource and waste management, and attitudes toward the labeling of genetically modified food products (Figure 1).

This dissertation investigates three key aspects of household pro-environmental behavior, as depicted in Figure 1:

Figure 1 Selected environmental aspects of consumer behavior. The topics



Source: own research

Besides others, the selection of these aspects of environmental consumer behavior is based on their significant impact on the environment and their potential to support sustainable practices:

Green Food Consumption: Household food consumption is a major contributor to environmental degradation due to factors such as resource depletion, greenhouse gas emissions and pollution. By focusing on green food consumption practices such as reducing food waste, choosing local and organic foods, and adopting a plant-based diet, households can significantly reduce their environmental footprint. These strategies promote resource conservation, minimize pollution from agricultural practices, and promote sustainable food production methods, thereby contributing to overall environmental sustainability.

Environmentally friendly waste management: Household waste generation and disposal pose significant environmental challenges, including pollution, habitat destruction and depletion of natural resources. By implementing green waste management practices such as

waste reduction, reuse and recycling, households can minimize the amount of waste sent to landfills, reduce greenhouse gas emissions associated with waste disposal and conserve valuable resources. These practices contribute to the protection of natural ecosystems and help mitigate the effects of waste production on the environment, thus promoting sustainability.

Importance of Genetically Modified Food Labeling: Genetically modified (GM) foods raise concerns regarding food safety, environmental impact, and ethical considerations. Consumer decisions regarding acceptance or rejection of GM foods can have significant environmental consequences. Labeling of genetically modified foods provides consumers with information about the presence of GM ingredients in products, allowing them to make informed decisions and putting pressure on food producers to adopt more sustainable agricultural practices. By understanding consumer attitudes toward GM food labeling, policymakers and stakeholders can develop effective regulatory frameworks and communication strategies to promote transparency in the food industry and support sustainable food production practices.

Moreover, the three selected aspects represent the three stages of consumption presented in Graph 1.

5. Stages of green consumption. Definitions and contexts.

5.1. Green purchasing

Green purchasing (GP) is consumer behavior characterized by the deliberate choice of environmentally friendly products and the active avoidance of those that harm the environment. This practice is rooted in the recognition of individual responsibility in promoting sustainability and mitigating environmental degradation. Chan (2001), Mostafa (2007) and Steg and Vlek (2009) emphasize that GP involves the purchase of products that are often recycled or produced by sustainable processes, thereby contributing positively to environmental protection. By making a conscious choice to support green products, consumers can play a significant role in driving market demand towards more sustainable practices and reducing the ecological footprint associated with consumption.

However, it is important to distinguish GP from sustainable procurement, as highlighted by Miemczyk et al. (2012). While GP focuses primarily on environmental sustainability, sustainable shopping encompasses a wider range of considerations. In addition to protecting the environment, sustainable purchasing also considers economic, social, health and other aspects of sustainability. This broader perspective recognizes the interconnectedness of

different sustainability goals and recognizes the importance of addressing multiple aspects of sustainability in consumer decision-making. By incorporating various sustainability criteria, sustainable shopping aims to promote holistic and responsible consumption patterns that contribute to long-term environmental, social and economic well-being.

In today's globalized and interconnected world, the importance of GP and sustainable purchasing goes beyond individual consumer choices to include wider social and environmental impacts. As consumers become increasingly aware of the environmental impact of their purchasing decisions, there is a growing demand for products and services that are in line with sustainability principles. Governments, businesses and other stakeholders are also recognizing the importance of promoting sustainable consumption practices through policy measures, corporate initiatives and public awareness campaigns. By promoting a culture of GP and sustainable purchasing, society can move towards a more environmentally conscious and socially responsible approach to consumption, setting the stage for a sustainable future for generations to come.

5.2. Saving resources

Consumers have different ways to contribute to environmental protection than just choosing environmentally friendly products. One approach involves resource conservation measures that can be categorized into two types: (1) reducing resource use through technologies that reduce energy and water waste, and (2) reducing unnecessary consumption by adopting practices such as reducing car consumption, reusing clothing and bags and minimizing furniture turnover. The first type often requires investment in new technologies and may be subject to government regulations, such as the EU ban on certain energy-inefficient products. While such measures can benefit the environment, they can also create social tensions due to economic disparities. Citizens' views on these policies, especially at a time of increased activity by EU policymakers in the field of environmental protection and climate change, therefore deserve attention.

Alternatively, voluntary consumption reduction represents a strategy for individuals to contribute to environmental protection, including actions such as reducing car use, air travel, and adopting practices such as reusing clothing and plastic bags (Nencková, et al., 2020). This approach cuts across economic and behavioral dimensions, as reducing unnecessary consumption not only reduces financial expenditure, but also impacts the individual utility derived from consumption (Pangarkar, et al., 2021). However, the loss of utility can be compensated by a positive sense of environmental awareness (Ketelsen, et al., 2020), which

requires the cultivation of such awareness. Mass media exposure, including online and offline discussion platforms, and educational initiatives play a vital role in shaping consumer attitudes and behaviors towards environmentally responsible consumption (Trvedi, et al., 2018; Liobikienė, Poškus, 2019).

Resource exploration essentially involves a multifaceted approach involving technological innovation, regulatory frameworks and individual behavioral changes. While government intervention can address resource inefficiencies through regulation, voluntary actions by consumers play a key role in reducing unnecessary consumption and enhancing environmental awareness. The interplay between economic considerations, individual utility, and environmental awareness underscores the complexity of resource conservation strategies and highlights the need for comprehensive approaches that integrate technological progress, policy measures, and consumer education to achieve meaningful environmental outcomes.

5.3. Green waste management

Environmentally motivated waste separation and disposal requires additional effort from individuals, which can sometimes lead to a reduction in intentions for environmentally sound waste management. Research by Welfens et al. (2016) and Wan et al. (2015) showed that the perceived burden of these efforts can discourage individuals from actively engaging in waste sorting and disposal practices. Despite being aware of the environmental benefits, individuals may prioritize convenience and ease of disposal over environmentally responsible practices. This highlights the importance of removing barriers and providing incentives to encourage sustainable waste management behaviour.

Governments often introduce financial incentives to compensate for the extra effort that environmentally conscious waste management practices require. A study by Xu et al. (2017) and Challcharoenwattana and Pharino (2016) demonstrate the effectiveness of financial incentives in promoting waste separation and disposal. For example, in the Czech Republic, separated waste can be disposed of free of charge, mixed waste is subject to a charge. In addition, separated food waste can be composted and used as fertilizer for agricultural production. However, the availability of composting facilities can vary, limiting the effectiveness of this incentive for all households. However, financial incentives play a significant role in shaping individuals' motivation for environmentally conscious waste management practices.

Various factors influence the motivation to manage waste in an environmentally friendly manner, including the wider environmental agenda, lifestyle choices and financial considerations. Vassanadumrongdee and Kittipongvises (2018) highlight the complex interplay of these factors in shaping individual behavior towards waste management. While environmental concerns may lead some individuals to favor sustainable practices, others may be more influenced by financial incentives or convenience. Understanding these motivations is essential to designing effective waste management policies and initiatives that promote sustainable behavior and contribute to environmental protection efforts.

5.4. Labelling of Genetically Modified Food

The labeling of genetically modified (GM) foods has become a significant area of discussion and debate in food regulation and consumer rights. The goal of GM food labeling is to provide consumers with transparent information about the presence of genetically modified organisms (GMOs) in food products, allowing them to make informed decisions based on their preferences and concerns. This aspect of food labeling has received considerable attention from policymakers, scientists, and consumer advocacy groups, reflecting broader concerns about food safety, environmental impact, and ethical considerations associated with GMOs.

The debate surrounding the labeling of GM foods goes beyond mere issues of transparency and consumer choice to include broader issues of public health, environmental sustainability and agricultural practices. Proponents of mandatory labeling argue that consumers have the right to know what's in their food and make informed decisions about the products they buy and consume. They argue that GM food labeling empowers consumers to exercise their autonomy and promotes transparency in the food supply chain. On the other hand, opponents of mandatory labeling often cite concerns about the potential stigma of GM foods, the economic implications for food producers, and the scientific consensus on the safety of GM crops. These conflicting views highlight the complexity of the issue and the different considerations involved in labeling GM foods.

In recent years, the labeling of GM foods has become the focus of regulatory and legislative efforts in many countries and regions around the world. Implementation of labeling requirements varies significantly across jurisdictions, reflecting differences in regulatory frameworks, public attitudes and political dynamics. Some countries have adopted mandatory labeling laws, while others have opted for voluntary labeling systems or no labeling requirements at all. The evolving landscape of genetically modified food labeling underscores

the importance of continued research, dialogue, and collaboration among stakeholders to navigate the complexities of this issue and create policies that balance the interests of consumers, food producers, and regulators.

6. Methodology

Methodologically the thesis employs several theoretical concepts developed in consumer behavior research, which are then operationalized and tested with help of secondary analysis of survey data. Namely the thesis employs Behavioral change model (Boudreau, 2010; Hungerford and Volk, 1990), modified Theory of Planned Behavior (Godin and Kok, 1996; Conner and Armitage, 1998), health belief model (Maiman, and Becker, 1974; Abraham and Sheeran, 2015).

6.1. Behavioural change model

The behavior change model draws on principles established in the general behavior change literature with a particular focus on environmentally responsible behaviour. Rooted in the work of Boudreau (2010) and Hungerford and Volk (1990), this model provides a framework for understanding the factors influencing individuals to adopt pro-environmental behaviors. Adapting established theories of behavior change to the context of environmental sustainability, the model seeks to elucidate the psychological and social determinants that lead individuals to engage in environmentally responsible actions. Through the integration of key concepts and empirical findings from behavioral science research, the model offers insight into the mechanisms underlying behavior change in the context of environmental issues.

At its core, the behavior change model assumes that individual behavior is shaped by a complex interplay of internal and external factors. The model is based on social cognitive theory and ecological psychology and emphasizes the role of cognitive processes, social influences, and environmental stimuli in shaping behavior. According to this framework, individuals' attitudes, beliefs, and perceptions interact with environmental contexts and social norms to influence their behavioral decisions. By elucidating these dynamic interactions, the model offers a nuanced understanding of the processes through which individuals adopt and maintain environmentally responsible behaviors.

Central to the behavior change model is the idea of behavior change as a dynamic and iterative process. The model recognizes that behavior change develops over time and involves different stages, including pre-contemplation, contemplation, preparation, action, and maintenance.

Importantly, the model recognizes the role of interventions and environmental modifications in facilitating behavior change at these stages. By identifying leverage points for intervention and tailoring strategies to individuals' level of readiness, the model offers practical insights for promoting environmentally responsible behavior and supporting sustainable lifestyles in different contexts.

6.2. Theory of planned behavior

The Theory of Planned Behavior (TPB), developed by Godin and Kok (1996) and further refined by Conner and Armitage (1998), provides a comprehensive framework for understanding and predicting human behavior. Central to the TPB is the idea that individual behavior is influenced by three primary factors: attitudes, subjective norms, and perceived behavioral control. According to this theory, attitudes reflect individuals' overall evaluation of behavior, subjective norms represent perceived social pressures to perform or refrain from behavior, and perceived behavioral control refers to individuals' beliefs about their ability to enact a given behavior. Together, these three components shape individuals' intentions to engage in a behavior, which in turn predicts actual behavior.

One of the key strengths of the TPB is its emphasis on the role of subjective norms in shaping behavior. Unlike other behavioral theories that focus only on individual-level factors, the TPB recognizes the importance of social influences in driving behavior. By taking into account how individuals perceive others' expectations and approval of behavior, the TPB provides a more nuanced understanding of the social context in which behavior occurs. This aspect of the theory is particularly relevant in the context of environmentally responsible behavior, where social norms and peer influences can play a significant role in shaping individuals' attitudes and intentions.

In addition, the TPB offers practical implications for behavior change interventions and policy interventions aimed at promoting environmentally responsible behavior. By identifying key determinants of behavior (ie, attitudes, subjective norms, and perceived behavioral control), TPB enables the development of targeted interventions that address specific barriers and leverage points for behavior change. Interventions based on TPB principles may include strategies for modifying individuals' attitudes and beliefs about environmentally responsible behavior, enhancing social support and approval of such behavior, and empowering individuals to overcome perceived barriers and increase their perceived control over taking sustainable actions. Overall, the TPB serves as a valuable tool for understanding the complex interplay of

psychological, social, and environmental factors that influence behavior and for designing effective interventions to promote sustainability.

6.3. Health Belief Model

The Health Belief Model (HBM, Maiman and Becker in 1974, Abraham and Sheeran 2015) provides a framework for understanding individuals' health-related behaviors by examining their threat perceptions and likelihood of engaging in preventive actions. At the core of the HBM are several key constructs, including perceived susceptibility, perceived severity, perceived benefits, perceived barriers, incentives to action, and self-efficacy. These constructs collectively influence individuals' perceptions of health threats and their likelihood of adopting preventive behaviors.

Perceived susceptibility and perceived severity are two core components of HBM that reflect individuals' beliefs about their vulnerability to a particular health condition and their assessment of the severity of its consequences. According to the model, individuals are more likely to engage in preventive actions if they believe they are at risk of a health problem and believe the consequences of the problem are serious. In addition, individuals' perceptions of the benefits and barriers associated with preventive measures play a key role in shaping their behavior. Perceived benefits, such as improved health outcomes or reduced risk of disease, may motivate individuals to adopt preventive behaviors, while perceived barriers, such as cost, inconvenience, or perceived ineffectiveness of preventive measures, may hinder their willingness to act.

Cues to action and self-efficacy are two other constructs within the HBM that influence the likelihood that individuals will engage in health-promoting behaviors. Cues to action refer to external cues or appeals that prompt individuals to take preventive action, such as media campaigns, advice from health care providers, or personal experiences with the disease. On the other hand, self-efficacy reflects individuals' confidence in their ability to successfully perform certain behaviors despite potential obstacles or challenges. By focusing on these key constructs, HBM provides insight into the cognitive and motivational factors underlying health-related decision-making and offers practical implications for designing interventions to promote health behavior change and disease prevention.

6.4. The econometric analysis

The study uses econometric analysis to investigate factors influencing consumer choices and preferences regarding environmentally responsible household behavior in the Czech Republic. Based on data from a cross-sectional survey of a representative sample of households, the study aims to provide insight into the determinants of green purchasing behavior and environmentally conscious decision-making. The data set is carefully described in the relevant sections of the work, which ensures transparency and rigor of the research process. By analyzing survey responses from different households, the study seeks to capture the complexity of consumer behavior and its underlying drivers.

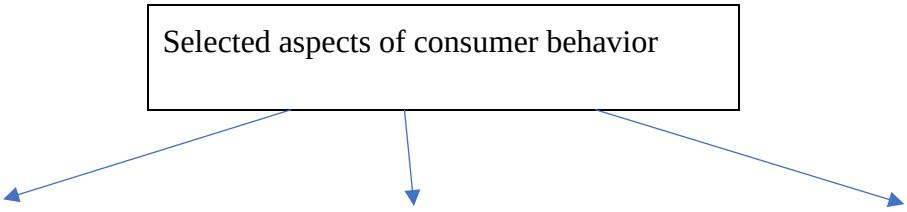
To analyze the multidimensional nature of consumer choices and preferences, the study uses Principal Component Analysis (PCA) to reduce the dimensionality of influencing factors and indicators. PCA allows researchers to identify latent variables or underlying patterns within a data set, thereby facilitating a more comprehensive understanding of the factors influencing consumer behavior. By extracting key components from the data, PCA helps streamline the analysis process and identify the most important variables for further investigation. This approach increases the efficiency and interpretability of the analysis and allows researchers to focus on the most important factors shaping consumer choices.

Ordinal regression analyzes are used to examine the relationships between the identified factors and consumer choices and preferences. By applying ordinal regression models, the study assesses the impact of various predictors on the likelihood of different consumer behavior or preferences. These models provide valuable insights into the relative importance of different factors in influencing consumer decisions and shed light on the mechanisms that drive environmentally responsible behavior. Models for econometric analyzes are carefully constructed based on existing theory, empirical findings, and policy-relevant studies summarized in literature reviews. This theoretical foundation ensures that the analysis is robust and meaningful and provides valuable implications for policy makers, practitioners and researchers in the field of environmental sustainability.

6.5. The conceptual and methodological structure of the thesis

The conceptual and methodological structure of the thesis is depicted in the Figure 2

Figure 2. Selected aspects of household consumer behavior in the context of environmental and technological changes. The methodologies



Green consumption Green purchasing	Green consumption Resource and waste management	The attitudes to the genetically modified food products. The issue of GMO labelling.
Factors affecting green purchasing decisions	Factors affecting environmentally conscious resource and waste management	Factors affecting the perceived need of GMO labelling including the willingness to read the labels and consume GMO food products
Behavioral change model Ordinal regression analysis	theory of planned Behavior The Principal Component Analysis Ordinal regression analysis	Health belief model The Principal Component Analysis. Ordinal regression analysis.
Chapter 7	Chapter 8	Chapters 9

Hlaváček, M., Čábelková, I., Brož, D., Smutka, L., & Prochazka, P. (2023). Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure. *Frontiers in Environmental Science*, *11*, 1130533.	Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). It starts from home? Explaining environmentally responsible resource and waste management. *Frontiers in Environmental Science*. 27 June 2023 Volume 11 - 2023 | https://doi.org/10.3389/fenvs.2023.1136171	Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). Exploring Attitudes towards GMO Labelling: A Study on the Czech Population. *Ukrainian Food Journal*. Vol. 12 (3) pp. 500-522

Source: own research

7. Green consumption. Explaining environmentally responsible resource and waste management.

This chapter is based on published paper Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). It starts from home? Explaining environmentally responsible resource and waste management. Frontiers in Environmental Science. 27 June 2023 Volume 11 - 2023 | https://doi.org/10.3389/fenvs.2023.1136171

7.1. 1 Introduction

Environmentally responsible resource and waste management is indispensable for environment protection. This is accomplished by reducing consumption of natural resources, reducing the amount of hazardous waste produced, and responsibly disposing of the waste that is created. Environmentally responsible resource and waste management is an important part of environmentally responsible consumption on all the three stages of the latter. First, it involves careful consideration of resource use at the level of purchasing decision; second, is assumes careful consumption with little waste produced on the stage of storage and consumption; third, it implies environmentally conscious waste management (for the three stages of consumption see Stern, 2000).

Environmentally responsible consumption bears immense potential for environment protection and mitigation of climate change as currently consumers contribute to more than 70% of urban greenhouse gasses (GHG) emissions (Hertwich and Peters, 2009; Lee and Lee, 2014; Ding, et al., 2017; Wiedenhofer, et al., 2017). Reducing the household-based carbon footprint in some countries could reduce almost 40% of national GHG emissions (e.g., National Strategy of Japan by 2030, Oshiro et al., 2017).

Environmentally responsible consumption is a subject of many policy initiatives on the level of the EU and single countries (Calabro, 2007; Skovgaard, 2014; Fischer and Geden, 2015). Environmentally friendly policy initiatives are generally well accepted by populations as they promise clean environment and mitigation of climate change. However, in some countries, the Czech Republic is the example, environmentally charged EU policies traditionally evoke certain controversy, as they negatively affect the economies of coal-producing regions and impose additional monetary and non-monetary burdens (Cabelkova et al., 2020; Cabelkova et al., 2022).

Environmentally conscious actions, that need to follow legislative measures, require joint determination of diverse social actors (Sahakian and Seyfang, 2018; Xu et al., 2018), each of

which is influenced by the individual attitudes, emotions, motivations, perceptions, values and norms (for the review see Wijekoon and Sabri, 2021). The impact of knowledge achieved through education or mass media (traditional, social, or new) cannot be overestimated. Previous research has shown that agendas presented in the mass media and discussion platforms create group norms and affect intentions and behavior (Moore and Moschis, 1983; Willnat and Weaver, 2018; Chen, et al., 2019). However, in the field of sustainable actions, research on the media's role is still largely missing (Chen et al., 2019).

The early theories on green consumption start from the Fisk's (1974) theory of responsible consumption, Henion and Kinnear's (1976) ecological marketing and Kardash's (1974) theory of ecologically concerned consumer. Theoretical and empirical studies concentrated on the factors affecting environmentally responsible behaviour in an attempt to predict and improve environmental outcomes. The early studies concentrated on socio-demographic predictors in the boundaries of the literature on market segmentation. Later studies suggested psychological and institutional factors to be the main predictors of environmentally friendly actions (Van Dam and Apeldoorn, 1996; Kilbourne and Beckmann, 1998). The more recent literature studied the role of environmental knowledge, economic rationality, attitudes, beliefs and values (Bartkus et al., 1999; Eriksson, 2004; Jackson, 2005; Han, et al., 2007; Carrus et al., 2008). The latest literature on the topic presented the role of the media (Jain et al., 2020; Wagdi et al., 2022), yet, this field remains understudied (Chen et al., 2019).

This paper studies factors affecting the propensity of the population to engage in environmentally conscious consumption, namely, in saving resources and sorting waste. We hypothesize that environmental concerns, perceptions on climate change, attitude to EU integration, and media exposure predict more saving resources and better household waste management in the Czech Republic. Methodologically we rely on principal component analysis, correlation, and ordinal regression analyses employing a representative sample of 904 respondents (aged 15–95 years, M ± SD: 47.74 ± 17.66; 51.40% women, 19.40% with higher education) from the Czech Republic.

7.2. Environmentally responsible resource and waste management as a part of environmentally responsible consumption

Environmentally responsible consumption starts with purchasing decisions, follows with consumption, and closes with waste management (Stern, 2000). Environmentally responsible resource and waste management resides in all the three parts of environmentally responsible

consumption. In the first part—choosing "green" products and limiting excessive consumption—resources might be saved in choosing the products with less resource input (e.g., energy or resource effective products), choosing the products producing less waste (e.g., products without packaging), or limiting excessive consumption and, thus excessive resource use. At the second stage—consumption per se—one could reduce waste by adequate storage technologies and use of utilities. At the third stage—waste sorting and disposal—waste itself may be considered as a resource and waste separation is one of the ways both to produce additional resources and reduce waste.

An indispensable part of household consumption consists of food items. Recent studies that have examined environmentally conscious purchasing focus primarily on protein consumption. They have shown a strong relationship between environmentally conscious purchasing and protein consumption. This relationship is important for both individuals and society as a whole. According to Flynn et al. (2016), individuals who prioritize environmental sustainability in their purchasing decisions tend to consume less protein. This is because animal-based protein production, such as beef and poultry, has a significantly larger carbon footprint than plant-based protein sources like beans and lentils (Steinfeld et al., 2006). Gerber (2013) also found that the meat industry is responsible for approximately 18% of global greenhouse gas emissions. Individuals can significantly reduce their carbon footprint and contribute to climate change mitigation by reducing their consumption of animal-based protein and opting for more environmentally friendly options. Furthermore, McDougall et al. (2002) found that plant-based diets have a lower environmental impact and numerous health benefits compared to diets high in animal protein. The health benefits include a reduced risk of chronic diseases such as heart disease and type 2 diabetes (McDougall et al., 2002).

7.3. Environmentally responsible consumption

7.3.1. 2.1.1 Green purchasing

Figure 1 Green purchasing (GP) refers to 1) purchasing environmentally friendly products, which are usually recycled and bring benefits to the environment, and 2) avoiding products that harm the environment (Chan, 2001; Mostafa, 2007; Steg and Vlek, 2009). In this regard, GP should be distinguished from sustainable purchasing, which, besides environmental sustainability, accounts for economic, social, health, and other sustainability aspects (Miemczyk, et al., 2012).

Green purchasing is also related to food consumption. This is particularly true about protein consumption. While protein consumption has long been considered an essential component of a healthy diet, recent studies have also highlighted the environmental impact of protein production, with animal-based protein sources often being particularly damaging to the environment. In response to this, many individuals and organizations have begun to adopt green purchasing practices, choosing protein sources that are both sustainable and environmentally friendly.

For example, Weber and Matthews (2008) found that the production of animal-based proteins requires significantly more resources and generates more greenhouse gas emissions than plant-based protein sources. Crowe et al. (2014) found that adopting a plant-based diet can significantly positively impact both individual and global health while reducing the environmental impact of protein production. This has led to a growing interest in plant-based protein sources, such as legumes, nuts, and seeds, which can provide high-quality protein while also being sustainable and environmentally friendly.

In addition to the environmental benefits of choosing plant-based protein sources, many organizations are also adopting green purchasing practices to support local agriculture and reduce food miles. This can help reduce the environmental impact of protein production, supporting the local economy and promoting food security (Rangan et al., 2013).

7.3.2. Saving resources

Besides favouring environmentally friendly products, consumers may reduce some parts of consumption to save the environment. Two types of saving can be considered: 1) limiting resource use, such as reducing waste of energy and water via water and energy-saving technologies, and 2) limiting unnecessary consumption, such as limiting car drives, reusing the closes and bags instead of buying new, changing the furniture in an apartment less often, etc.

The first alternative often implies additional costs for new technologies and can be regulated by the governments (e.g., the prohibition of selling electric bulbs in the EU). Though these actions may benefit the environment, the prohibitions may create societal tensions, as they create discrepancies on an economic level. The opinion of the citizens on these policy measures should be considered, especially in light of the increasing activity of EU policymakers in the field of environmental protection and climate change.

The second alternative suggests voluntary consumption deprivation to protect the environment (e.g., limiting car drives, flights, reusing clothes or plastic bags, etc. (Nenckova, et al., 2020). This strategy implies economic and behavioral aspects. Limiting unnecessary consumption reduces financial expenses and decreases consumption's utility (Pangarkar, et al., 2021). This utility loss might be compensated by the positive feeling of being environmentally conscious (Ketelsen, et al., 2020), which, in turn, requires building this consciousness. The exposition to mass media (including all kinds of online and offline discussion platforms) and education are likely to be the affecting factors (Trivedi, et al., 2018; Liobikienė and Poškus, 2019).

7.3.3. Waste management

Environmentally motivated waste separation and disposal generally require extra efforts, which are shown to reduce the intentions for environmentally correct waste management (Wan et al., 2015; Welfens, et al., 2016). The governments compensate for these efforts via financial motivations (Challcharoenwattana and Pharino, 2016; Xu et al., 2017). For example, separated waste in the Czech Republic can be disposed of free of charge, while the utilization of mixed waste is charged. Besides, separated food waste can be used as fertilizers for further agricultural production if composted. However, not all households have access to composting facilities. In any case, the motivation for environmentally conscious waste management is impacted by the agenda of environmental protection, style of life, and financial motivations (Vassanadumrongdee and Kittipongvises, 2018).

7.4. Factors affecting environmentally responsible consumption in the literature

The roots of green consumption can be seen in centuries past, but the phrase itself was first used in the 1970s in the United States alongside the development of "societal marketing," which addressed environmental questions. Fisk's Theory of Responsible Consumption (Fisk, 1974), Henion and Kinnear's Ecological Marketing (Henion and Kinnear, 1976), and Kardash's Ecologically Concerned Consumer (Kardash, 1974) were all theories that categorized green consumption. Research initially centered on energy use and pollution related to the automobile, oil, and chemical industries. Recycling, energy savings, and consumer reactions to advertising and labeling were primary topics of study (Kilbourne and Beckmann, 1998; Henion and Kinnear, 1976; Peattie, 2010).

In the 1980s, the resurging interest in environmental protection was propelled by various major events, such as the Exxon Valdez oil spill, and strong evidence of environmental damage. Data from market research, the popularity of green consumer guides, and the worldwide boycott of

aerosols powered by chlorofluorocarbons (CFCs) showed that consumers were becoming increasingly aware of environmental issues. This presented a business opportunity for various companies, and sparked further research into green consumer behavior (Henion and Kinnear, 1976). Early studies focusing on understanding green consumer attitudes and conduct evolved into efforts to comprehend their motivations, psychology, and the influence of institutional factors (Van Dam and Apeldoorn, 1996; Kilbourne and Beckmann, 1998; Peattie, 2010).

The current empirical literature on factors affecting environmentally sustainable consumption tests various sets of factors presented. This paper contributed to this literature by studying the role of environmental fears attitudes and preferences including the agenda of climate change, attitudes and trust to political institutions (namely, the EU), the impact of the media exposure, and socio-demographics. The following sections describe the current contexts of these four factors with respect to environmentally conscious consumption and the relevant literature.

7.5. The factors affecting environmentally responsible consumption studied in this paper. the literature, agendas and context

7.5.1. The agenda of climate change

The role of concerns about climate change on environmentally sustainable consumption is well documented in the literature (Wynveen and Sutton, 2015; Valle et al., 2005; Vassanadumrongdee and Kittipongvises, 2018). Though climate change is a subset of environmental protection, the agenda of climate change, as presented in the media, significantly differs from the agenda of environmental protection. First, local environmental changes are more visible to the public than climate change's global effects. Second, the agenda of climate change is somewhat controversial as it can be easily affected by commercial and political elites.

The literature describes the two roles played by the traditional mass media - (1) mass media as an outlet to elite cues (political, economic, other, see (Brulle, et al., 2012, Carmichael and Brulle, 2017, Schäfer and Painter, 2021) and (2) as an outlet for accurate scientific information (for the discussion see Cabelkova et al., 2022). Corporations and political movements expose alarming messages on climate change in the media as they profit from green policies. On the other hand, the climate skeptic movements question the existence of climate change and diminish its importance in the eyes of the media consumer (Weber and Stern, 2011; McCright and Dunlap, 2011). The engagement of stakeholders presenting their interests in the media led to the overrepresentation of climate change issues compared to the general agenda of environmental protection (Legagneux et al., 2018). New media, such as online news servers,

social networks, blogs, and discussion platforms, exaggerate these controversies via intense opinions polarization and information bubbles (Pearce et al., 2019).

In any case, the methods to fight climate change are presented primarily as the reduction of greenhouse gas emissions via green consumption, green housing, recycling, and green travel (Alfredsson, 2004). Consumers, for example, are suggested to reuse clothes more often and reduce meat consumption. Morren et al. (2021) found that more environmentally conscious individuals were also more likely to reduce their protein consumption. This is because many protein sources, such as meat and dairy products, have a higher environmental impact than plant-based proteins. Individuals can decrease their carbon footprint by reducing protein consumption, thus helping to protect the environment (Morren et al., 2021). Consumers are also advised to reduce purchases of commodities in disposable packaging to purchase locally produced products, save water and energy, limit traveling by car or plane, etc (Pavlovič, 2020; Alfredsson, 2004).

The effects of waste management on climate change are described in the literature as reducing landfill methane emissions, the need for industrial energy due to recycling, energy recovery from waste, and saving forests for carbon sequestration (Ackerman, 2000; Castro, et al, 2021). The waste agenda, as presented in the media, is more related to general environment protection and saving resources (Cabelkova et al., 2022)

In the Czech Republic, the discussion on climate change in mass media is related to the coal industry. Contrary to other countries, where coal consumption reduction was caused by depletion of reserves or competition of other sources of energy (for the story of UK see Beatty et al., 2007; Turnheim and Geels, 2013), the reduction of coal production in the Czech Republic is primarily argued from the point of view of environmental or climate concerns, which, however, bring direct economic problems to the people and regions. However, the appeal to fight climate change via the adoption of climate-conscious behavioral patterns is dominant (Navrátilová, 2021; Trunečková, 2015; Cabelkova, et al, 2022). On the other hand, in the context of economically important areas (such as coal mining), the climate effects of fossil fuels were effectively forgotten (Lehotský et al., 2019; Černý and Ocelík, 2020; Cabelkova, et al, 2022).

7.5.2. The agenda of environmental protection

The impact of environmental concerns on environmentally conscious consumption is well documented in the literature (Lin and Niu, 2018; Janssen, 2018; for the review, see Suciu et al.,

2019). While the dangers of climate change are often distant and not primarily visible in the Czech Republic, environmental degradation is more often experienced directly (Hůnová, 2020). The health effects of polluted food, smog, frequently appearing in the cities, and changes in biodiversity in ecosystems are experienced directly. In the Czech Republic, the agenda and environmental effects of coal mining and processing are directly visible to the general public in exposed regions (Lehotský and Černík, 2019).

The coal-producing regions report intense environmental degradation resulting in significant health effects (Frantál and Nováková, 2014), though the reduction in coal production and combustion produced substantial social and economic disparities (Frantál, 2016; Lehotský and Černík, 2019). In any case, a direct negative experience with environmental problems substantially affected the willingness to protect the environment.

7.5.3. The role of preferences for EU integration. The specifics of the Czech Republic.

The preferences for EU integration are closely related to the EU regulations on one side and EU financial compensations on the other. The EU regulations relevant to consumer behaviour can be divided into product and waste legislation. Product legislation includes environmental product requirements, information and labeling requirements, rules on product guarantees, and climate legislation (Sajn, 2020). Waste legislation motivates waste recycling, processing, and environmentally friendly waste disposal. Though these policies are beneficial for the Czech environment, they aroused certain controversy, as they affected the economies of coal-producing regions, limited the supply of cheap but environmentally damaging products, and increased prices due to environmental measures (Cabelkova et al., 2020, 2022). The attitude toward EU integration was compromised in affected regions.

7.5.4. The role of the media

Scholars have reported that a lack of information might prevent individuals from sustainable consumption, as information impacts people at multiple psychological levels (Cerri et al., 2018; Testa et al., 2015). The role of the media is difficult to overestimate. Traditional media studies suggest that media serve as agenda setters (McCombs and Valenzuela, 2020; Dumitrescu and Mughan, 2010). Media play an essential role in disseminating information, thus influencing people's knowledge, awareness, attitudes, and socioeconomic choices (Jalan & Somanathan, 2008; Madajewicz et al., 2007). The impact of the media is then dependent upon the extent and the prominence of media coverage (the quantity coverage theory, Mazur, 2009). However, the

information presented in traditional media may be biased as it is heavily affected by the stakeholders (Andrews and Caren, 2010, Brick and McGreggor Cawley, 2008).

The new (online, discussion-based) media, social networks, and blogs present a counterpole to the traditional ones in terms of the impact of stakeholders. However, the new media are subject to incorrect information, polarisations, and the creation of information bubbles (Pearce et al., 2019). The impact of the media on environmentally responsible attitudes and behaviors varies according to the type of media and the agenda the media presents (Cabelkova et al., 2020; 2022).

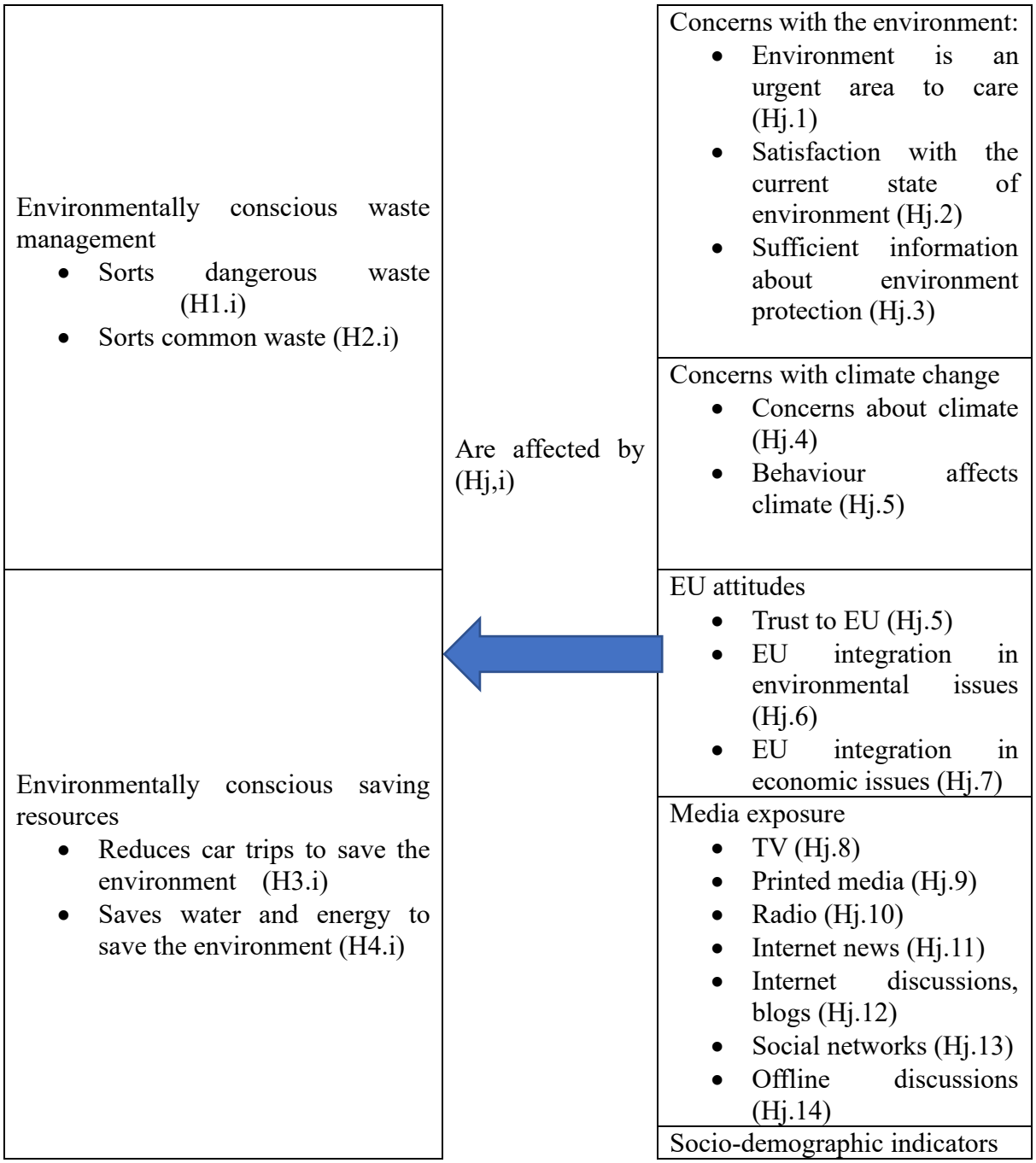
Two types of environmentally related agendas have been recently stressed in the media – environment degradation (including pollution, land degradation, and overuse of resources) and the effects of climate change (including global warming, Jati and Rahayu, 2020). Both are supposed to be exacerbated by anthropogenic pressure and in both cases, human action is required.

7.6. Data and methods

7.7. The model and hypotheses

The model presented in this paper is built on a line of modified Theory of Planned Behaviour (Godin and Kok, 1996; Conner and Armitage, 1998). We hypothesize, that environmentally conscious waste management and saving resources are related to concerns with the environment and climate change, EU attitudes, media exposure, and sociodemographic characteristics (Graph 2).

Graph 2 The model and hypotheses (Hj.i)



Source: own research

7.7.1. The data

We rely on data collected by the Czech Institute of Sociology in July 2021 in s survey entitled Our society. A total of 904 respondents (aged 15–95 years, M ± SD: 47,74 ± 17,66; 51.40% women, 19,40% with higher education) answered the questions in the questionnaire voluntarily and anonymously under the supervision of 139 experienced interviewers. All participants were Czech native speakers living in the Czech Republic. All the questionnaires were included in

the data sample. The sampling relied on quotes (geographical position, age, gender, and education) to achieve representativity. According to quotes, the data sample is representative of the Czech Republic. The data were kindly provided by the Czech Social Science Data Archive (Sociologický ústav. Akademie věd ČR. 2021).

7.7.2. The indicators

7.7.2.1. Environmentally conscious behaviour.

Based on three phases of consumption (Graph 2), three indicators of environmentally conscious consumption are depicted in Table 2. This paper primarily concentrates on saving resources and waste management; however, we also conduct exploratory Principal component analysis to study the structure of all the indicators of environmental consumption.

Table 2 Environmentally conscious consumption. Indicators.

Environmental consumption indicators		
Green purchasing	Saving resources	Waste management
Indicators • buying organic food • buying locally-produced food • when buying products, being guided by whether they are environmentally friendly	Indicators • limiting car journeys to protect the environment • saving energy and water to protect the environment	Indicators • handing in, separating hazardous waste • separating regular waste

Source: own research

Table 3 Environmental consumption indicators. The exact wording of the questions and the distribution of the respondents (%)

As far as your household is concerned, you ...	always	often	rarely	never	N/A
Purchasing decisions					
buy organic food	3,10	19,20	45,00	28,40	4,30
buy locally-produced food	8,10	50,10	30,10	7,50	4,20
when buying products you are guided by whether they are environmentally friendly	7,00	23,80	32,20	26,80	10,20
Waste management					
Separate, hand in your hazardous waste	48,30	32,00	11,60	3,80	4,30
separate your regular waste	52,00	33,70	10,40	3,40	0,50
Saving resources					
limit car journeys to protect the environment	4,30	17,30	30,90	27,70	19,80
save energy and water to protect the environment	15,00	40,60	24,60	16,90	2,90

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

The least frequent environmentally responsible behavior is reported in the cases of buying organic food (22,30% report buying it always or often, and 28,40% of the respondents report never buying them), and limiting car journeys to protect the environment (21,60% of the respondents report limiting car journeys always of often and 27,70% report never buying them). On the other side, the Czech population showed to be environmentally conscious in waste management, where 80,30% of the respondents reported handing in and sorting hazardous waste always or often, and 85,70% of the respondents reported always or often sorting regular waste (Table 3).

7.7.2.2. Perceptions on the environment, climate change, attitude to EU policies.

The exact wording of the questions and the distribution of the respondents are presented in Table 4.

Table 4 Perceptions on the environment, climate change, EU. The distribution of the respondents (%)

How urgent do you think it is to address the following areas in the Czech Republic this year: Environment protection				
Not urgent at all	Rather urgent	Very urgent	N/A	
19,8	48,8	29,5	1,9	
How satisfied are you with the environment in the place where you live?				
Very satisfied	Rather satisfied	Rather dissatisfied	Very dissatisfied	N/A
19,7	56,2	18,8	4,6	0,7
Do you have enough information about how to be environmentally friendly?				
Definitely enough	Rather enough	Rather not enough	Definitely not enough	N/A
15,3	52,2	22,9	4,0	5,6
How worried are you about the impacts of climate change?				
Very worried	Rather worried	Rather not worried	Not worried at all	N/A
13,2	40,7	26,2	9,2	10,7
Do you think that if people changed their current behavior, they could change the current climate change?				
Could stop it completely	Could slow it down	Could not affect the climate change	N/A	
5,9	63,3	15,0	15,8	
In your opinion, is European integration beneficial or harmful in these areas: economy				
Definitely beneficial	Rather beneficial	Rather harmfull	Definitely harmful	N/A
11,7	44,0	26,2	7,6	10,5
In your opinion, is European integration beneficial or harmful in these areas: environment				

Definitely beneficial	Rather beneficial	Rather harmfull	Definitely harmful	N/A
12,2	46,2	20,0	6,4	15,2
Please tell me, how much do you trust the European Union				
Definitely trust	Rather trust	Rather distrust	Definitely distrust	N/A
5,2	45,5	27,2	15,4	6,7

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

Environment and climate issues raise considerable concerns. Almost eighty percent of the respondents perceive environmental protection as urgent or rather urgent (Table 4). More than half of the respondents are worried or rather worried about climate change (53,9%). On the other hand, three quarters of respondents are very or rather satisfied with the state of the environment in their neighborhood. Almost seventy percent of the respondents believe that change is behavior could at least slow (and at most can stop) climate change.

There is considerable polarization in beliefs on whether European integration is beneficial and whether the respondents trust the EU: Approximately a third of the respondents (33,8% in the case of economic policies and 26,4% in the case of environmental policies) believe that EU integration is harmful to the Czech Republic. 42,6% of the respondent reported some level of distrust of the EU.

7.7.2.3. Media exposure

The exact wording of the questions on media exposure and the distribution of the respondents are presented in Table 5.

Table 5 Media exposure. The wording of questions and the distribution of the respondents (%)

How often do you follow social life on	At least 1x a day, %	Several times a week, %	1x a week, %	Less than 1x a week, %	Never, %	N/A, %
TV	42,1	33,8	10,3	7,3	5,9	0,6
Printed newspapers, magazines	7,2	18,3	23,0	24,2	26,7	0,6
Radio	19,1	28,4	16,7	14,3	20,6	0,9

Online news servers	19,6	29,1	15,8	12,9	22,0	0,6
Social networks	14,2	18,7	11,0	14,2	40,9	1,0
Offline discussion	7,1	24,8	21,8	20,9	24,1	1,3

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

TV is still the most frequently used media, while the second place is occupied by radio and online news (Table 5). The exposition to printed newspapers, magazines, and offline discussions is relatively rare. The exposition to social networks is rare – 40,9% of the respondents never use them.

7.7.2.4. Socio-demographic characteristics

We control for the standard of living (very good 8,8%, rather good 45,7%, neither good nor bad 35,2%, rather bad 8,6%, very bad 1,2%), gender (51,4% women), age (aged 15–95 years, M ± SD: 47,74 ± 17,66) education (19,40% with higher education), political orientation (1 left - 11 right, M ± SD: 6,56 ± 2,27), subjective town size (21,5% big city, 3,4% suburb of big city, 26,7% average town, 24,7% small town, 8,9% big village, 14,3% small village).

7.8. The method

We conduct exploratory Principal Component Analysis to study the structure of environmentally conscious consumption indicators (Table 3). Namely, we are interested in whether the grouping suggested above (purchasing activities, waste management, and saving resources) correspond to the structure of components presented in the data.

Second, we conduct a set of ordinal regression analyses to test the hypotheses presented in Graph 2 according to the formula (1).

$$Behavior_i = logit(a_0 + a_{1-3}Environment + a_{4,5}Climate + a_{6-8}EU + a_{9-15}Info + a_{16}Standart + a_{17}Gender + a_{18}Age + a_{19}Political\ orientation + a_{20-22}Education + a_{23-27}Town\ size + e \quad (1)$$

Where

$Behavior_i$ – stands for the frequency of conducting environmentally conscious activities consequently (separate and hand in hazardous waste, separate regular waste, limit car journeys to protect the environment, save energy and water to protect the environment, for the distribution of the respondents see Table 3)

Environment – 1) the extent the environmental protection is urgent, 10) the level of satisfaction with the environment in the locality of the respondent, 11) the extent the respondent has sufficient information about how to behave in an environmentally friendly way (for the distribution of the respondents see Table 4)

Climate – concerns about the effects of climate change and belief that people's behavior can mitigate climate change (for the distribution of the respondents, see Table 4)

EU – the attitude to EU policies, namely: whether European integration in the fields of economy and environment is beneficial or harmful, and the extent the respondents trust the EU.

Info – six variables reflecting exposition to media sources, namely: TV, printed newspapers and magazines, radio, online news serves, social networks, and offline discussions (for the distribution of the respondents, see Table 5).

Standard – subjective standard of living of the respondents (very good to very bad, 5-point scale)

Gender and Age –gender and age of the respondents

Political orientation – political orientation (left-right, 11-point scale)

Education – education dummies (primary, secondary w/o state exam, secondary with state exam, higher)

Town size – dummies for subjective town size (big city, suburb of big city, average town, small town, big village, small village)

The bivariate correlations between the variables above are presented in Appendix 1.

7.9. Results

We run exploratory principal components analysis for the indicators of environmental consumption (Table 3) to study the internal structures.

7.9.1. Environmental consumption. The principal component analysis

The results of the principal component analysis are presented in tables 6 and 7. Three components were extracted:

- Component 1: saving resources and buying products to protect the environment.
- Component 2: waste management.

- Component 3: purchasing decisions.

Factor extraction was determined by the fixed number of factors equal to three, and all variables were extracted as expected. The Bartlett test of sphericity with a Chi-Square value 1232,92 ($p < 0,001$) and Kaiser-Meyer-Olkin Measure of sampling adequacy was equal to 0,757 (>0,5), suggests that the data are suitable to identify factor dimensions.

The three extracted components were able to capture 73,43% of the total variance. The distribution of the indicators to components roughly corresponds to the distribution presented in Table 14: purchasing decision, waste management, and saving resources. The only indicator assigned to an unexpected component was purchasing environmentally friendly products, though the commonality with purchasing decisions is also high (0,402).

Table 6 Environmental consumption indicators. Results of principal component analysis. Rotated component matrix.

		Compponents		
		1	2	3
1	you limit car journeys to protect the environment	0,884	0,022	0,119
	you save energy and water to protect the environment	0,745	0,314	0,136
	when buying products, you are guided by whether they are environmentally friendly	0,697	0,088	0,402
2	you sort your regular waste	0,086	0,883	0,126
	you hand in, sort your hazardous waste	0,168	0,876	0,055
3	you buy organic food	0,141	-0,012	0,903
	you buy locally-produced food	0,305	0,298	0,63

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021). Extraction method: principal component analysis. Rotation Method: Varimax with Kaiser Normalization. The number of components to extract was set to 3. Component 1: saving resources and buying products to protect the environment. Component 2: waste management. Component 3: Purchasing decisions. N=625

Table 7 Environmental consumption indicators. Results of principal component analysis. Total Variance Explained

Component		Sums of Squared Loadings	
	Total	% of variance	Cumulative %
1	1,971	28,161	28,161

2	1,743	24,902	53,064
3	1,426	20,375	73,439

Source: own computations based on data (Sociologický ústav. Akademie věd ČR. 2021). Extraction method: principal component analysis. Rotation Method: Varimax with Kaiser Normalization. Component 1: saving resources and buying products to protect the environment. Component 2: waste management. Component 3: Purchasing decisions.

For the sake of conciseness, in the following ordinal regressions we concentrate primarily on the indicators belonging to Components 1 (saving resources) and Component 2 (waste management), leaving green purchasing for another analysis.

7.9.2. Ordinal regression analysis

The results of ordinal regression analyses are presented in Table 8.

Table 8 Environmentally conscious saving resources and waste management as predicted by environment protection, concerns about climate change, EU policies, exposition to media, and socio-demographics. Results of ordinal regression analyses.

	Saving resources				Waste management			
	Reduces car trips		Saves water and energy		Sorts dangerous waste		Sorts common waste	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	-1,361	0,153	0,499	0,553	3,347***	<,001	2,993**	0,001
Threshold=2	0,726	0,440	2,804***	<,001	5,483***	<,001	5,210***	<,001
Threshold=3	2,661**	0,005	4,324***	<,001	7,240***	<,001	7,017***	<,001
Environment protection								
Urgent areas - environment	-0,114	0,248	-0,194*	0,033	-0,443***	<,001	-0,099	0,332
Satisfaction with the environment	0,012	0,929	0,194	0,111	0,480***	<,001	0,341*	0,010
Enough info about environment	0,054	0,681	0,333**	0,006	0,807***	<,001	0,534***	<,001
Concerns about climate change								
Behaviour affects climate	0,493*	0,017	0,199	0,277	-0,528*	0,010	-0,347	0,086
Concerns about climate	0,415***	<,001	0,463***	<,001	0,388**	0,003	0,259*	0,038
EU policies								
EU integration, environment	0,027	0,844	0,161	0,203	0,170	0,224	0,100	0,466
EU integration, economy	0,060	0,664	-0,149	0,246	-0,129	0,364	-0,163	0,247
Trust to EU	-0,078	0,546	-0,017	0,887	0,257	0,053	0,158	0,231
Political orientation (left-right)	-0,057	0,170	0,011	0,768	-0,010	0,816	0,029	0,490
Exposition to media								
TV	-0,169	0,098	-0,047	0,602	0,053	0,611	0,020	0,834
Printed media	0,105	0,202	-0,116	0,128	0,031	0,718	-0,051	0,537
Radio	0,051	0,495	-0,042	0,537	-0,072	0,342	-0,061	0,410
Online news	-0,191*	0,021	0,015	0,848	0,091	0,295	0,097	0,261
Online discussions, blogs	0,168	0,055	0,018	0,824	0,035	0,704	-0,035	0,696
Social networks	0,020	0,802	0,059	0,438	-0,099	0,248	-0,174*	0,040
Offline discussions	0,102	0,199	0,064	0,384	0,004	0,962	0,094	0,238
Socio-demographics								
Standard of living	-0,062	0,622	0,213	0,056	0,279*	0,023	0,296*	0,014

Gender (men)	0,584**	0,002	0,324	0,061	-0,046	0,810	0,150	0,423
Age	-0,007	0,289	-0,015*	0,015	-0,001	0,846	-0,004	0,592
Education								
Basic	0,143	0,713	-0,072	0,827	0,533	0,136	0,686	0,053
Secondary w/o state exam	0,265	0,302	0,296	0,228	0,200	0,462	0,465	0,086
Secondary with state exam	-0,135	0,571	-0,065	0,777	-0,006	0,982	0,045	0,860
Town size								
Large City	-0,243	0,453	0,656*	0,026	0,893**	0,007	0,826*	0,013
Large city suburb	-0,382	0,472	-0,339	0,488	0,644	0,235	0,373	0,492
Average town	-0,342	0,262	0,314	0,259	0,027	0,933	0,653*	0,039
Small town	-0,778*	0,010	-0,356	0,202	0,484	0,120	0,615	0,051
Big village	0,259	0,503	0,042	0,907	-0,025	0,952	-0,312	0,468
N	463		536		528		540	
Sig		<,001		<,001		<,001		<,001
Pseudo R-Square								
Cox and Snell	0,158		0,155		0,221		0,153	
Nagelkerke	0,172		0,168		0,252		0,178	
McFadden	0,069		0,066		0,119		0,084	

*Link function: Logit., reference variables: women, higher education, small village. *** significant at the 0.001 level (2-tailed). ** significant at the 0.01 level (2-tailed). * significant at the 0.05 level (2-tailed). Source: own computations based on data (Sociologický ústav. Akademie věd ČR. 2021)*

Table 9 summarizes the statistically significant associations presented in Table 8.

Table 9 Predicting environmentally conscious consumption. Results of ordinal regression analyses. Statistically significant associations on conventional levels (5%, 1%, 0,1%).

	Saving resources, frequency of		Waste management, frequency of	
	Reduction of car trips	Saving water and energy	Sorting dangerous waste	Sorting common waste
Environment protection				
Urgent areas - environment		+	+	
Satisfaction with the environment			+	+
Enough info about environment		+	+	+
Concerns about climate change				
Behavior affects climate	+		-	
Concerns about climate	+	+	+	+
EU integration and political orientation				
EU integration, environment				
EU integration, economy				
Trust to EU				
Political orientation (left-right)				
Exposition to mass media				
TV				
Printed media				
Radio				
Online news	-			
Online discussions, blogs				
Social networks				-
Offline discussions				
Socio-demographics				
Standard of living			+	+
Gender (women)	+			
Age		+		
Education				
Basic				
Secondary w/o state exam				
Secondary with state exam				
Town size				
Large City		-	-	-

Large city suburb				
Average town				-
Small town	+			

Note: + denotes positive association, - denotes negative association.

The signs of the associations might be different from the signs of coefficients presented in Table 9 as they reflect the encoding of the variables. Reference variables: men, higher education, small village. The exact wording of the associations depicted in the table are presented in Appendix 2.

Environment protection attitudes and concerns about climate change predict positively environmentally conscious saving resources and waste management. However, the more respondents believed that change in behavior could mitigate climate change, the less they were willing to sort dangerous waste. This result is still to be explained.

Attitudes to EU integration, political orientation, and exposition to mass media showed to be less related to environmentally conscious saving resources and waste management than expected. The political variables were unrelated, while the impact of media exposition, if significant, was negative. Online news negatively predicted reducing car trips, and social networks negatively predicted sorting common waste.

Age, gender and standard of living were positively related to some indicators of environmentally conscious waste management and saving resources though education also proved to be unrelated. Women tended to reduce car trips more than men. Higher standard of living predicted positive environmentally conscious waste management. Age positively predicted saving water and energy. People living in small villages proved to engage in more environmentally conscious waste management and saving resources than people living in other settlements.

7.10. Discussion

The literature suggests that green consumption can be divided to thee main activities roughly representing the three stages of consumption: purchasing decision, consumption itself and green waste management (Stern, 2000). In this article we studied the first stage in the context of saving resources and choosing the green products, second stage in the context of saving resources and the third stage in the aspect of waste management. The results of principal component analysis indicate that consumers view the activities of purchasing, saving resources

and waste management separately, which might indicate that the predictors of green behavior in these areas vary. In this paper we primarily concentrated on saving resources and waste management from the point of view of environment protection.

We hypothesized that the main predictors of pro-environmental behavior in resource and waste management include concerns with environment and climate change, political attitudes (including the attitudes to the EU), exposure to the mass media and socio-demographics. The results of ordinal regression analysis suggest, that environmentally-motivated resource and waste management proved to be statistically significantly predicted by climate and environmental concerns, while political attitudes and media exposure were not statistically significant.

Similarly to existing literature, most of the indicators of concerns about the environment and climate change proved to increase environmentally conscious saving resources and waste management (Wynveen and Sutton, 2015; Valle et al., 2005; Vassanadumrongdee and Kittipongvises, 2018; Lin and Niu, 2018; Janssen, 2018; for the review see Suciu, et al., 2019). However, some significant differences showed up.

7.11. Saving resources

Saving resources reflected the difference in agendas of environmental protection and climate change. While both indicators of climate change proved to reduce unnecessary car trips, neither of the three indicators of environmental concerns (environment as an urgent area, current satisfaction with the environment, and information about environmentally conscious behavior) showed to affect car trip reduction. This result reflects the agenda of reduction of greenhouse gasses (GHG) which, arguably, is primarily related to climate change rather than environmental protection. Saving water and energy have both the dimension of environmental protection (in the sense of reduction of wasting resources) and climate change (in the sense that producing energy generally may also produce GHG). In addition, we suggest, similarly to Barr (2007), in case of car trips practicalities might be more important than ideas about environment or climate change.

The mass media (both traditional and new) did not effectively support saving resources. All but one media were unrelated to saving resources – online news proved to reduce the tendency to spare car trips to protect the environment. This effect of online news might reflect the general polarization of ideas of environmental protection measures and the existence of climate change existing in online media (Pearce et al., 2019) or self-selection of the respondents. This result is

rather surprising as much of research published in various times showed the media effect (Haron, 2005; Jain et al. 2020; Wagdi, et al., 2022)

The lack of media influence on saving resources has scientific and policy-making implications. From the scientific point of view, this result contradicts the existing studies. From the policy-making perspective, the none-existing effect of the media exposure suggests that the media does not fulfill its informative and motivating function and cannot be considered an effective channel to distribute government-relevant agenda. More work needs to be done to find the right communication channel, content and framing (see also Kronrod, et al., 2023).

7.12. Waste management

Although the agendas of climate change and environmental protection are somewhat different, they produced similar associations in the case of the two waste management indicators. The concern about environmental protection (including the protection urgency, the state of the environment in the neighborhood, and the relevant information about environmentally conscious behavior) increase the tendency to sort waste (similar to Leiserowitz, et al. 2006; Dietz, et al., 2005; Sivapalan et al., 2021). Similarly, the worry about climate change increases waste sorting. However, the idea that if people changed their behavior, they could slow down climate change proved to reduce the tendency to sort waste. While similarly irrational, this result may correspond to the overall dysphoria about the possibility of stopping climate change, as reflected by a very small percentage of the respondents (5,9%) who believe that behavior could stop climate change.

The role of traditional mass media and social networks has shown to be suboptimal. First, the media exposure proved to be largely unrelated to environmentally conscious waste management. The only exception – exposition to social networks – was negatively related to waste management. This might reflect the idea that some people following social networks belong to specific information bubbles that discourage sorting the waste, or, at least, do not view that as urgent any case, social networks do not support environmentally conscious waste management. The information bubble's role on social networks needs to receive more attention. Similar to the case of saving resources, the low relation of media exposure to waste management is rather surprising as previous research showed the opposite (Haron, 2005; Jain et al. 2020; Wagdi, et al., 2022) People living in large cities and in average-sized towns proved less prone to separate waste. Similarly to Xu et al., (2017) and Challcharoenwattana and Pharino (2016), we suggest this reluctance to be related to the financial aspects of waste sorting.

People living in villages more often live in family houses and more often have to pay for each waste bin of unsorted waste. They can dispose of separated waste free of change. On the other hand, waste disposal in larger cities and towns is paid for together by many people. Financial motivation is less direct here.

Besides, food waste can be used as fertilizers for further agricultural production if composted. However, not all households have access to composting procedures. In most cases, people living in villages in family houses have access to composting capacities. Thus, the motivation for waste management is impacted by both the agenda of environmental protection (and climate change) and financial motivations (Vassanadumrongdee and Kittipongvises, 2018).

To sum it up, the waste management was supposed to be impacted by four factors: the concerns about the state of environment (and climate change), the political orientation including the attitude to EU, the exposition to the mass media and the socio-demographics. Understandably, the concerns with the environment and climate change proved to be statistically significant predictors, while the impact of political attitude and the media was less than expected and, in some cases, even negative. The low impact of political orientation, besides others, can be attributed to the vague understanding about left- and right- political orientation in the population. Given the eminent importance of the environmentally friendly waste management, these results are important from the scientific perspective and from the point of view of the policy makers. From the scientific perspective we might suggest, that the media should provide the information on waste management and motivate people for environmentally friendly behavior. From our results it follows, that the role of the media is suboptimal. Moreover, in some cases they actually on average demotivate people from environmentally friendly action. From the policy making perspective, the lack of the media effect presents a significant obstacle, obstructing the public absorption of reasonable societal agendas. The reasons behind this are still to be explained as they may reflect the actual role of the media in society as opposed to the theoretical one.

7.13. Limitations and suggestions for further research

As with any study, this research is subject to several limitations. First, the Green attitude-behavior gap (Witek, 2019; Wang, et al., 2019; Joshi and Rahman, 2015, Defra, 2006) suggests that the intention to behave does not always transform into real action. However, the questions in the questionnaire asked about the frequency of a particular action, not the intention to act. Moreover, the intention to behave in an environmental way and the actual behavior are shown

to be driven by the same determinants (Janssen, 2018). Thus, the factors studies are still relevant.

The impact of the mass media (online and offline) on environmentally conscious consumption showed the biggest controversy and requires more research. We suggest two explanations. First, the exposition to certain media types is subject to considerable self-selection. Second, the role of polarization and information bubbles need to be studied.

7.14. Conclusions

To conclude, the results suggest that total waste morale in the Czech Republic is rather good - 80,30% of the respondents reported handing into special places and sorting hazardous waste always or often, and 85,70% of the respondents reported always or often sorting regular waste (Table 3). This motivation seems to be largely given by environmental concerns and, possibly, by the financial motivations enacted in the differently-sized towns.

The least coherent proved to be the role of the media exposition. Most of the media sources, traditional or new, proved to be largely unrelated to waste management. Moreover, the exposure to social networks proved to negatively impact environmentally conscious waste management. We suggest that online media resources are prone to polarization and the creation of information bubbles. More work needs to be done in this direction. Neither the preferences for EU integration nor political orientation revealed a significant association with waste management and saving resources, although the EU largely pushed these agendas. We suggest that more work needs to be done in media research to study the exact reasons for the results above.

This paper contributes to the research on factors affecting the environmentally responsible consumption of household. Our results partly confirmed the effect of values and perceptions about environment and climate changes on conscious consumption behavior. We reported the effect of economic rationality and location effects in higher propensity to separate waste in smaller towns. The effect of personal responsibility for climate change and perceived ability to contribute to its mitigation on environmental resource and waste management proved to be the opposite that what we expected, which still need to be explained.

Citation:

Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). It starts from home? Explaining environmentally responsible resource and waste management. *Frontiers in*

Environmental Science. 27 June 2023 Volume 11 - 2023 | https://doi.org/10.3389/fenvs.2023.1136171

8. Green consumption, Explaining Green purchasing

This chapter is based on published paper Hlaváček, M., Čábelková, I., Brož, D., Smutka, L., & Prochazka, P. (2023). Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure. Frontiers in Environmental Science, 11, 1130533.

8.1. Introduction

Green purchasing is an important part of environmental sustainability and responsible stewardship of resources. It involves the acquisition of goods and services that are environmentally friendly and reduces the negative impacts of production, use and disposal. Green purchasing can help reduce environmental pollution, conserve natural resources, reduce energy and water use, reduce waste and reduce the environmental costs of production, transportation, and disposal.

Factors affecting green consumption have been a long subject of research. The early literature on green consumption presented the term in the context of "societal marketing," which addressed environmental questions (Fisk, 1974; Henion and Kinnear, 1976) and studied economic incentives and socio-demographic segmentation. Later on, individual values, emotions and attitudes proved to be more important. Environmental attitudes, knowledge and personal responsibilities showed to have positive effects on green consumption in some cases but not in others. Dominant social paradigms (e.g., consumerism), individual and collective norms, and habits, such as the perception that green products are luxuriously expensive and insufficient or incorrect information, may reduce green consumption.

All these factors are affected by the agenda presented in the mass media and discussion platforms, which may, if effective, create group norms and affect intentions and actual behavior (Moore and Moschis, 1983; Willnat and Weaver, 2018; Chen et al., 2019).

In Europe, green consumption is a subject of a number of political initiatives on the level of the EU and single countries. The EU is considered a global leader in environmental and climate change politics (Fischer and Geden, 2015; Skovgaard, 2014); green procurement is an essential part of public and private consumption policies (Calabro, 2007). These initiatives are not always accepted positively by the local population, which may affect the willingness to purchase green products. In the Czech Republic, environmentally charged EU policies traditionally evoke controversy, as they negatively affect coal-producing regions, limit the

supply of cheap but environmentally damaging products, and incorporate environmental externalities into the product prices. The EU Environmental policies damaged the economies of the poor coal-producing regions and created an aversion in part of the population to EU integration (Cabelkova et al., 2020, 2022)

Environment protection requires relevant knowledge transferred to the general public through school education or various types of mass media (traditional, online, social). In this field, research on the media's role in different sustainable actions is still largely missing (Chen et al., 2019)

This paper aims to study the role of environmental attitudes, perceptions on climate change, attitudes to the EU, and media exposure in predicting environmentally responsible consumption in the Czech Republic. We distinguish three types of "green" commodities: organic food, local food, and environmentally friendly products. Methodologically we rely on Principal Component Analysis (PCA), correlation, and ordinal regression analyses applied to a representative sample of 904 respondents (aged 15–95 years, M ± SD: 47,74 ± 17,66; 51.40% women, 19,40% with higher education) in the Czech Republic to reach the following research objectives:

1. The literature suggests that environmental concerns and attitudes may increase green purchases. However, the effect does not always manifest itself as economic and normative factors may play a bigger role. For example, green products may be considered luxuriously expensive, and the norm is not to buy them. The paper aims statistically examine the effect of environmental concerns and attitudes on green purchasing.
2. One of the more recent environmental concerns relates to climate change. While in general, it presents a sub-set of environmental changes, it is often communicated as a separate category. This paper aims to study (1) whether the concerns about climate change are disconnected from environmental concerns in the minds of the representative sample (via factor analysis) or belong to the same factor. (2) The paper aims to test the relation between the concerns with climate change and green purchasing.
3. Enhancing green consumption is one of the priorities of the European Union, manifested in several legislative documents and overall communication. However, the green agenda produces certain controversies, especially in the coal-producing regions,

and may not always be viewed positively. This paper aims to test whether the acceptance of EU integration positively predicts green purchasing

4. Mass media is one of the important factors affecting the level of information, but also the group norms and attitudes. Ideally, we suggest that mass media positively affect green consumption. This paper aims to test whether the exposition to mass media (TV, printed media, online news social networks, online discussions and blogs, social networks, and offline discussions) is related to green purchasing and if yes, whether this is a positive or negative association.

Green purchasing (GP) refers to (1) purchasing environmentally friendly products, which are usually recycled and bring benefits to the environment, and (2) avoiding products that harm the environment (Chan, 2001; Mostafa, 2007; Steg and Vlek, 2009). In this regard, GP should be distinguished from sustainable purchasing, which, besides environmental sustainability, accounts for economic, social, health, and other sustainability aspects (Miemczyk et al., 2012).

While the definition of green products is relatively simple in practice, there is still a certain controversy about which products can be classified as green (Huijbregts et al., 2008; Mancini et al., 2016; Hanafiah et al., 2012) since many environmental externalities cannot be directly measured. Nevertheless, green marketing utilizes the green phenomenon to propagate some products as "green" via various "green" certificates and labels (Boström and Klintman, 2008; Schwartz et al., 2020). Besides the products themselves, a number of certificates and labels are employed to indicate the use of eco-friendly or recycled materials in production or packaging, sustainable agrarian practices, or responsible animal handling (eco-labeling, Dhir et al., 2021; Anuar et al., 2020).

Though green- and eco-labeling and environmental concerns are on the rise, the actual purchase of green products still falls behind (Wojnarowska et al., 2021; Rizqiyana and Wahyono, 2020). The intention to purchase green often is not followed by the action. Hughner et al. (2007) showed that though 67% of consumers reported a positive attitude to organic food products, only 4% purchased those products. The discrepancy between the positive attitude and actual green purchases is widely reported in the literature as ('green purchasing inconsistency' or 'green attitude-behavior gap (Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015). The following section presents the factors affecting green consumption and green purchasing per se.

8.2. The factors affecting green purchasing

Green purchasing belongs to a more general category of green consumption. The concept of green consumption first emerged in the 1970s in the United States, alongside the development of "societal marketing," which addressed environmental questions. Fisk's Theory of Responsible Consumption (Fisk, 1974), Henion and Kinnear's Ecological Marketing (Henion and Kinnear, 1976), and Kardash's Ecologically Concerned Consumer (Kardash, 1974) all contributed to categorizing green consumption. Initially, research focused on energy use, pollution connected to the automobile, oil, and chemical industries, as well as consumer reactions to advertising and labeling (Kilbourne and Beckmann, 1998; Henion and Kinnear, 1976; Peattie, 2010). Later, the studies concentrated more on green purchases of food products and environmentally friendly products.

The literature on factors affecting green consumption aimed at defining factors that might help to increase green consumption. Obviously, the factors in question reflected the dominant social and economic paradigms of a particular period and social context. The early literature concentrated on economic incentives and financial possibilities of households, socio-demographic characteristics, and environmental knowledge (Peattie, 2010). The proponents of economic rationality viewed green consumption as primarily affected by economic factors and suggested that government policy must provide primarily economic incentives (Jackson, 2005; Eriksson, 2004; Bartelings and Sterner, 1999; Shen and Wang, 2022; Wang et al., 2021). This approach is still used, for example, in waste management, where the households are incentivized to sort communal waste by making the disposal of sorted waste free of change. The economic literature also suggests that more affluent households produce a larger environmental footprint but can afford to purchase "greener" goods (Lenzen and Murray, 2003; Cymru, 2002; Huang, et al. 2022). Thus, income rise may increase green consumption.

Socio-demographic aspects as predictors of green consumption were originally important primarily from the point of view of market segmentation according to sex, age, presence and number of children, educational level, and socioeconomic class (Laroche, et al., (2001), Robinson and Smith (2002), Jenkins, et al. (2003). Yet, they are still frequently included in empirical analyses, often as control variables (Walia et al, 2020)

The impact of environmental knowledge in supporting green consumption is not uniform. The straightforward conclusion that providing more information about the environment increases green consumption was supported by some studies (Bartkus et al., 1999) but not the others

(Davies, et. al., 2002; Pedersen and Neergaard, 2006; Rustam, et al., 2020). Besides price ("green" goods are still more expensive, making them difficult to afford), the green attitude-behavior gap seems to play a role here (Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015).

While the early studies studied primarily economic, demographic, or knowledge factors, the later research proved that attitudes and values are often more important predictors of green consumption than rational choices. (Carrus et al, 2008; Han, et al., 2007; Wang, et al, 2019; Peattie, 2010). The values are a broad category. One stream of research concentrated on the existing models of values. For example, Schwartz's value model or altruist values were shown to be related to pro-environmental behavior. However, other studies report the opposite - pro-environmental values increase product reuse and waste-minimization intentions and behaviors but not recycling (Barr, 2007), or pro-environmental values increase the intention to recycle and conserve water but not to buy organic food or avoid leaving appliances on standby (Lyndhurst, 2004). The other studies report that environmental attitudes, environmental knowledge, subjective norms, perceived behavioral control, conditional value, and emotional value have a positive effect on green purchase intentions (Nekmahmud, et al., 2022a)

The lower expected effect of pro-environmental values on pro-environmental behavior was explained by the particularities playing more important role (Barr, 2007) or by the impact of economic incentives (Jackson 2005; Eriksson, 2004; Bartelings and Sterner, 1999; Shen and Wang, 2022; Wang et al. 2021) and the green attitude-behavior gap (Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015). The dominant social paradigm (DSP) and cultural/ethnic group norms may reduce the role of the value factors above (Kilbourne, et al., 2002; Johnson, 2004; Halder, et al., 2020; Fischer, et al., 2021). For example, consumerism reduces willingness to engage in green consumption (Kilbourne and Polonsky, 2005; Fischer, et al., 2021). Consumption is then viewed as a social process in social, political, and historical contexts, and conditions of lives and lifestyles bear immense importance. All these factors affect green consumption (Moisander, 2007; Connolly and Prothero, 2003; Fischer, et al., 2021; Beatson, et al., 2020). The (pro)environmental behavior may also belong to social norms. For example, recycling may be adopted because it is perceived as normal, Barr (2007), or the existing prices may represent the norm, and greener products represent an expensive luxury (Krystallis and Chryssohoidis, 2005). Similarly, pro-social behavior is showed to influence pro-environmental behavior (Ramkissoon, 2023).

Values can be effective in the case the consumer feels that a change in his behavior can produce a significant change in the environmental outcome, or, oppositely, the current state of the environment is partly caused by his behavior. Understanding personal responsibilities for both causing and solving environmental problems and believing that the action they take can have a meaningful impact was shown to be a significant predictor of pro-environmental behavior (Gupta and Ogden 2009; Yue et al (2020).

The spatial dimension (local, urban/rural, regional, and national) is the next dimension of factors affecting pro-environmental behavior (Peattie, 2010). The urban and rural differ in waste infrastructure (Munksgaard, et al., 2000), style of housing, agricultural systems, and specific mix of energy sources (Hines and Peattie, 2006), and people's behavior (Tang, et al., 2022). We can expect different economic incentives in pro-environmental behavior, different local culture and style of life and habits (Leiserowitz, et al., 2010; Empacher and Götz, 2004; ElHaffar, et al., 2020; Vita, et al., 2019; Samkange et al., 2021)

All the perceptions, values and knowledge can be impacted by the mass-media and education. The impact of mass media on pro-environmental values and pro-environmental behavior was shown to be a significant one (Haron, 2005; Jain, et al, 2020; Wagdi, et al, 2022). Especially video content that is largely based on emotions has a particular influence on pro-environmental attitudes (Ramkissoon, and Smith, 2014). Social media, as a special case of the mass media, were shown to have a significant positive effect on green consumption intentions promoting attitude, subjective norms, and green thinking via social media marketing (Nekmahmud, et al, 2022b). However, the media is such a complex phenomenon that much of the research on the media's role in different sustainable actions is still largely missing (Chen et al., 2019).

This paper contributes to the research on the factors affecting green consumption by studying the effect of values and attitudes related to climate change, environment protection, personal possibility to affect environmental outcomes such as climate change, and the sufficiency of information about environmental protection. We add political attitudes such as trust in the European Union and the perceived reasonability of EU integration. In addition, we add more comprehensive research on the effect of media exposure (TV, printed media, radio, internet news, discussions and blogs, social networks, and offline discussions), socio-demographic indicators including sex, gender, education, the standard of living, and town size. The following sections will describe more closely relevant agendas and the existing literature.

8.3. Green purchasing – hypotheses development

8.3.1. The agenda of climate change

The climate change agenda is largely related to global warming production, among other extreme weather events. However, personal experience with extreme weather phenomena such as hurricanes and storms is rare, and overall observable temperature increase is not always associated with global warming. Thus, the information about climate change largely depends on the mass-media presentation (Anderson, 2011; Ryghaug et al., 2011), though the scope and frequency of presentation of climate-related agenda in different countries fluctuate (Schmidt et al., 2013). In the extreme case, public opinion can be understood as just a simple reflection of the extent and prominence of media coverage (the agenda-setting hypothesis, McCombs and Valenzuela, 2020; Dumitrescu and Mughan, 2010; the quantity coverage theory, Mazur, 2009).

The agenda of climate change, as presented in media, suffered considerable changes with the change of the media itself. The diminishing role of specialist reporters and the emergence of online news media and niche sites specializing in climate journalism accompanied by the shift of roles of journalism from "gatekeeping" to "curating" roles plus the change of journalist sources from elite scientists to a broader range of stakeholders led to a strong and rising influence of the interests of stakeholders to climate journalism (Schäfer and Painter, 2021). The engagement of stakeholders presenting their interests in the media led to overrepresentation of climate change issues compared to the general agenda of environment protection (Legagneux et al., 2018)

The media agenda formation is shown to produce significant polarization of the climate-related agenda (Matakos, et al., 2017; Li, et al, 2013; Gubanov and Petrov, 2019). Facing perceived scientific uncertainty about climate change, the media norms eventually helped the climate-skeptic opinions to become a relevant part of the climate discourse. The internet-based social networks can exacerbate the effect of opinion polarization. The pre-defined computer algorithms are likely to diminish the exposure frequency of the content, presenting alternative ideas (Pearce et al., 2019).

Social networks, open forums, and internet-based discussion platforms are the other frequent source of climate change attitudes (Williams et al., 2015; Pearce et al., 2019), where all kinds of influencers and celebrities can shape public opinion (ibid., Anderson, 2011)

In the Czech Republic, the discussion on climate change in mass media is rather scarce in most cases, presented according to the mainstream viewpoint as global warming of anthropogenic origin (Navrátilová, 2021; Trunečková, 2015; Cabelkova et al., 2022). The appeal to fight climate change via the adoption of climate-conscious behavioral patterns was also dominant (ibid.). On the other hand, in the context of economically important areas (such as coal mining), the climate effects of fossil fuels were effectively missing (Lehotský et al., 2019; Černý and Ocelík, 2020; Cabelkova et al., 2022).

In any case, the methods to fight climate change are presented primarily as the reduction of greenhouse gas emissions via green consumption, green housing, and green travel (Alfredsson, 2004).

From the discussion above and in line with literature survey two hypotheses can be made:

H1 Concerns with climate change positively predict green consumption

H2 The impact of the media on green consumption may vary according to the type of the media as some types produce significant polarization of opinions

8.3.2. The agenda of environmental protection

Though measures combatting climate change is one of the forms of environmental protection, the media presentations of the two substantially differ. While the dangers of climate change are often distant and not primarily visible in the Czech Republic, environmental degradation is more often experienced already (Hůnová, 2020). The health effects of contaminated food, smog, frequently appearing in the cities, and changes in biodiversity in ecosystems are experienced directly. In the Czech Republic, the agenda and environmental effects of coal mining and processing are directly visible to the general public in exposed regions (Lehotský and Černík, 2019).

So, contrary to climate change agenda, general environment protection attitudes are more related to personal experience (positive or negative) and less affected by the media. If fact, the agenda of environment protection might be perceived as a completely different agenda from the agenda of climate change. Thus we can formulate the following research question:

Q1. Values related to climate change and environment protection represent two separate sets of values belonging to two factors.

We do not formulate this as hypotheses since it is not directly testable, though we will apply exploratory factor analysis to research it.

H3. The concerns with environment protection positively predict green consumption

8.3.3. The role of preferences for EU integration. The specifics of the Czech Republic.

The EU policies that are relevant to consumers' sustainable choices can be divided into two categories: product legislation and waste legislation. Product legislation includes environmental product requirements, information and labeling requirements, rules on product guarantees, and climate legislation (Sajn, 2020). Waste legislation makes it easier to waste recycling. Though in general, these policies are beneficial for the environment, in the Czech Republic they aroused certain controversy, as they affected the economic choices of coal-producing regions, limited the supply of cheap but environmentally damaging products, and in general, incorporated the environmental externalities into the product prices (Cabelkova et al., 2020, 2022). Thus, the trust in the EU and the public attitudes to environmental and economic EU policies were compromised in affected regions.

Being as it is, we hypothesize, that:

H4. Positive attitudes to European integration and policies with respect to environment and economic development positively predict green consumption

8.3.4. The role of the media

Media play an essential role in disseminating information, thus influencing people's knowledge, awareness, attitudes, and socioeconomic choices (Jalan & Somanathan, 2008; Madajewicz et al., 2007). Media usage and browsing significantly affect sustainable purchasing (Zafar, et al., 2021). The impact of the media on environmentally responsible attitudes and behaviors varies according to the type of media and the agenda the media presents (Cabelkova et al., 2020; 2022).

We hypothesize that:

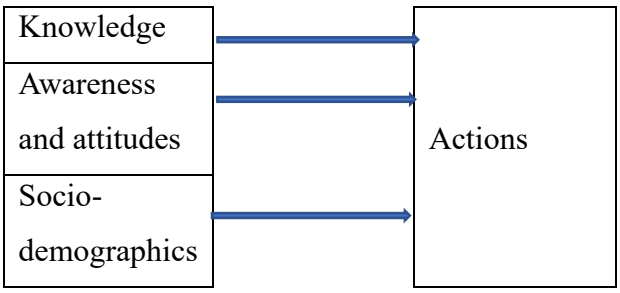
H5. Exposition to the mass media predicts green consumption. The type of the association depends on the media.

8.4. Materials and method

8.4.1. The model

The model is built according to the principles of the general behavioral change model (Boudreau, 2010; Hungerford and Volk, 1990) applied to environmentally responsible behavior (Graph 3).

Graph 3. Behavioral change model



Source: modified from Boudreau, 2010; Hungerford and Volk, 1990

The knowledge part is impacted by the education level and the sources of information about the social life. Awareness and attitudes are then represented by the awareness and concerns with the environment and climate change, satisfaction with the current state, and sufficient information about environmental protection. As environmental protection was one of the topics that proliferated on the level of EU policies, we include the indicators of trust and attitude to EU policies. Finally, we also control for socio-demographic variables. The resulting model and hypotheses are presented in Graph 4.

Graph 4 The model and hypotheses (Hj.i)

Green purchasing indicators		Impacting factors
Purchasing organic food (H1.i)	Are affected by (Hj,i)	Concerns with the environment: Environment is an urgent area to care (Hj.1) Satisfaction with the current state of environment (Hj.2) Sufficient information about environment protection (Hj.3)
Purchasing local food (H2.i)		Concerns with climate change Concerns about climate (Hj.4) Behavior affects climate (Hj.5) EU policies Trust to EU (Hj.5) EU integration in environmental issues (Hj.6) EU integration in economic issues (Hj.7)
Purchasing environmentally friendly products (H3.i)		Media exposure TV (Hj.8) Printed media (Hj.9) Radio (Hj.10) Internet news (Hj.11) Internet discussions, blogs (Hj.12) Social networks (Hj.13) Discussions outside the internet (Hj.14)
		Socio-demographic indicators

Scholars have highlighted that lack of information might prevent consumers from buying sustainable products as it impacts individuals at multiple psychological levels (Cerri et al., 2018; Testa et al., 2015).

8.4.2. The data

The data were collected in July 2021 via a survey entitled Our society (Naše společnost) conducted by the Czech Institute of Sociology. A total of 904 respondents (aged 15–95 years, M ± SD: 47,74 ± 17,66; 51.40% women, 19,40% with higher education) answered the questions in the questionnaire voluntarily and anonymously under the supervision of 139 experienced interviewers. Methodologically the method of interviewing can be classified as structured interviews. As the quality of the filled-out questionnaires was considered very good, all the questionnaires were included in the data sample. All participants were Czech native speakers living in the Czech Republic. The method of sampling relied on representative sampling with quotes. The quotes included the geographical position, age, gender, and education of the respondents. According to quotes, the data sample is representative of the Czech Republic. The data were kindly provided by the Czech Social Science Data Archive (Sociologický ústav. Akademie věd ČR. 2021).

8.4.3. The indicators

8.4.3.1. Green purchasing.

The indicators of green purchasing include the frequency of purchasing organic food, local food, and environmentally friendly products. The exact wording of the questions and the distribution of the respondents are presented in Table 10.

Table 10 Environmental consumption indicators. The exact wording of the questions and the distribution of the respondents (%)

As far as your household is concerned, you ...	always	often	rarely	never	N/A
Purchasing decisions					
- buy organic food	3,10	19,20	45,00	28,40	4,30
- buy locally-produced food	8,10	50,10	30,10	7,50	4,20
- when buying products, you are guided by whether they are environmentally friendly	7,00	23,80	32,20	26,80	10,20

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

The least frequent green purchasing is reported in the cases of buying organic food (22,30% report buying it always or often, and 28,40% of the respondents report never buying them). On the other side, the Czech population showed to be environmentally conscious in purchasing locally produced food, where 58,20% of the respondents reported buying it always or often (Table 10).

8.4.3.2. Perceptions on the environment, climate change, attitude to EU policies.

The exact wording of the questions and the distribution of the respondents are presented in Table 11

Table 11 Perceptions on the environment, climate change, EU. The distribution of the respondents (%)

How urgent do you think it is to address the following areas in the Czech Republic this year: Environment protection				
Not urgent at all	Rather urgent	Very urgent	N/A	
19,8	48,8	29,5	1,9	
How satisfied are you with the environment in the place where you live?				
Very satisfied	Rather satisfied	Rather dissatisfied	Very dissatisfied	N/A
19,7	56,2	18,8	4,6	0,7
Do you have enough information about how to be environmentally friendly?				
Definitely enough	Rather enough	Rather not enough	Definitely not enough	N/A
15,3	52,2	22,9	4,0	5,6
How worried are you about the impacts of climate change?				
Very worried	Rather worried	Rather not worried	Not worried at all	N/A
13,2	40,7	26,2	9,2	10,7
Do you think that if people changed their current behavior, they could change the current climate change?				
Could stop it completely	Could slow it down	Could not affect the climate change	N/A	
5,9	63,3	15,0	15,8	
In your opinion, is European integration beneficial or harmful in these areas: economy				
Definitely beneficial	Rather beneficial	Rather harmful	Definitely harmful	N/A
11,7	44,0	26,2	7,6	10,5
In your opinion, is European integration beneficial or harmful in these areas: environment				
Definitely beneficial	Rather beneficial	Rather harmful	Definitely harmful	N/A
12,2	46,2	20,0	6,4	15,2
Please tell me, how much do you trust the European Union				
Definitely trust	Rather trust	Rather distrust	Definitely distrust	N/A
5,2	45,5	27,2	15,4	6,7

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

The majority of the respondents perceive environmental protection as urgent or rather urgent (78,3%), although most of the respondents are very or rather satisfied with the state of the

environment in their neighborhood (75,9%, table 2). Approximately half of the respondents are worried or rather worried about climate change (53,9%), and are rather optimistic about the ability of people to affect climate change if they change their current behavior (69.2%, table 2).

However, society is polarized regarding the environmental and economic effects of European integration and trust in the European Union. Approximately a third of the respondents (33,8% in economic policies and 26,4% in environmental policies) believe that EU integration is harmful to the Czech Republic. 42,6% of the respondent reported some level of distrust to the EU.

8.4.3.3. Media exposure

The distribution of the respondents on media exposure and the exact wording of the questions are presented in Table 12.

Table 12 Media exposure. The distribution of the respondents (%)

How often do you follow social life on	At least 1x a day, %	Several times a week, %	1x a week, %	Less than 1x a week, %	Never, %	N/A, %
TV	42,1	33,8	10,3	7,3	5,9	0,6
Printed newspapers, magazines	7,2	18,3	23,0	24,2	26,7	0,6
Radio	19,1	28,4	16,7	14,3	20,6	0,9
Online news servers	19,6	29,1	15,8	12,9	22,0	0,6
Social networks	14,2	18,7	11,0	14,2	40,9	1,0
Offline discussion	7,1	24,8	21,8	20,9	24,1	1,3

Source: own computations based on representative raw data from Sociologický ústav. Akademie věd ČR. (2021)

Most TV is still frequently used media, while the second place is occupied by radio and online news. Printed newspapers and magazines and offline discussions are relatively rarely used sources of information (table 12). Social networks are very respondent-specific and rarely used 40,9% of the respondents never use them.

8.4.3.4. Socio-demographic characteristics

We control for the standard of living (very good 8,8%, rather good 45,7%, neither good nor bad 35,2%, rather bad 8,6%, very bad 1,2%), gender (51,4% women), age (aged 15–95 years, M ± SD: 47,74 ± 17,66) education (19,40% with higher education), political orientation (1 left - 11 right, M ± SD: 6,56 ± 2,27), subjective town size (21,5% big city, 3,4% suburb of big city, 26,7% average town, 24,7% small town, 8,9% big village, 14,3% small village).

8.5. The method

Methodologically we rely on Principal component analysis to study the structure of attitudes to environmental protection and climate change. Namely, we are interested in whether the agendas of environmental protection and climate change represent one or two different agendas in the minds of the representative sample of the population in the Czech Republic. In theory, the agenda of climate change represents a subset of the agenda of environmental protection. However, the literature review suggested that according to the media presentation and the non-availability of personal experience, they may present two different agendas.

Second, we conduct ordinal regression analyses to test the factors associated with environmentally conscious behavior according to the scheme presented in Table A1 and formula (2).

$$Behavior_i = logit(a_0 + a_{1-3}Environment + a_{4,5}Climate + a_{6-8}EU + a_{9-15}Info + a_{16}Standart + a_{17}Gender + a_{18}Age + a_{19}Political\ orientation + a_{20-22}Education + a_{23-27}Town\ size + e \quad (2)$$

Where

$Behavior_i$ – stands for the frequency of conducting environmentally conscious activities consequently (buy organic food, buy locally produced food, when buying products you are guided by whether they are environmentally friendly, hand in, sort your hazardous waste, sort your regular waste, limit car journeys to protect the environment, save energy and water to protect the environment, for the distribution of the respondents)

Environment – three variables capturing environment protection attitudes, namely: 1) the extent the environment protection is urgent, 2) the level of satisfaction with the environment in the locality of the respondent, 3) the extent the respondent has sufficient information about how to behave in an environmentally friendly way (for the distribution of the respondents)

Climate – stands for two variables reflecting concerns about the effects of climate change and whether the respondents believe that people's behavior can change climate.

EU – stands for the three variables reflecting the attitude to EU policies: whether European integration in the fields of economy and environment is beneficial or harmful, and the extent to which the respondents trust the EU.

Info – stands for the six variables reflecting the frequency the respondents follow social life in the following media: TV, printed newspapers and magazines, radio, online news serves, social networks, and offline discussions (for the distribution of the respondents,).

Standard – subjective standard of living of the respondents (very good to very bad, five-point scale)

Gender and Age – stands for the gender and age of the respondents

Political orientation – political orientation (left-right, eleven-point scale)

Education – education dummies (primary, secondary w/o state exam, secondary with state exam, higher; higher education is reference variable)

Town size – dummies for subjective town size (big city, suburb of big city, average town, small town, big village, small village)

The bivariate correlations between the variables above are presented in Appendix 1.

8.6. Results and discussion

8.6.1. Results

Before conducting ordinal regression, we run principal components analysis for the indicators of concerns with the environment and climate to study the internal structure represented by components.

8.6.1.1. Concerns with the environment and climate change. The principal component analysis

As environmental protection and climate change largely represent different agendas in the media, we conducted correlation analysis and Principal component analysis for the indicators of environmental concerns and the concerns with climate change.

The Principal Component Analysis of climate change indicators and environmental concerns are presented in tables 13 and 14. An Eigenvalue of 1 or higher determined the number of factors extracted. The Bartlett test of sphericity with a Chi-Square value 163,50 ($p < 0,001$) and Kaiser-Meyer-Olkin Measure of sampling adequacy was equal to 0,550 (>0,5), suggests that that the data are suitable to identify factor dimensions.

Table 13 The Principal Component Analysis of concerns with the environment and climate change. Rotated component matrix

	Component	
	1	2
Behavior affects climate	0,786	-0,006
Concerns about climate change	0,743	-0,221
Satisfaction with the environment in locality of residence	-0,105	0,780
Urgent areas - environment	-0,215	0,608
Enough info about environment	0,372	0,487

Table 14. The Principal Component Analysis of concerns with the environment and climate change. Total variance explained

Component	Rotation Sums of Squared Loadings		
	Total	% of variance	Cumulative %
1	1,365	27,3	27,3
2	1,264	25,278	52,579

Extraction Method: Principal Component Analysis.

The results suggest that perceptions of climate change and environmental concerns present two largely independent categories (slight correlation was reported only in the case of concerns about climate change on the one hand and satisfaction with the environment of the respondent in the locality where he lives and perception that environment is an urgent issue, see appendix 2)

The correlation matrix of environmentally conscious behavior and concerns about the environment and climate change is presented in Appendix 2.

The results of ordinal regression (logit) according to formula 2 are presented in Table 15

Table 15 Environmentally conscious purchasing as predicted by environment protection, concerns about climate change, EU policies, exposition to media, and socio-demographics. Results of ordinal regression analysis

	Buys organic food		Buys local food		Buys environmentally friendly products	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	0,631	0,483	-0,209	0,821	-0,75	0,387
Threshold=2	3,1***	<,001	3,262**	<,001	1,349	0,117
Threshold=3	5,654***	<,001	5,787**	<,001	3,168***	<,001
Environment protection						
Urgent areas - environment	-0,005	0,960	-0,235*	0,031	-0,243*	0,011
Satisfaction with the environment	-0,131	0,303	0,383**	0,004	0,209	0,098
Enough info about environment	-0,034	0,784	0,261*	0,046	0,269*	0,030
Concerns about climate change						
Behaviour affects climate	0,056	0,770	0,449*	0,023	0,063	0,738
Concerns about climate	0,467***	<,001	0,076	0,532	0,516***	<,001
EU policies						
EU integration, environment	0,298*	0,024	0,019	0,891	0,283*	0,031
EU integration, economy	0,031	0,815	-0,016	0,910	-0,122	0,356
Trust to EU	0,137	0,292	0,026	0,849	-0,087	0,490
Political orientation (left-right)	-0,143***	<,001	-0,149***	<,001	-0,112**	0,005
Exposition to media						
TV	-0,182	0,052	-0,118	0,229	-0,244**	0,008
Printed media	0,226**	0,005	0,067	0,416	0,120	0,130
Radio	-0,004	0,958	0,056	0,441	-0,022	0,754
Online news	0,018	0,826	0,108	0,202	-0,054	0,502
Online discussions, blogs	0,209*	0,014	0,052	0,565	0,252**	0,003
Social networks	-0,166*	0,036	0,005*	0,951	-0,042	0,587
Offline discussions	0,106	0,169	-0,018	0,820	0,055	0,468
Socio-demographics						
Standard of living	0,034	0,770	0,127	0,293	0,036	0,749
Gender (men)	0,371*	0,038	0,381*	0,041	0,479**	0,007
Age	0,022***	<,001	0,001	0,846	-0,004	0,586

Education						
Basic	0,779*	0,027	0,821*	0,023	-0,024	0,944
Secondary w/o state exam	0,733**	0,004	0,687*	0,011	0,048	0,847
Secondary with state exam	0,567*	0,016	0,393	0,120	0,139	0,547
Subjective town size						
Large City	0,919**	0,003	0,712*	0,027	0,061	0,841
Large city suburb	0,495	0,347	-1,450**	0,008	-0,842	0,107
Average town	0,672*	0,022	-0,273	0,374	-0,258	0,369
Small town	0,571*	0,049	-0,401	0,192	-0,214	0,454
Big village	0,612	0,100	-0,275	0,484	-0,095	0,799
N	531		531		505	
Sig		<,001		<,001		<,001
Pseudo R-Square						
Cox and Snell	0,232		0,176		0,161	
Nagelkerke	0,257		0,201		0,175	
McFadden	0,113		0,093		0,069	

*Link function: Logit., reference variables: women, higher education, small village. *** significant at the 0.001 level (2-tailed). ** significant at the 0.01 level (2-tailed). * significant at the 0.05 level (2-tailed). Source: own computations based on data (Sociologický ústav. Akademie věd ČR. 2021)*

Table 16 summarizes the results presented in table 15.

Table 16 Predicting environmentally conscious consumption. Results of ordinal regression analyses. Statistically significant associations on conventional levels (5%, 1%, 0,1%). Brief summary.

	Frequency of purchasing of		
	Organic food	Local food	Environmentally friendly products
Environment protection			
Urgent areas - environment		+	+
Satisfaction with the environment		+	
Enough info about environment		+	+
Concerns about climate change			
Behavior affects climate		+	
Concerns about climate	+		+
EU policies and political orientation			
EU integration, environment	+		+
EU integration, economy			
Trust to EU			
Political orientation (left-right)	+ (right)	+ (right)	+ (right)
Exposition to media			
TV			-
Printed media	+		
Radio			
Online news			
Online discussions, blogs	+		+
Social networks	-	+	
Offline discussions			
Socio-demographics			
Standard of living			
Gender (women)	+	+	+
Age	-		
Education			
Basic	-	-	
Secondary w/o state exam	-	-	
Secondary with state exam	-		
Town size			
Large City	-	-	
Large city suburb		+	
Average town	-		
Small town	-		

Note: + denotes positive association, - denotes negative association. The signs of the associations might be different from the signs of coefficients presented in tables 6 and 7 as they reflect the encoding of the variables. Reference variables: men, higher education, small village. The exact wording of the associations depicted in the table is presented in Appendix 3.

Environment protection attitudes predicted a higher frequency of purchasing local products and environmentally friendly products (Table 16). However, environmental protection indicators were not associated with purchasing of organic food. Concerns about climate change predicted higher purchasing of organic food and environmentally friendly products but were unrelated to

purchasing local food. On the other hand, the perception that behavior can affect climate predicted higher purchasing of local food (Table 16).

The positive attitude to EU integration predicted higher purchasing of organic food and environmentally friendly products but was unrelated to local food purchasing. Right-wing political orientation predicted higher values in all three indicators of green consumption.

The impact of the exposition to the media provided a controversial picture as printed media and online discussion forums and blogs predicted higher purchasing of organic food and environmentally friendly products. In contrast, exposure to social media negatively impacted organic food purchasing. However, the frequent use of social networks positively predicted purchasing of local food. Surprisingly, frequent exposition to TV negatively predicted purchasing of environmentally friendly products.

Age, gender, and education were also associated with green purchasing. Women engaged more in environmentally conscious purchasing than men. Higher-educated respondents purchased more organic and local food. Age was related to lower organic food purchasing. People living in small villages purchase more organic food than those living in other settlements.

8.7. Discussion

The literature suggested six major factors impacting environmentally conscious consumption – (1) economic incentives and possibilities, (2) socio-demographic segmentation, (3) values emotions and personal responsibilities, (4) sources and sufficiency of information, including education and mass media, (5) factors related to locality of the respondents including lifestyles (Peattie, 2010). Empirical studies report that some of the factors contradict each other, making the effects unpredictable. This study researched the effects of the environment- and climate-related values, political preferences, economic position (measured by the standard of living), information (whether the respondent has enough information about the environment, education, exposition to mass-media), and socio-demographic values.

The results of the principal component analysis suggest that the population considers the agendas of climate change and environmental protection as two different agendas. While environmental degradation is evident to the public, the disadvantages of climate change are less direct. Moreover, the presentation of climate change in the media results in polarization of opinions both on the existence and long-lasting nature of climate change and on the negative effects of climate change (Matakos, et al., 2017; Li, et al, 2013; Gubanov and Petrov, 2019).

Some people believe climate change presents more advantages than disadvantages in the Czech Republic as temperature increase may reduce the necessity to heat houses in winter and possibly allow to collect two harvests per year (Cabelkova et al., 2022).

In general, the interest of Czech respondents in climate change issues is rather low. Only 20% of the respondents reported that they were interested or rather interested (ibid.). Despite the little interest, 86% of the respondents believe the change is happening (the climate has changed during the last 100 years, ibid.)

The difference in environmental protection and climate change agendas was most reflected in the frequency of buying organic food. Surprisingly, the propensity to purchase organic food was predicted by concerns with climate change but was unrelated to all three indicators of environmental protection. The organically managed farms were previously shown to mitigate climate change through the reduction of N2O emissions from soils (the potential was reported to be about 20% of emissions, Scialabba and Müller-Lindenlauf, 2010) and carbon sequestration (the potential is about 40–72% of the world's current annual agricultural greenhouse gas (GHG) emissions, ibid.). On the other hand, the yields from organic farming proved to be lower, and if the whole cycle of production is taken into account, the benefits of organic farming from the reduction of GHG emissions are not that certain.

The lack of association between indicators of environmental protection and the frequency of purchasing organic food is intriguing, as, previously, the association was rather supported by the literature (Janssen, 2018; for the review, see Suciu et al., 2019). We can hypothesize that previous authors included climate change in the definition of environmental concerns.

The perception of EU integration positively predicted purchasing organic food and environmentally friendly products. The EU organic certificates and Ecolabelling may play a large role. However, local food purchasing was not associated with EU policies, possibly reflecting the lack of visibility of EU policies.

The role of mass media in environmentally conscious purchasing proved to be very controversial. Larger exposure to printed media, online discussions, and blogs positively predicted purchasing organic food and environmentally friendly products. The exposure to social networks reduced buying organic food, and surprisingly, exposure to TV reduced purchasing environmentally friendly products.

The role of social networks needs more attention as exposure to this media negatively affected buying organic food and sorting common waste, though it positively predicted purchasing local food. The propensity of social networks to form information bubbles may create these phenomena, which need to be studied.

The negative effect of TV on purchasing environmentally friendly products needs to be studied from the traditional journalistic point of view. The presentation of the environmental agenda is subject to numerous biases starting from the topic, through the way of presentation, and ending with conclusions and socially desirable outcomes. From this point of view, it is even more alarming that the media negatively affect environmentally conscious behavior. We can hypothesize that there might be certain self-selection. In many cases, people most exposed to TV have it as a background to other activities rather than actively watching. Thus, the sole fact of exposition might define the group as people working with the information differently, which may also correlate with a lack of environmental concern. TV exposure as a factor of self-selection needs to be analyzed. We also suggest that TV advertisements often emphasize low price rather than environmental benefits, making consumers more price sensitive and less willing to pay a premium for green products.

The positive effect of right-wing political orientation on environmentally conscious purchasing, similar to the attitude to EU integration, presents the political aspect of the environmental efforts.

8.8. Conclusion

Green purchases are indispensable for environmental protection and combatting climate change. The relevant information is, in most cases, distributed to the general public via education, mass media, green marketing, certification, and labeling. In Europe, the EU plays a major role in determining environmental policies and the provision of relevant certificates.

The existing literature established that attitudes to environmental protection and climate change, among other factors such as values, beliefs, lifestyles, and orientations, significantly affect the propensity of the population for green purchasing (Wijekoon and Sabri, 2021), though certain green attitude-behavior gap, (Witek, 2019; Wang, et al., 2019) limits the applicability of these findings. On the other hand, the intention to purchase and the purchase itself are shown to be driven by the same determinants (Janssen, 2018). In this field, research on the media's role in green purchases is still largely missing (Chen et al., 2019).

This paper studied the effects of attitudes to environmental protection, climate change concerns, and EU integration, and mass media (traditional and new ones) on the reported frequency of green purchases of households. Predictably, environmental attitudes and climate concerns positively predicted green purchases. The EU integration was the most important in the sense of environmental integration.

However, the most problematic effects were shown on the side of mass media as the exposure to TV and social networks diminished green purchasing. We suggest that information bubbles that polarize opinions (most frequent in social networks) cause this unfortunate outcome (see also Pearce et al., 2019). Besides the content, the negative effect of TV might be caused by significant self-selection or inappropriate advertisement that primarily emphasize the price Both of these effects need to be studied. In any case, more efforts must be made by the TV and social networks to increase the population's awareness on green products.

The impact of the paper is twofold. First, the paper contributes to the empirical literature on green consumption by analyzing value, information, and media factors affecting green consumption. Second, the paper poses significant problems to policymakers and media experts. As exposition to TV and social networks was shown to diminish green consumption, policymakers and journalists need to concentrate on these two media channels to reverse the unfavorable trends. Especially video-content, so vital for green consumption intentions (Ramkissoon and Smith, 2014), should be analyzed and modified accordingly in these two media outlets.

8.9. Limitations and suggestions for further research

The biggest limitation of this research is the discrepancy between the positive attitude and actual green purchases ('green purchasing inconsistency' or 'green attitude-behavior gap, Witek, 2019; Wang et al., 2019; Joshi and Rahman, 2015). However, this problem is partially reduced by the fact that the questions in the questionnaire were formulated as the frequency of actual purchasing rather than the intention to purchase. Moreover, the intention to purchase and the purchase itself are shown to be driven by the same determinants (Janssen, 2018).

The impact of the mass media (online and offline) on environmentally conscious consumption showed the biggest controversy, which needs to be studied further. TV and Social networks proved to reduce several indicators of environmentally conscious consumption. We suggest that the nature of these effects is twofold and may not necessarily be related to the content. First, the frequent use of both media implies certain self-selection. Second, especially in the

case of social networks, the role of information bubbles and polarizations needs to be studied. In the case of TV, we can hypothesize that many of the respondents, who report watching TV on a daily basis, use TV programs as a background to their daily activities. The emotional need of this background may define the group.

On the other hand, there might be a considerable percentage of people watching TV news on a daily basis. Given the existence of alternative news sources, this group also may share certain characteristics that distinguish them from others and define the negative association between the frequency of watching and environmentally conscious behavior.

The other avenue for further research may lie in the area of political preferences. The role of political orientation and the perception of EU integration proved to be significant factors for purchasing decisions but not for saving resources or waste management. These effects need to be explained.

Citation:

Hlaváček, M., Čábelková, I., Brož, D., Smutka, L., & Prochazka, P. (2023). Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure. *Frontiers in Environmental Science*, *11*, 1130533.

9. Exploring Attitudes towards GMO Labelling: A Study on the Czech Population

Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). Exploring Attitudes towards GMO Labelling: A Study on the Czech Population. Ukrainian Food Journal. Vol. 12 (3) pp. 500-522

9.1. Introduction

The ongoing debate over the labeling of genetically modified foods (GMFs) reflects a complex interplay of public interest, health concerns and the availability of information. Discourse on genetically modified foods (GMFs) is shaped by various sources, including mass media, websites and informal communication channels (Gibson et al., 2022). Considering the above pros and cons, this public discourse can be encapsulated in five overarching themes: the basic science of biotechnology, food and feed safety assessment (including labelling), environmental safety assessment (including pest control, use of pesticides or chemicals, biodiversity, mitigating climate change and environmental degradation), government regulations and global trade in GM crops (Arcelo-Villena, 2019).

Despite unanimous conclusions from several risk assessments confirming the safety equivalence of genetically modified foods (GMFs) with conventional crops in terms of human and animal health (Smyth et al., 2021), the public still tends to take GMFs with apprehension due to the perceived potential. risks. As a result, regulatory measures have been introduced, particularly in Europe, with parallel developments observed in developing countries across Africa and Asia, regions that may gain significant benefits from the adoption of GM products (Qaim, 2020).

In the European Union, the European Food Safety Authority (EFSA) plays a key role in conducting risk assessments for regulated food and feed, including GM crops. EFSA's approach is based on a comprehensive framework of legal and methodological guidelines that govern the decision whether to authorize a particular food or feed for the European market (Hilbeck et al., 2020; Garcia-Alonso et al., 2022). However, the regulatory process is not without problems, as evidenced by the estimated cost of approving genetically modified food and feed in the EU ranging from €11 to €16.7 million (EuropaBio, 2019).

As the discourse has evolved beyond the mere question of whether to label GMO products, understanding the factors that drive the public to label GMFs has become essential. This paper aims to contribute to this discourse by examining the influence of environmental concerns,

perceived health risks associated with GMOs, and the availability of information on the public's demand for GMF labeling, as well as their propensity to read such labels. This investigation is conducted on a representative sample of the Czech population, including 884 individuals aged 18 to 90 years (M ± SD: 48.17 ± 17.72; 53.40% women, 18.04% with higher education).

Methodologically, our approach involves hierarchical ordinal regression analysis to examine the relative impact of these key factors on public attitudes towards GMF labelling. In the first stage of our analysis, we examine the overall predictive power of environmental issues, health risks, and information availability. Acknowledging the paramount importance of GMF-induced health effects, we then delve into a second-stage hierarchical regression to discern the predictive power of GMO-induced negative health effects relative to other factors influencing labeling attitudes.

By focusing on these aspects, this study aims to offer a detailed understanding of the factors that shape public opinion on GMF labeling and to provide insights that can inform both academic discourse and policy decisions on GM products.

The organization of the paper develops as follows: The introductory sections provide an overview of the public discourse on genetically modified foods (GMFs) and offer a synthesis of the existing discussion on GMF. The following segments detail the literature review, data collection process, and chosen methodology. Subsequently, we present the findings, engage in a comprehensive discussion and draw conclusions.

9.2. Genetically Modified Foods (GMF): A Review of Health, Ecological and Ethical Aspects

Genetically modified foods (GMFs) have become the focus of intense scrutiny, leading to a comprehensive examination of their multifaceted implications. This review delves into three primary dimensions – health, ecology and ethics – to provide a detailed understanding of the challenges and opportunities that GMF presents. Health considerations include potential risks associated with consumption, examination of issues such as toxicity and allergenicity, as well as examination of claims of changes to human DNA. On the environmental front, the assessment reviews both negative concerns, including reduced biodiversity and potential contamination, and positive aspects, such as reduced reliance on harmful chemicals in agriculture. In addition, ethical considerations are explored that deal with moral objections and cultural perspectives that view genetic modification of food as a violation of the natural order and a violation of fundamental principles. By synthesizing these aspects, this review aims to

contribute to a balanced discourse on GMFs and to inform discussions about their cultivation, regulation and adoption in our global food systems.

9.2.1. Health risks associated with GMF

The introduction of genetically modified foods (GMFs) has sparked extensive debate with a primary focus on health risks. Researchers such as Ozkok (2015), Gizaw (2019) and Krimsky (2019) have highlighted concerns related to GMF. Among the prevalent health problems associated with GM foods, toxicity and allergenicity are often highlighted (Zhang et al., 2016). Consumer reports following the introduction of transgenic corn revealed an association between GM corn consumption and food allergy symptoms, including headaches, diarrhea, nausea, and vomiting (Bernstein et al., 2003; Dona and Arvanitoyannis, 2009).

Another major health issue revolves around the potential alteration of human DNA as a result of substantial modifications to our diet through GM foods. The change can occur through the insertion of foreign genes into the human genome or through cumulative changes in metabolic processes resulting from modified food intake. However, current evidence as reported by Nawaz et al. (2019), does not conclusively demonstrate a causal link between GM foods and changes in human genetics. Despite two decades of widespread GM food consumption, no confirmed cases of gene insertion in humans directly linked to GM food intake have been reported.

9.2.2. Environmental impacts of GMOs

Genetically modified organisms (GMOs) bring a spectrum of potential environmental impacts and generate both concerns and potential benefits. Tsatsakis et al. (2017) elaborate on the negative consequences, including the reduction of biodiversity, potential contamination by non-genetically modified organisms, disruption of natural ecosystems due to the widespread introduction of GMOs, and the potential reduction in the effectiveness of some pest deterrents. The risk of unintended gene transfer between species is another threat that leads to unpredictable impacts on the environment and food webs.

Conversely, GM crops offer positive environmental effects by reducing the need for herbicides, pesticides and other chemicals in food production. This reduction is in line with environmental sustainability goals and contributes to reducing the environmental impact associated with traditional agricultural practices. As the complexities surrounding GMOs develop, it becomes

essential to consider both potential risks and benefits in order to make informed decisions about their cultivation and use in agricultural systems.

9.2.3. Moral and ethical dimensions of GMF

Criticism of GMF goes beyond scientific concerns and includes moral and ethical dimensions. Knight (2009), Kumar and Yadav (2021) and Green (2023) highlight the prevailing moral objections, particularly regarding the perception that GMFs disrupt the natural order of food production. Genetic modification of foods involves changing their DNA to increase nutritional content or resistance to disease, pests or environmental stressors. Many individuals find this manipulation morally objectionable and see it as a violation of the fundamental principles of nature. There are also concerns about potential long-term health risks and unintended environmental consequences through cross-pollination.

Religious beliefs further contribute to ethical discourse, particularly in cultures where religion strongly influences dietary practices. Streiffer and Hedemann (2005) and Chen and Li (2007) note that the introduction of genetically modified foods may conflict with established religious doctrines, reducing their acceptance in the general population. Individuals express concern about GMOs as interfering with natural processes and disrupting nature's delicate balance, leading to fears of unforeseeable consequences and the ethical dilemma of "playing god". Even those without religious objections may reject GMFs out of a broader respect for nature or fear of potential unknown dangers associated with their consumption. The intersection of ethical considerations and belief systems plays a critical role in shaping public policy decisions and influencing consumer decisions as GMOs continue to evolve and affect our food systems.

9.2.4. Public awareness challenges and the role of knowledge

A significant gap in public awareness of the scientific evidence surrounding genetically modified (GM) technologies contributes to confusion among the general population. Sikora and Rzymski (2021) highlight the polarization evident in media debates between proponents and opponents of GM, further fueled by deliberate anti-GM actions led by non-governmental organizations (NGOs). The dissemination of information through social media, which often lacks a scientific basis, increases the complexity of public understanding (Jiang & Fang, 2019). Individuals with limited knowledge, including parents, play a key role in shaping perceptions of GMOs (Shtulman, et al., 2020).

Empirical evidence from studies such as Moon and Balasubramanian (2004), Moerbeek and Casimir (2005) and Vilella-Vila et al. (2005) highlights a direct and positive relationship between increasing knowledge of GM technologies and increased support for their applications (Costa-Font et al., 2008). Targeted information campaigns have the potential to cultivate an informed public and promote a more objective understanding of the risks and benefits associated with GM products. However, the impact of knowledge is varied, influenced by perceptions of the morality of genetic modification, rather than simply dependent on political or religious views (Hasell & Stroud, 2020).

Conversely, some studies question the assumed direct link between scientific knowledge and attitudes, suggesting that the correlation between science-based information about GMF and public perception remains weak and in some cases non-existent (Diamond et al., 2020). Government regulatory policies and laws regarding the cultivation and sale of genetically modified products are important determinants of public acceptance. Consumers who do not agree with these policies can express their disapproval by protesting GM products, even if they are not directly affected. As the debate on GM technologies continues to evolve, the multifaceted interplay between knowledge, perception and regulatory frameworks will play a key role in shaping public attitudes and influencing wider societal acceptance of genetically modified products.

9.2.5. GMF labelling

In many countries, the absence of clear regulations governing the labeling of genetically modified (GM) foods has left consumers uncertain about the products they buy and consume, contributing significantly to the prevailing sense of mistrust of the technology. The introduction of mandatory labeling of genetically modified organisms (GMOs) represents a potential solution to alleviate the lack of information on GMFs. The issue of GMO labeling has been central to political and public discourse since the beginning of commercialized GM technology (Adalja et al., 2023). Consumers express a critical need to be informed about the presence of transgenic ingredients in their food in order to make informed consumption decisions (Delgado-Zegarra et al., 2022).

Voluntary labeling initiatives, particularly for non-GMO (third-party verified) products, have gained traction in the United States to address consumer preferences. This approach resonated with consumers and increased sales of non-GMO products to over $26 billion in 2019 (Food Business News, 2019). Such labeling is particularly important for consumers who are

concerned about safety and show resistance to GM technologies (Zheng & Wang, 2021). Research also shows that consumer demand for GM foods is influenced by labeling schemes adopted by policy makers (Kim et al., 2022). As a result, mandatory labeling requirements are emerging as an essential tool to provide transparent information to consumers and enable them to make informed decisions about food choices.

While some studies suggest that the cultivation and production of modified products can lead to lower production costs (Azadi & Ho, 2010; Ekici and Sancak, 2012), a significant segment of consumers choose more expensive non-GMO alternatives for reasons of principle rather than for functional reasons. . This preference is consistent with a broader pattern of low public acceptance of GM foods, with consumers having subjective knowledge and limited objective understanding demonstrating a greater willingness to pay for non-GMO variants (Rihn et al., 2021). As debates about GMOs and labeling evolve, the dynamic interplay between regulatory frameworks, consumer preferences, and the principles that guide food choices will continue to shape the landscape of GM food acceptance and consumption.

This paper concentrates on two main discourses: the effects of environment protection and supposed health risks on GMF acceptance. As the consumer preferences are highly impacted by the available information, we also research the effect of information availability on the GMO acceptance.

H1: GMF labelling requirements are predicted by environmental concerns

H2: GMF labeling requirements are negatively predicted by perceived health risks

H3: GMF labelling requirements are predicted by availability of relevant information including the interest in the subject.

9.3. The data

The survey data was collected in July 2021 through a study called "Food 2021" conducted by the Czech Sociological Institute. A total of 884 participants, reflecting the population of the Czech Republic, answered the questionnaire voluntarily and anonymously (age 18–90 years, M ± SD: 48.17 ± 17.72; 53.40% women, 18.04% with higher education). The survey was conducted under the supervision of 139 experienced interviewers who used a combination of Paper and Pencil Interview (PAPI) and Computer-Assisted Personal Interview (CAPI) methods. Due to the high quality of completed questionnaires, all collected data were included in the sample. Participants, native speakers residing in the Czech Republic, were selected using

quota sampling by region (NUTS 3), size of place of residence, gender, age and education. This dataset, provided by the Czech Social Science Data Archive (Institute of Sociology. Academy of Sciences of the Czech Republic. 2021), is representative of the Czech Republic.

9.4. The method

We apply hierarchical ordinal regression analysis to test the following hypotheses (Graph 7):

Table 17. The hypotheses

GMF Labelling	Are predicted by	Information about GMF
		GMF effects on health
		Environmental concerns

Additionally, we incorporate controls for the significance of food and food-related habits, as well as socio-demographic factors.

The hierarchical ordinal regression analysis consists of two sequential steps. Initially, we assessed the model with all explanatory variables based on the specified formula (Formula 1).

GMF Labelling = Logit (a_0 + $a_{1\text{-}3}$ Information + $a_{4\text{-}8}$ Health + $a_{9\text{-}12}$ Environment + $a_{13\text{-}17}$ Food Purchasing + $a_{18\text{-}20}$ Food habits + $a_{21\text{-}27}$ Socio-demographics + e) (1)

In the second stage, we omitted the set of variables associated with health effects and performed ordinal regression using the following formula (2):

GMF Labelling = Logit (a_0 + $a_{1\text{-}3}$ Information + $a_{9\text{-}12}$ Environment + $a_{13\text{-}17}$ Food Purchasing + $a_{18\text{-}20}$ Food habits + $a_{21\text{-}27}$ Socio-demographics + e) (2)

We contrasted the pseudo R-squared values between both models and drew conclusions regarding the moderation effects of the excluded variables.

9.5. Indicators

9.5.1. GMF labelling needs

Examining GMO labeling needs includes three dimensions: perceived importance of having GMO information on labels, frequency of checking GMO labels when shopping, and current

perception of GMO content in consumed foods. The survey questions were formulated as follows:

- “To what extent do you agree or disagree with the following statements? Foods containing ingredients from genetically modified crops should have this information in the description or on the label.
- How many of the foods you normally eat do you think contain ingredients from genetically modified crops?
- When you buy food, how often do you check the label for ingredients from genetically modified crops?" *(Sociologicky ustav, 2021)*

Table 18. Distribution of Respondents (%) Based on Attitudinal Indicators for Genetically Modified Foods (GMF)

Question	definitely agree	rather agree	undecided	rather disagree	definitely disagree	no opinion
Food items containing genetically modified ingredients should carry labels indicating their genetic modification status.	51,1	23,2	9,3	2,9	1,6	11,9
What proportion of the foods you consume contains genetically modified (GM) ingredients?	none or almost none	rather a minority	about half	rather the majority	all or almost all	no opinion
	14,9	27,8	13	4,6	0,8	38,8
	20,4	41,7	15	12,4	10,4	
Examine food labels for genetic modification information during your purchases.	always	often	rarely	never		
	3,1	10,9	25,7	60,4		

Note: Due to a notable number of individuals expressing no opinion on the perception questions, we included these respondents in the "undecided" category wherever applicable (category 3 on the 5-point Likert scale).

Table 18 shows that approximately 74% of participants agree that genetically modified foods (GMFs) should be labelled. Conversely, 60% of respondents said they never checked information about GM ingredients on food labels. Data on the actual consumption of GMFs is quite limited, almost 40% of the participants did not express any opinion about the share of GMFs in their total food intake.

9.5.2. Information about GMF

Access to information plays a crucial role in shaping opinions. This study utilizes indicators to assess the availability and adequacy of information, while also accounting for the respondents' level of interest in the subject. Table 19 provides an overview of the indicators, scales, and the distribution of respondents regarding information about GMF.

Table 19. Distribution of Respondents (%) Based on Indicators of Genetically Modified Foods (GMF) Information

Are you familiar with genetically modified crops?	No	Yes, but does not know what it refers to	yes, and roughly knows what it involves	yes, and knows well what it involves	
	27,7	31,9	33,4	6,8	
Do you have an interest in Genetically Modified Products (GMP)?	definitely yes	rather yes	rather no	no	does not know
	3,3	12,7	32,9	48,4	2,6
Do you possess sufficient information about Genetically Modified Foods (GMF)?	definitely enough	rather enough	rather not enough	definitely not enough	does not know
	3,1	14,1	32,5	40,8	9,4

Respondents who answered "do not know" were excluded from subsequent analysis.

9.5.3. Perceived GMF effects on health

The existing literature indicates that perceived health effects are among the most significant informational challenges influencing legislation and public acceptance of Genetically Modified Foods (GMF).

Table 20. Distribution of Respondents (%) Based on Indicators of Perceived Effects of Genetically Modified Foods (GMF) on Health

Self-assessment of personal health	very good	good	average	bad	very bad	
	20,00	42,30	29,30	7,50	0,90	
Consuming Genetically Modified Foods (GMF) is safe	definitely agree	rather agree	undecided	rather disagree	definitely disagree	No opinion
	4,30	18,40	26,80	16,20	8,90	25,10
Research on the Health Effects of Genetically Modified Products (GMP) is sufficient	definitely agree	rather agree	undecided	rather disagree	definitely disagree	No opinion
	5,90	22,50	21,60	15,50	7,90	26,50
Consuming GMP can change human DNA	definitely agree	rather agree	rather disagree	definitely disagree	no opinion	
	5,40	15,70	21,20	21,40	36,20	
GMF can endanger human health	definitely agree	rather agree	rather disagree	definitely disagree	no opinion	
	10,30	24,70	24,40	7,00	33,60	

Note: Respondents with no opinion were combined with the "Undecided" group for subsequent analysis.

9.5.4. Environmental concerns

The initial indicator of environmental concerns determined the degree of subjective importance of the impact of food production on the environment (Definitely important: 11.10% of respondents; Rather important: 37.30%; Rather unimportant: 30.10%; Definitely unimportant: 11.00%; No opinion: 3.70%).

We then assessed environmental concerns based on the frequency of participation in pro-environmental behaviors. The descriptive statistics is presented in Table 21.

Table 21 Indicators of environmental concerns. Descriptive statistics.

How frequently does the respondent:	Mean	Std. Deviation
Utilize their own reusable shopping bag	3,98	1,182
use reusable bags for purchasing fruits and vegetables	2,35	1,41
use reusable bottle for drinks	2,71	1,428
use environmentally friendly detergents	2,72	1,204
prefer purchasing Czech-made foods	3,35	1,088
pack the food into reusable boxes	2,71	1,353
avoid single-use plastic products	3,21	1,301
limit car trips to protect the environment	2,15	1,195
Conserve energy and water to protect the environment	2,92	1,266
Practice waste sorting	3,96	1,159
Engage in composting	2,58	1,618

Note: N=727 The respondents with No opinion were excluded from further analysis

To simplify the model, we employed Principal Component Analysis (PCA) on the indicators outlined in Table 21, utilizing regression-based factor scores for subsequent analysis. The outcomes of the PCA are detailed in the Data Transformation section, where three components were identified: inclination toward waste reduction and sorting, resource conservation, and engagement in recycling.

9.5.5. The Significance of Food Characteristics in Purchase Decisions

Consumers evaluate several characteristics to varying extents when making food purchases, including consideration of ingredients, package material and size, origin, and, notably, price (refer to Table 22). We posit that these factors serve as crucial predictors for attitudes towards Genetically Modified Foods (GMF).

Table 22 Indicators of the importance of food characteristics when purchasing

	Mean	Std. Deviation
origin	3,1	1,479
package material	4,89	1,298
price	2,22	1,438
ingredients	2,78	1,412
package size	3,48	1,472

N=799, Min=1 (very important), Max=6 (least important)

9.5.6. The Significance of Food and Dietary Practices

Table 23. Indicators of the Importance of Food and Dietary Practices. The Distribution of the Respondents (%)

Food consumption important	definitely important	rather important	rather unimportant	definitely unimportant		
	43,30	43,00	9,80	3,40		
Frequency of food purchasing	daily	several times a week	1x a week	1x per 14 days	less than 1x per 14 days	No answer
	9,80	50,80	23,50	5,50	3,50	6,70
Number of meals per day	one meal	two meals	three meals	four meals	five meals	more than five
	0,10	8,50	39,90	30,70	16,40	4,10

9.5.7. Socio-Demographic characteristics of the respondents and other factors

We consider variables such as gender, age, and education (ranging from 18 to 90 years, with a mean ± standard deviation of 48.17 ± 17.72; 53.40% women, 18.04% with higher education), subjective town size (from big city to small village), household standard of living (very good, 13.12%; rather good, 45.5%; neither good nor bad, 33.9%; rather bad, 6.4%; very bad, 0.9%), life satisfaction (very satisfied 20.8%; rather satisfied, 50%; neither satisfied nor dissatisfied, 21.3%; rather dissatisfied, 5.7%; very dissatisfied 1.2%), and belief in God (69.9% non-believers).

9.5.8. Data transformations and handling of missing values

Given the limited awareness about GMFs, certain survey questions recorded a notable proportion of respondents expressing no opinions. In line with the methodology discussed in preceding sections, respondents with no opinions were amalgamated with the Undecided group. It is essential to acknowledge that this data transformation is a recognized limitation of the study. In instances where an "Undecided" category was not available, respondents with no opinions were omitted from subsequent analyses. This approach ensures transparency in data interpretation, emphasizing the challenges associated with gauging public opinion in areas where information levels are inherently low.

9.5.8.1. Data Transformations: Analyzing Environmental Concerns through Principal Component Analysis

To reduce the complexity of our model, we used a principal component analysis (PCA) on a set of variables representing respondents' environmental protection measures (Indicators of Environmental Concerns, Table 21). Factor extraction was determined by an eigenvalue of 1 or greater, and all variables were successfully extracted. Suitability of data for factor identification was confirmed by Bartlett's test of sphericity (chi-square value 1716.968, $p<0.001$) and Kaiser-Meyer-Olkin sampling rate of 0.852 (>0.8). Overall, these two extracted factors cumulatively explained 54.095% of the total variance. The rotated component matrix is shown in Table 24.

Table 24 Rotated Component Matrix for Indicators of Environmental Concerns

		Component		
	Frequency of Respondent's Actions	1	2	3
Waste Reduction	sort waste	0,765	0,059	0,179
	use own reusable shopping bag	0,623	0,138	0,055
	prefer purchasing Czech-made foods	0,614	0,326	0,125
Resource Conservation for Environmental Protection	limit car trips to protect the environment	-0,062	0,842	0,113
	save energy and water to protect the environment	0,394	0,637	0,136
	avoid single-use plastic products	0,457	0,545	0,101
	use environmentally friendly detergents	0,410	0,523	0,227
Recycling Efforts	use own reusable bottle for drinks	0,018	0,127	0,796
	pack the food into reusable boxes	0,177	0,155	0,760
	compost	0,421	-0,078	0,500
	use reusable bags for purchasing fruits and vegetables	0,105	0,367	0,495
% of Variance explained		34,25	10,593	9,252

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

The regression-based factor scores for all three components were computed and subsequently utilized for further analysis.

9.6. Results

The outcomes of the initial phase of hierarchical ordinal regression analyses are depicted in tables 25 and 26 below, corresponding to formula 1. The results for the second stage are presented in tables A1 in the appendix, reflecting formula 2.

Table 25 Predictive Factors of Attitudes Toward GMF Labeling. Results from Ordinal Regression Analysis (Formula 1)

	GMF labelled		Check lables on GMF		GMF content	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	-1,075	0,492	-0,14	0,937	0,962	0,584
Threshold=2	0,31	0,843	2,378	0,174	3,428	0,052
Threshold=3	2,188	0,163	4,853**	0,006	5,190**	0,003
Threshold=4	3,381*	0,033			7,045***	<,001
Information about GMF						
Heard of GMF	-0,662***	<,001	-0,435**	0,002	-0,146	0,309
Interested in GMF	-0,111	0,399	1,200***	<,001	-0,084	0,555
Enough Info about GMF	-0,001	0,988	0,453***	<,001	-0,183	0,055
GMF effects on health						
State of own Health	0,086	0,503	0,183	0,214	-0,212	0,15
GMF is safe	-0,206	0,094	0,067	0,615	-0,26	0,051
the effects of GMP on health are scientifically investigated	-0,113	0,332	-0,102	0,42	0,012	0,926
Consuming GMP can change DNA	0,06	0,466	0,285**	0,002	-0,025	0,782
GMP can endanger his health	0,188*	0,043	0,082	0,435	0,328**	0,002
Environmental concerns						
Effect of food production on environment important	-0,056	0,647	0,407**	0,004	0,141	0,325
Reduce Waste (component 1)	-0,543***	<,001	0,174	0,148	-0,218	0,076
Save Resources (component 2)	0,165	0,075	-0,171	0,109	0,173	0,128
Recycling (component 3)	0,227*	0,014	-0,238*	0,021	0,124	0,26
Aspects of food important when purchasing						
Origin	0,155	0,065	-0,02	0,825	0,271**	0,005
Packaging	-0,103	0,187	-0,023	0,795	0,249**	0,008
Price	-0,123	0,127	-0,159	0,055	0,231**	0,009
Ingredients	0,037	0,68	-0,161	0,11	0,308**	0,003
Package size	0,147	0,068	-0,078	0,357	0,091	0,311
Food habits						

Number of meals per day	-0,005	0,959	-0,127	0,21	0,061	0,551
Importance of self catering	0,036	0,772	0,098	0,521	0,328*	0,032
Frequency of food purcbhasing	-0,026	0,798	0,001	0,993	-0,268*	0,022
Socio-demographics						
Gender (men)	-0,123	0,485	0,072	0,727	-0,466*	0,027
Age	0,013*	0,022	-0,005	0,482	0	0,959
Education	0,054	0,587	0	0,997	-0,114	0,323
Town size	0,017	0,769	0,038	0,559	-0,076	0,252
Household standard of living	-0,084	0,521	0,097	0,522	0,032	0,834
Life satisfation	-0,12	0,382	-0,295	0,054	0,341*	0,03
Non believer in God	0,244	0,221	-0,038	0,864	-0,239	0,311
Model Fitting Information						
Sig.		<,001		<,001		<,001
N	625		612		413	
Pseudo R-Square						
Cox and Snell	0,227		0,472		0,186	
Nagelkerke	0,251		0,537		0,202	
McFadden	0,11		0,302		0,082	

Note: Link function: Logit. ***-significant on 0,1% level. ** - significant on 1% level, * - significant on 5% level. Components 1, 2, 3 reflects the three components of PCA presented in Table PCA1.

Information and interest

The results, presented in the table 25 suggest, that

- The more the respondent is informed about GMF, (1) the more he believes GMF should be labelled, (2) the more often they check information on GM ingredients when buying food
- The more often they check information on GM ingredients when buying food
- The more are respondents confident that they have enough information about GMF the more often they check information on GM ingredients when buying food

The findings reveal a compelling relationship between the level of information individuals have about genetically modified foods (GMFs) and their attitudes and behaviors. A higher level of information is positively correlated with the belief that GMF should be labeled. This suggests

that as individuals become more informed about GMFs, they tend to support the idea of clear labeling of these products. Moreover, increased interest in GMFs positively predicts a more frequent habit of checking information about GM ingredients when purchasing food. This underlines the role of personal interest as a motivating factor in seeking information about GMF. Moreover, respondents who express confidence in sufficient information about GMF are more likely to check for GM ingredients when purchasing food. This alignment suggests that perceived adequacy of knowledge plays a role in encouraging individuals to be more vigilant about the GM content of the products they consume.

Health risks

The results, presented in the table 25 suggest, that

- The subjective assessment of own health condition proved unrelated to GM labelling attitudes.
- The more do the respondents believe, that GMF can change their DNA, the more they check information on GM ingredients when buying food
- The more do the respondents believe, that the GMF can endanger their health, (1) the more they believe GMF should be labelled (2) the less GM ingredients is contained in the food the respondent normally eats according to his perception.

Examining health-related factors in relation to attitudes and behaviors around genetically modified foods (GMFs) reveals remarkable findings. Surprisingly, subjective evaluation of one's own health status does not appear to significantly influence attitudes toward GM labeling. This suggests that individuals' personal perception of health may not be a major factor in shaping their opinion on the necessity of GMF labeling. However, when considering beliefs about the potential health risks associated with GMFs, a compelling relationship emerges. Those who express a belief that GMF can change their DNA tend to check more frequently for information about GM ingredients when purchasing food. Similarly, respondents who believe that GMF may endanger their health are more likely to support the idea that GMF should be labeled. Interestingly, this group also tends to perceive a lower occurrence of GM ingredients in the foods they normally consume.

Environmental concerns

The results, presented in the table 25 suggest, that

- The more important is the effect of food production on the environment, the more the respondents check the information about GM ingredients when purchasing food;
- The more the respondents recycle, (1) the more they check information on GMF ingredients when purchasing food; (2) the more they want GMF labelled.
- The more do the respondent engage in waste management including waste reduction and sorting, (1) the more they want GMF labelled

Examining the intersection of environmental concerns and attitudes toward genetically modified foods (GMFs) provides valuable insights into factors influencing consumer behavior. The findings reveal a remarkable relationship between the perceived importance of the environmental impact of food production and the frequency of checking information about GM ingredients when purchasing food. Individuals who prioritize the environmental effects of food production show a higher propensity to search for information about GM ingredients, suggesting a link between environmental awareness and food composition awareness.

In addition, the study suggests a positive association between pro-environmental behaviors such as recycling and waste management and preferences for GMFs. Respondents who actively engage in recycling practices are not only more likely to check information about GMF ingredients, but also express a stronger tendency to want to have a GMF label. Additionally, those involved in waste reduction and sorting show an increased desire for GMF labeling. This highlights the potential alignment between pro-environmental behavior and concerns related to the transparency of GMF information.

Important food characteristics and dietary habits

The results, presented in the table 25 suggest, that

- The food characteristics and habits proved to be most significantly related to perceived content of GM ingredients in meals consumes. The more important are origin, packaging, price, ingredients of the food at the time of purchasing, the lower is the content of GM ingredients in the food the respondent eats.
- The subjective importance of self-catering positively predicts the low GMF content in meals.
- The less often the respondent goes shopping for food items, the higher is the GM content in his meals.

Examining the importance attributed to different food attributes during the purchase process in conjunction with specific eating habits provides valuable insights into the factors influencing the perception of genetically modified foods (GMFs). The study reveals compelling links between individual preferences, purchasing behavior and the perceived content of GM ingredients in foods.

A key finding suggests that the perceived content of GM ingredients in consumed foods is significantly related to the importance placed on specific food characteristics at the time of purchase. Origin, packaging, price and ingredients emerge as crucial factors, with respondents who prioritize these factors reporting a lower perceived content of GM ingredients in food. This association underlines the impact of individual preferences during the purchase phase on the subsequent perception of GMF content in daily meals.

In addition, the study reveals interesting associations between dietary habits and perceived GMF content. Individuals who subjectively emphasize the importance of self-feeding demonstrate a positive association with lower GMF content in their meals. It follows that the preference for preparing one's own meals can contribute to reducing dependence on genetically modified ingredients.

Moreover, the frequency of grocery shopping appears to be a significant factor influencing the content of GMF in consumed foods. Respondents who buy food less often tend to report higher GM content in their food. This observation suggests that shopping frequency plays a role in shaping dietary choices and, consequently, the perceived prevalence of GM ingredients in the diet.

Sociodemographic characteristics of the respondents and other controls

The results, presented in the table 25 suggest, that

- Women report lower GM content in their meals comparing to men.
- Age negatively predicts the necessity of GMF labelled.
- The bigger is the city the more people are willing to try GMF
- The more is the respondent satisfied in his life, the more he is willing to try GMF, but the lower proportion of the GM food in meals he reports.

Examining sociodemographic factors and other controls provides valuable insights into how individual characteristics shape perceptions and attitudes toward genetically modified foods

(GMFs). Several notable findings emerged that shed light on the nuanced relationship between sociodemographic variables and attitudes toward GMF.

First, a gender difference is evident, as women tend to report a lower perceived content of GM ingredients in their foods compared to men. This gender difference suggests that women may have more conservative views on the inclusion of GM ingredients in their diets, contributing to differences in perceived GM content.

Age as a socio-demographic factor plays a significant role in shaping attitudes towards GMF. The study suggests a negative correlation between age and the perceived necessity of GMF labeling. This suggests that older respondents may express less demand for explicit labeling of GMF products, reflecting potential differences in attitudes across age groups.

Urbanity, represented by city size, appears to be a significant factor influencing individuals' willingness to try GMF. In particular, respondents from larger cities show greater openness to experimenting with GMF. This urban-rural difference highlights the importance of contextual factors in shaping attitudes towards new food technologies, with urban environments potentially fostering a more receptive environment for GMF adoption.

Life satisfaction, a subjective measure of overall well-being, reveals interesting associations with attitudes toward GMF. Respondents reporting higher life satisfaction express a greater willingness to try GMF. However, this positive trend contrasts with the lower reported proportion of GM foods in their meals. This nuanced relationship suggests that while life satisfaction positively influences openness to trying GMFs, it does not necessarily translate into higher actual consumption of GM ingredients.

The results of the second stage of hierarchical ordinal regression

The second stage of the hierarchical ordinal regression analysis, which included the exclusion of variables related to the perceived health effects of genetically modified foods (GMFs), revealed significant insights into the dynamics of predictors influencing public demand for GMF labeling. This strategic exclusion allowed for a targeted examination of the unique impact of health-related variables on GMF attitudes. The results are presented in table A1 in appendix.

Table 26 Factors predicting attitudes to GMF. Results of ordinal regression analysis without health risks

	GMF labelled		Check information on GMF		GMF content	
	Estimate	Sig.	Estimate	Sig.	Estimate	Sig.
Threshold=1	-0,258	0,852	-1	0,537	0,441	0,789
Threshold=2	0,783	0,57	1,423	0,376	2,76	0,095
Threshold=3	3,097*	0,025	3,817*	0,018	4,435**	0,008
Threshold=4	4,448	0,001			6,289***	<,001
Information about GMF						
Heard of GMF	0,162	0,147	-0,425**	0,002	-0,138	0,327
Interested in GMF	0,158	0,184	1,185***	<,001	-0,151	0,275
Enough Info about GMF	0,08	0,31	0,466***	<,001	-0,126	0,173
Environmental concerns						
Effect on environment important	0,018	0,872	0,399**	0,004	0,139	0,321
Reduce Waste (component 1)	-0,079	0,399	0,186	0,116	-0,199	0,097
Save Resources (component 2)	-0,042	0,625	-0,16	0,13	0,179	0,11
Recycling (component 3)	0,019	0,82	-0,189	0,061	0,079	0,465
Importance when purchasing						
Origin	0,171*	0,029	0,009	0,918	0,273**	0,004
Packaging	0,114	0,118	-0,008	0,923	0,225*	0,015
Price	0,037	0,601	-0,135	0,097	0,202*	0,018
Ingredients	0,112	0,179	-0,157	0,111	0,274**	0,006
Package size	0,049	0,505	-0,064	0,441	0,057	0,519
Food habits						
Number of meals per day	-0,12	0,145	-0,147	0,142	0,017	0,867
Importance of self catering	-0,032	0,784	0,12	0,431	0,319*	0,031
Frequency of food purcbhasing	-0,03	0,751	-0,04	0,737	-0,252*	0,028
Socio-demographics						
Gender (men)	0,185	0,259	0,089	0,662	-0,38	0,066
Age	-0,004	0,438	-0,005	0,463	0,001	0,931

Education	-0,017	0,854	-0,004	0,97	-0,123	0,279
Town size	-0,039	0,469	0,019	0,771	-0,059	0,367
Household standard of living	0,058	0,628	0,061	0,679	-0,006	0,966
State of own Health	-0,049	0,678	0,171	0,239	-0,245	0,091
Non believer in God	-0,15	0,225	0,034	0,874	-0,025	0,912
Life satisfation	0,222	0,217	-0,26	0,081	0,304*	0,046
Model Fitting Information						
Sig.		0,42		<,001		<,001
N	624		626		415	
Pseudo R-Square						
Cox and Snell	0,037		0,192		0,121	
Nagelkerke	0,04		0,212		0,132	
McFadden	0,014		0,091		0,051	

Note: Link function: Logit. ***-significant on 0,1% level. ** - significant on 1% level, * - significant on 5% level. . Components 1, 2, 3 reflects the three components of PCA presented in Table PCA1.

The results suggest, that the exclusion of the variables representing the health effects of the GMF led to significant changes in the predictive power of the models for the need for GMF labelled. While the original Pseudo R2 ranged from 47% to 53% (for checking the lables) and 11% to 25% (labelling requirement) and the original models were statistically significant on 0,1% level, the exclusion of health variables led to reduction of Pseudo R2 to the level of 1-5% and to the loss of statistical significance (for the need to label model). Thus, the results indicate, that health effects can be considered most powerful predictors of the public requirement to label them.

The effects of exclusion of health variables on the other four regressions was less pronounced as the regressions stayed statistically significant on 0,1% level in all the four cases (checking information on GM content when purchasing and perceived content of GM ingredients in daily own meals). However, the variability explained by the model as measured by Pseudo R2 decreased to the levels from 20% to 3%.

The results underscored the key role of perceived health effects as influential predictors of public adherence to GMF labeling. The substantial reduction in Pseudo R2 and the loss of statistical significance in the models related to the need for labeling after exclusion of health variables highlight the dominant position of health considerations in the formation of consumer

attitudes. This finding is consistent with existing literature highlighting health issues as a central factor influencing public perceptions and decisions about GMF.

While the effects of excluding health variables were less pronounced in other regression models, there was a substantial reduction in the variability explained by the model while maintaining statistical significance. This suggests that health considerations play a vital role not only in demand for labeling but also in shaping other aspects of consumer behavior, such as checking GM content information when shopping and perceptions of GM ingredients in everyday foods.

These findings highlight the need for targeted communication and policy strategies that address and mitigate health concerns related to GMF. Understanding the disproportionate impact of health considerations on public attitudes provides valuable insights for policymakers and industry stakeholders seeking to promote greater acceptance of GMF. The delicate interplay between health perceptions and labeling requirements requires comprehensive approaches that prioritize transparent communication and address the multifaceted dimensions of consumer concerns about GMF.

9.7. Discussion

The observed associations between GMF information, interest, and behavior, presented in the sections above, are consistent with the broader literature on public perception and decision-making in the context of genetically modified organisms (Moon and Balasubramanian, 2004; Moerbeek and Casimir, 2005; and Vilella-Vila et al., 2005). These findings underscore the importance of targeted information campaigns to improve public understanding and shape attitudes toward GMF. While the data suggest positive correlations, they also prompt consideration of the design and delivery of outreach initiatives. Addressing knowledge gaps and promoting interest could contribute to more informed consumer choice and subsequently influence wider societal acceptance of genetically modified products. As GM technologies continue to evolve, strategies that effectively communicate information and satisfy the public interest will play a key role in navigating the complex landscape of GMF adoption.

The observed associations highlight the complex relationship between environmental awareness, sustainable behavior and attitudes towards GMF. Individuals with increased environmental awareness seem to be more careful about checking the content of their food, especially when it comes to GM ingredients. This highlights the interconnectedness of environmental and food concerns, suggesting that consumers who actively contribute to

environmental protection can extend their conscientiousness to the decisions they make in the area of food consumption. As environmental sustainability becomes an increasingly integral aspect of consumer decision-making, recognizing and addressing these connections can underpin strategies to promote transparency and understanding in the GMF context.

The associations between health risk beliefs and attitudes toward GMF presented in this paper point to a complex interplay between perceived risks and consumer behavior. In general our results are consistent with the literature (Ozkok, 2015; Gizaw, 2019; Krimsky, 2019; Bernstein et al., 2003; Dona and Arvanitoyannis, 2009). The association between concern about DNA alteration and increased information-seeking behavior suggests that individuals with specific health-related concerns may be more active in controlling GM ingredients. The importance of the health risks for the subjective need of GMO labeling isa highlighted by the fact that the second stage of hierarchical ordinal regression analysis was not statistically significant if the health concerns are excluded. the association between health risk beliefs and support for GMF labeling underscores the importance of addressing perceived health risks in public discourse and educational initiatives. As concerns about potential health effects continue to influence public opinion, efforts to provide accurate and accessible information about the health effects of GMFs are essential to support informed decision-making and shape more differentiated attitudes.

These findings , related to the role of consumer choices, food habits, and shopping habits, presented in this paper highlight the complex associations between consumer choices, food-related habits and GMF perceptions. Preference for specific food characteristics during the purchasing process and the habit of self-eating are identified as influential factors in shaping the perception of GMF content. Recognizing the impact of these factors can lead to targeted interventions to increase consumer awareness and support informed decision-making about GMF consumption. As individuals increasingly favor certain food attributes and habits, understanding these dynamics becomes critical to developing strategies that align with consumer preferences and contribute to a more transparent and consumer-centric food environment.

Last, but not least, the findings of associations between socio-demographic characteristics and attitudes to GMO labelling, presented in the paper, underscore the diversity of attitudes toward GMF based on sociodemographic characteristics. Gender, age, urbanicity and life satisfaction all contribute to a complex tapestry of perceptions and preferences regarding GMF.

Recognizing these variations is critical to tailoring communication strategies and policy interventions that resonate with different demographics. The study highlights the need for targeted approaches that take into account the subtle interplay between individual characteristics and attitudes towards GMF and promote a more comprehensive understanding of the factors influencing public acceptance and consumption patterns.

9.8. Conclusion

This study delved into the complex landscape of public attitudes toward genetically modified foods (GMFs) by examining the factors influencing demand for GMF labeling. It seeked to enrich the ongoing discourse on genetically modified foods (GMFs) by examining the impact of environmental concerns, perceived health risks associated with GMOs, and the availability of information on the public's propensity to challenge GMF labeling and the likelihood that it will scrutinize such labels. . The research was conducted on a representative sample of the Czech population, including 884 individuals aged 18 to 90 (M ± SD: 48.17 ± 17.72; 53.40% women, 18.04% with higher education).

The findings shed light on the multifaceted interplay of information, health perceptions, environmental issues, food characteristics, and sociodemographic factors in shaping consumer attitudes.One of the key findings from this investigation is the overriding role of health considerations in influencing the public's insistence on GMF labeling. Perceived health effects were shown to be strong predictors that significantly influenced not only demand for labeling but also influencing behaviors such as checking GM content in purchases and perceptions of GM ingredients in daily foods. This underscores the need for targeted communication strategies that address health-related issues transparently and comprehensively.

Environmental concerns also played a notable role, with individuals favoring the environmental impact of food production showing a greater tendency to check information about GM ingredients when purchasing food and supporting the need for GMF labeling. These findings underscore the interconnectedness of environmental awareness and consumer choices regarding GMF.

Importantly, the study highlighted the importance of food characteristics and habits in shaping attitudes towards GMF. Origin, packaging, price and ingredients were found to be critical factors influencing the perceived content of GM ingredients in foods. Understanding these nuances provides valuable insights for both policymakers and the food industry to tailor communication and marketing strategies to match consumer priorities.

Sociodemographic factors revealed distinct patterns, with gender, age, city size, and life satisfaction contributing to differences in attitudes toward GMF. The complex relationship between these factors highlights the need for tailored approaches that take into account different demographic perspectives.

In the context of a second-stage hierarchical ordinal regression, the exclusion of health-related variables significantly altered the predictive power of the models and highlighted the central role of health considerations in the demand for GMF labeling.

In conclusion, this study underscores the need for nuanced, multidimensional strategies in addressing public concerns and promoting greater adoption of GMF. Transparent communication, targeted education campaigns and policies that align with consumer values and priorities are essential to navigate the complex landscape of GMF perceptions. As technology advances, continued research and adaptive approaches will be critical to shaping a sustainable and informed future for the integration of GM products into the global food supply.

Citation:

Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). Exploring Attitudes towards GMO Labelling: A Study on the Czech Population. Ukrainian Food Journal. Vol. 12 (3) pp. 500-522

10. Discussion

Green food consumption, green waste management and consumer attitudes towards GMOs together reveal a holistic and interconnected framework that promotes a greener and more responsible approach to consumption. These three elements are integral to a larger sustainability story, where individual choices resonate across sectors and impact both the environment and societal well-being. The aspects of these three elements studied in this thesis related primarily to the factors influencing individual consumer choices.

Individual consumer choices have a profound impact on both the environment and societal well-being, highlighting the key role that personal choices play in shaping the world we inhabit. The significance of these choices extends far beyond immediate personal gratification and affects wider ecosystems, economies and the collective quality of life.

First, individual consumption choices directly affect the environment. From the products we buy to the food we eat, every decision has implications for resource use, waste generation and overall environmental sustainability. Choosing sustainable and environmentally friendly products, reducing the number of single-use items and adopting energy-efficient practices contributes to protecting natural resources and mitigating environmental degradation. Through informed and conscientious decisions, individuals become stewards of the planet and actively participate in efforts to address climate change, biodiversity loss and other pressing environmental issues.

At the same time, individual consumption choices play a vital role in shaping social well-being. The products and services that individuals support through their purchases often reflect and influence broader societal values. Choosing ethically sourced and fair trade products promotes responsible business practices and helps ensure workers receive fair wages and humane working conditions. In addition, choosing locally produced goods contributes to the vitality of local economies, supports community resilience and reduces the carbon footprint associated with long-distance transport.

Health and well-being are also deeply affected by individual consumer choices. Nutritional choices, including the types of foods and beverages consumed, directly affect personal health. Choosing a balanced and varied diet not only supports individual well-being, but also reduces the burden on healthcare systems. Similarly, lifestyle decisions such as using sustainable transport and incorporating physical activity into daily routines contribute to overall health and social well-being.

In addition, individual consumption choices influence industries and markets, moving them towards more sustainable and socially responsible practices. The demand for environmentally friendly products, ethical business practices and social responsibility is encouraging businesses to adopt sustainable strategies. In this way, individual consumers become catalysts for positive change and shape markets that prioritize both profit and purpose.

11. Policy recommendations

This thesis suggests that the three most important factors impacting the consumer choices in the field of environmental consumption are environmental concern, the sufficiency and correctness of the information, and own health risks and concerns. Based on the findings of this work, which highlight the key role of environmental concern, adequacy and accuracy of information and health considerations in shaping consumer decisions on green consumption, the following policy proposals are proposed. Most of these policies are already enacted on some level. The others are still to be incorporated.

1. Strengthen environmental education initiatives.

To strengthen initiatives in the area of environmental education, it is crucial to implement targeted educational campaigns that raise awareness of environmental issues and emphasize the interconnectedness of individual choices with broader environmental impacts. These campaigns should effectively communicate the importance of sustainable living and support informed decision-making.

2. Strengthen transparency and availability of information:

To increase transparency and availability of information, it is essential to enforce mandatory labeling standards that include comprehensive and standardized requirements for product labels. This includes clear information about the environmental impact, sourcing practices and sustainability measures associated with each product. By implementing these standards, consumers can make informed decisions in line with their environmental values. Furthermore, the creation of accessible and user-friendly digital platforms is essential to further facilitate the dissemination of information. These platforms should provide detailed information on the ecological footprint of products and allow consumers to navigate complex information effortlessly and make sustainable decisions. By enforcing labeling standards and developing digital platforms, a more transparent and informative market can be cultivated that supports a consumer environment where conscious choices are in line with environmental considerations.

3. Strengthen the Incentives for sustainable practices:

To bolster incentives for sustainable practices, it is crucial to implement a two-pronged approach. Firstly, the introduction of tax incentives for businesses adopting sustainable practices can serve as a powerful catalyst for the adoption of environmentally friendly production methods and sustainable supply chain processes. By providing financial benefits, this measure encourages businesses to prioritize sustainability in their operations. Additionally, consumer-focused incentives play a pivotal role in driving sustainable choices. Implementing rewards, discounts, or other incentives for choosing environmentally friendly products or engaging in sustainable behaviors establishes a positive reinforcement mechanism. This not only encourages individuals to make eco-conscious decisions but also creates a market demand that further motivates businesses to embrace sustainable practices. By combining both business and consumer incentives, a synergistic approach is achieved, fostering a more sustainable and resilient economic landscape.

4. Provide more accurate information on the risks and the benefits of GMO food products

In relation to GMO food products, health risks have emerged as a significant issue, underscoring the paramount importance of addressing this issue. However, it is noteworthy that not all perceived risks are supported by reliable evidence, highlighting the need for a more comprehensive and evidence-based understanding of the health effects associated with the consumption of GMOs. To bridge this gap, there is an urgent need for greater dissemination of information regarding the health aspects of GMOs that offer a more nuanced and informed perspective. In addition, it is essential to highlight the positive dimensions of GMOs and promote a balanced discourse that considers both potential risks and benefits. This approach ensures that the public is equipped with accurate and holistic information that enables individuals to make informed decisions about GMO consumption.

By incorporating these policy proposals, policymakers can create an environment that provides consumers with the knowledge and incentives needed to make sustainable choices. This, in turn, can contribute to a shift towards more environmentally conscious and health-oriented consumer behaviour, supporting a sustainable and resilient future.

12. Conclusion

In conclusion, this work delved into the multifaceted aspects of environmentally friendly consumer choice, focusing on two key dimensions: green consumption in the context of food choices and waste management at the household level, and factors influencing attitudes towards the labeling of genetically modified foods. food products.

The green food consumption survey highlights the significant ecological footprint of households and the potential for positive change through conscious choices. Households can contribute to a more sustainable and greener food system by addressing issues such as food waste, incorporating local and organic options, and adopting a plant-based diet.

Similarly, research into green waste management highlights the key role that households play in waste generation and disposal. The work highlights the importance of the 'reduce, reuse and recycle' mantra in minimizing the environmental impact associated with both solid and hazardous waste. Through these practices, households can actively contribute to reducing the burden on landfills and promote a more sustainable approach to waste management.

The analysis also extends to the area of genetically modified food products, where households have an influence on either supporting or preventing their spread. Emphasis on labeling requirements is emerging as a key factor in shaping consumer acceptance of genetically modified foods. This underscores the importance of transparent information and regulatory measures in influencing consumer perceptions and choices regarding genetically modified foods.

All the three analyses above studied the impact of environmental concern, adequacy and accuracy and sources of information and health considerations on the aspects of green consumption. The results suggest, that information, in terms of source of information, sufficiency of information and correctness of the information play a profound role in environmental consumer choices. Moreover, some sources of information, surprisingly, do not do a good job in terms of promoting environmental behavior, while the other support it. Health risks proved most important especially in the case of GMO food products. Not all the risks are supported by evidence. More information about health effect of GMO needs to be published. Moreover, the positive aspects of GMO needs to be distributed to the population as well.

In essence, this work underlines the interconnectedness of individual choices and their collective impact on the environment. By recognizing the influence of households in shaping

consumption patterns and waste management practices, as well as their role in determining the acceptance of genetically modified foods, it provides policy makers, businesses and individuals with a vision for a more sustainable and greener future.

In conclusion, this dissertation has provided a comprehensive examination of various aspects of environmentally responsible consumption and its implications for environmental sustainability. Through the analysis of consumer behavior and attitudes towards green consumption, resource and waste management and the labeling of genetically modified foods, this research shed light on the complexities of sustainable decision-making in contemporary society. By elucidating the factors influencing consumer choices and perceptions, this dissertation contributes to a better understanding of the challenges and opportunities in promoting environmentally responsible behavior. In the future, policymakers, stakeholders, and researchers can use these insights to develop more effective strategies to promote sustainable consumption patterns and address pressing environmental issues. Ultimately, by empowering individuals to make informed decisions and by promoting systemic change at the societal and institutional levels, we can work towards a more sustainable and resilient future for generations to come.

13. Limitations and suggestions for further research

The three analyzes conducted in the above investigations examined the effect of environmental concern, adequacy and accuracy of information, and health aspects on different aspects of green consumption. The findings suggest that information, including factors such as source, sufficiency, and accuracy, significantly shape decisions related to environmentally conscious consumer choices. Surprisingly, some sources of information prove insufficient in promoting environmentally responsible behavior, while others are shown to be supportive. These results underscore the need for further research to delve deeper into the dynamics of information sources and their influence on shaping environmentally friendly consumer behavior.

As in the case of all research, the results presented in this thesis are subject to the following limitations. Most of the limitations are related primarily to the general limitations of questionnaire studies. One notable issue is the potential for response bias, where participants may offer socially desirable responses, skewing the data toward more favorable portrayals. This tendency to present oneself positively can compromise the authenticity of the information received, leading to a potential gap between reported and actual behavior or attitudes.

Questionnaire studies can also lack depth of context, preventing a comprehensive understanding of participant responses. Without the ability to explore context or probe further during survey administration, researchers may have difficulty understanding the underlying reasons or motivations behind participants' choices.

In addition, the range of questions in a questionnaire is often limited by practical considerations, which limits the breadth of topics covered. This limitation may lead to overlooking crucial factors or variables that could significantly influence the phenomenon under investigation. As a result, the comprehensiveness and applicability of the findings may be compromised.

Questionnaire studies also face problems in capturing changes in behavior or attitudes over time. These studies, which provide a snapshot of participants' perspectives at a particular point in time, may not effectively track the dynamics and evolution of behavior or opinions.

Assessing causation presents a significant challenge because questionnaires primarily establish correlations between variables without delving into causation. Researchers must be careful about inferring causality based on questionnaire data alone.

Memory bias is another concern, especially when participants are asked to recall past events or experiences. Memory lapses or inaccuracies can compromise the reliability of responses, especially in studies dependent on accurate retrospection.

Finally, questionnaire studies rely heavily on self-reporting, which makes them susceptible to subjective interpretations by participants and may be influenced by memory lapses, social desirability, or the desire to conform to social norms. Researchers should be aware of these limitations to ensure a different interpretation of the data collected.

Thus, in order to overcome these limitations the researchers, who plan to study similar issues in the future would have to go deeper to the qualitative type of research, which would allow them to cover the issues studied in more complexity.

14. Appendices

14.1. Appendix A1. The results or ordinal regression analysis presented in bulleted form

Health risks

- The subjective assessment of own health condition proved unrelated to GM attitudes and actions.
- The more the respondents believe that GMF is safe, (1) the more they would purchase foods with GM ingredients and (2) the less they consider GMF immoral; (3) the more likely they would try GMF.
- The more the respondents believe that GMF can change their DNA, (1) the less likely they would buy food with a GM ingredient, (2) the more they consider GMF immoral.
- The more the respondents believe that GMF can endanger their health, (1) the less likely they would buy food with a GM ingredient, (2) the more they consider GMF immoral; (3) the less likely they are to try food with GM ingredients.

Environmental concerns

- The more important the effect of food production on the environment, the less likely they would try GMF.
- The more the respondent engage in waste management, the more likely they are to try GMF.

Information and interest

- The more the respondent is informed about GMF, (1) the more likely he would buy food with a GM ingredient, (2) the less he believes that GMF is morally unacceptable.

- Interest in GMF positively predicts (1) GMF considered immoral: the more the respondents are interested in GMF, the more they consider GMF immoral;
- The more the respondents believe that the effects of GM are scientifically investigated, (1) the more likely they would buy food with a GM ingredient.

Socio-demographics and other controls

- The bigger the city, the more people are willing to try GMF
- The more the respondent is satisfied in his life, the more he is willing to try GMF

14.2. Appendix A2. Pearson correlation of independent variables in the ordinal regression

Table A2. Pearson correlation of independent variables in the ordinal regression model

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Urgent areas-environment (1)	1	,161**	0,024	-,078*	-0,062	-0,004	-0,025	-0,061	0,01	0,041	-0,001	-0,041	-0,007	-0,036	0,049	0,015	-0,065	-,095**	0,045
Sig. (2-tailed)		<,001	0,489	0,032	0,078	0,905	0,449	0,085	0,757	0,217	0,984	0,216	0,846	0,284	0,142	0,659	0,074	0,007	0,181
Satisfaction with the environment (2)	,161**	1	,079*	,077*	,101**	,113**	-0,063	-0,058	,079*	0,043	,080*	-0,03	-,075*	-0,045	-0,004	,098**	-0,071	-,177**	-0,014
Sig. (2-tailed)	<,001		0,021	0,033	0,004	<,001	0,06	0,102	0,018	0,195	0,017	0,364	0,025	0,178	0,909	0,003	0,051	<,001	0,672
Enough info about environment (3)	0,024	,079*	1	,132**	0,062	,124**	0,005	0,017	-0,042	-0,039	0,02	,165**	,080*	0,066	,072*	,149**	0,035	0,027	-,145**
Sig. (2-tailed)	0,489	0,021		<,001	0,085	<,001	0,889	0,646	0,219	0,26	0,57	<,001	0,02	0,055	0,036	<,001	0,346	0,454	<,001
EU integration, environment (4)	-,078*	,077*	,132**	1	,505**	,460**	0,065	-0,051	0,07	0,013	0,032	0,043	0,005	0,049	0,014	,125**	,114**	,151**	-,078*
Sig. (2-tailed)	0,032	0,033	<,001		<,001	<,001	0,071	0,176	0,052	0,719	0,384	0,238	0,896	0,175	0,69	<,001	0,003	<,001	0,032
EU integration, economy (5)	-0,062	,101**	0,062	,505**	1	,517**	,111**	-0,066	,074*	,109**	,078*	,097**	0,019	,090*	0,014	,149**	,086*	0,024	-0,063
Sig. (2-tailed)	0,078	0,004	0,085	<,001		<,001	0,002	0,077	0,036	0,002	0,028	0,006	0,584	0,011	0,684	<,001	0,023	0,524	0,074
Trust in EU (6)	-0,004	,113**	,124**	,460**	,517**	1	,149**	-,127**	0,019	,085*	,073*	,085*	0,023	0,066	,086*	,121**	,127**	,117**	-,085*
Sig. (2-tailed)	0,905	<,001	<,001	<,001	<,001		<,001	<,001	0,573	0,013	0,035	0,013	0,498	0,056	0,013	<,001	<,001	0,001	0,013
Age (7)	-0,025	-0,063	0,005	0,065	,111**	,149**	1	-,277**	-,323**	-,239**	-,256**	,305**	,316**	,424**	0,043	,150**	,081*	0,012	,072*
Sig. (2-tailed)	0,449	0,06	0,889	0,071	0,002	<,001		<,001	<,001	<,001	<,001	<,001	<,001	<,001	0,205	<,001	0,026	0,731	0,031
Political orientation (8)	-0,061	-0,058	0,017	-0,051	-0,066	-,127**	-,277**	1	0,016	-0,013	-0,004	-,196**	-,124**	-,137**	-0,055	-,191**	-0,041	-0,008	,135**
Sig. (2-tailed)	0,085	0,102	0,646	0,176	0,077	<,001	<,001		0,663	0,708	0,912	<,001	<,001	<,001	0,121	<,001	0,287	0,837	<,001
TV (9)	0,01	,079*	-0,042	0,07	,074*	0,019	-,323**	0,016	1	,406**	,377**	0,042	-0,05	-,075*	,112**	-0,003	-0,028	-0,003	-,069*
Sig. (2-tailed)	0,757	0,018	0,219	0,052	0,036	0,573	<,001	0,663		<,001	<,001	0,208	0,133	0,025	<,001	0,929	0,437	0,937	0,04
Printed media (10)	0,041	0,043	-0,039	0,013	,109**	,085*	-,239**	-0,013	,406**	1	,456**	0,048	0,014	-,067*	,144**	0,013	0,004	0,044	-,122**
Sig. (2-tailed)	0,217	0,195	0,26	0,719	0,002	0,013	<,001	0,708	<,001		<,001	0,151	0,679	0,046	<,001	0,705	0,904	0,217	<,001
Radio (11)	-0,001	,080*	0,02	0,032	,078*	,073*	-,256**	-0,004	,377**	,456**	1	,085*	-0,007	-,066*	,134**	0,004	0,061	0,005	-,103**
Sig. (2-tailed)	0,984	0,017	0,57	0,384	0,028	0,035	<,001	0,912	<,001	<,001		0,011	0,842	0,05	<,001	0,895	0,094	0,895	0,002

Online news (12)	-0,041	-0,03	,165**	0,043	,097**	,085*	,305**	-,196**	0,042	0,048	,085*	1	,616**	,532**	,282**	,196**	0,066	,095**	-,312**
Sig. (2-tailed)	0,216	0,364	<,001	0,238	0,006	0,013	<,001	<,001	0,208	0,151	0,011		<,001	<,001	<,001	<,001	0,071	0,007	<,001
Online discussions, blogs (13)	-0,007	-,075*	,080*	0,005	0,019	0,023	,316**	-,124**	-0,05	0,014	-0,007	,616**	1	,650**	,339**	,090**	0,062	0,065	-,179**
Sig. (2-tailed)	0,846	0,025	0,02	0,896	0,584	0,498	<,001	<,001	0,133	0,679	0,842	<,001		<,001	<,001	0,007	0,088	0,065	<,001
Social networks (14)	-0,036	-0,045	0,066	0,049	,090*	0,066	,424**	-,137**	-,075*	-,067*	-,066*	,532**	,650**	1	,342**	,131**	0,066	0,041	-0,063
Sig. (2-tailed)	0,284	0,178	0,055	0,175	0,011	0,056	<,001	<,001	0,025	0,046	0,05	<,001	<,001		<,001	<,001	0,068	0,25	0,06
Offline discussions (15)	0,049	-0,004	,072*	0,014	0,014	,086*	0,043	-0,055	,112**	,144**	,134**	,282**	,339**	,342**	1	,077*	,103**	,096**	-,074*
Sig. (2-tailed)	0,142	0,909	0,036	0,69	0,684	0,013	0,205	0,121	<,001	<,001	<,001	<,001	<,001	<,001		0,022	0,005	0,007	0,028
Standard of living (16)	0,015	,098**	,149**	,125**	,149**	,121**	,150**	-,191**	-0,003	0,013	0,004	,196**	,090**	,131**	,077*	1	0,016	0,054	-,240**
Sig. (2-tailed)	0,659	0,003	<,001	<,001	<,001	<,001	<,001	<,001	0,929	0,705	0,895	<,001	0,007	<,001	0,022		0,657	0,123	<,001
Behavior affects climate (17)	-0,065	-0,071	0,035	,114**	,086*	,127**	,081*	-0,041	-0,028	0,004	0,061	0,066	0,062	0,066	,103**	0,016	1	,336**	-0,025
Sig. (2-tailed)	0,074	0,051	0,346	0,003	0,023	<,001	0,026	0,287	0,437	0,904	0,094	0,071	0,088	0,068	0,005	0,657		<,001	0,491
Concerns about climate (18)	-,095**	-,177**	0,027	,151**	0,024	,117**	0,012	-0,008	-0,003	0,044	0,005	,095**	0,065	0,041	,096**	0,054	,336**	1	-,107**
Sig. (2-tailed)	0,007	<,001	0,454	<,001	0,524	0,001	0,731	0,837	0,937	0,217	0,895	0,007	0,065	0,25	0,007	0,123	<,001		0,002
Education (19)	0,045	-0,014	-,145**	-,078*	-0,063	-,085*	,072*	,135**	-,069*	-,122**	-,103**	-,312**	-,179**	-0,063	-,074*	-,240**	-0,025	-,107**	1
Sig. (2-tailed)	0,181	0,672	<,001	0,032	0,074	0,013	0,031	<,001	0,04	<,001	0,002	<,001	<,001	0,06	0,028	<,001	0,491	0,002	

** correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). Source: own computations based on data (Sociologický ústav. Akademie věd ČR. 2021).

14.3. Appendix A3. Principal component analysis of perceptions on climate change and conserns about environment

Table A3. Pearson correlations of preceptions of climate change and environmental conserns

Correlations						
		Satisfaction with the environment	Enough info about environment	Urgent areas - environment	Behaviour affects climate	Concerns about climate change
Satisfaction with the environment	Pearson Correlation	1	,079*	,161**	-0,071	-,177**
	Sig.		0,021	<,001	0,051	<,001
	N	898	849	898	758	803
Enough info about environment	Pearson Correlation	,079*	1	0,024	0,035	0,027
	Sig.	0,021		0,489	0,346	0,454
	N	849	853	851	731	771
Urgent areas - environment	Pearson Correlation	,161**	0,024	1	-0,065	-,095**
	Sig.	<,001	0,489		0,074	0,007
	N	898	851	902	759	805
Behaviour affects climate	Pearson Correlation	-0,071	0,035	-0,065	1	,336**
	Sig.	0,051	0,346	0,074		<,001
	N	758	731	759	761	743
Concerns about climate change	Pearson Correlation	-,177**	0,027	-,095**	,336**	1
	Sig.	<,001	0,454	0,007	<,001	
	N	803	771	805	743	807

* Correlation is significant at the 0.05 level (2-tailed). ** correlation is significant at the 0.01 level (2-tailed).

14.4. Appendix A4. Environmentally conscious consumption as predicted by ordinal regression analysis. Results. Interpretations for tables

- The more urgent is perceived the environment protection, the more the respondent buys local food and the environmentally friendly products
- The more the respondent is satisfied with the local environment, the more he buys local food.
    - This association is natural as one wants to eat "non-polluted" food; thus, the indicator of buying local food may be viewed both as an indicator of satisfaction with the local environment and an indicator of environmentally friendly behavior.
- The more the respondents believe that they have enough information about how to be environmentally friendly, the more they purchase local food and environmentally friendly products.
- The more the respondents believe that their behavior can affect climate change, the more they buy local food.
    - This is understandable, as limiting the need to transport the products is presented as one of the ways how to reduce CO2 emissions and slow down climate change.
- The more the respondents are worried about the impacts of climate change, the more they report buying organic food and environmentally friendly products.
    - Thus, climate change is viewed as one of the manifestations of environmental degradation. Environmentally friendly products are likely to include those that reduce climate change.
- The more the respondent believes that European integration in the area of environmental protection is beneficial, the more they report buying organic food and environmentally friendly products.
- The less the respondent follows social life TV, the more he buys environmentally friendly products
- The more the respondent follows social life printed media, the more he buys organic food
- The more the respondent follows social life in internet discussions and blogs, the more he buys organic food and environmentally friendly products.
- The less the respondent follows social life on social networks, the more he buys organic food.

- The more the respondent follows social life on social networks, the more he buys local food
- Women report more often purchasing organic food, local food, and environmentally friendly products compared to men
- Older people buy less organic food
- The more the respondent adheres to right-wing political orientation, the more he buys organic food, local food, and environmentally friendly products.
- Respondents with higher education report purchasing more organic food compared to all the other types of education
- Respondents with basic and secondary w/o state exam education buy less local food compared to the respondents with higher education.
- People living in large cities, average and small towns buy less organic food than people living in small villages
- People living in large cities buy less local food compared to small villages.
- People living in suburbs of large cities buy more local food compared to small villages.

15. References

Ackerman, F. (2000). Waste management and climate change. Local Environment, 5(2), 223-229.

Agyeman, C. M. (2014). Consumers' buying behavior towards green products: An exploratory study. *International journal of management research and business strategy*, *3*(1), 188-197.

Alfredsson, E. C. (2004). "Green" consumption—no solution for climate change. *Energy*, *29*(4), 513-524.

Anderson, A. (2011). Sources, media, and modes of climate change communication: the role of celebrities. *Wiley interdisciplinary reviews: climate change*, 2(4), 535-546.

Andrews, K. T., & Caren, N. (2010). Making the news: Movement organizations, media attention, and the public agenda. *American sociological review*, *75*(6), 841-866.

Anuar, M. M., Omar, K., Ahmed, Z. U., Saputra, J., & Yaakop, A. Y. (2020). Drivers of green consumption behaviour and their implications for management. *Polish Journal of Management Studie*s, 21.

Arcelo-Villena, M. M. C. Q. (2019) Personal Constructs and Social Discourses on Genetically Modified Organisms (GMOs). Policy Briefs. Nol. 1. No. 5, pp. 1-8.

Azadi, H., & Ho, P. (2010). Genetically modified and organic crops in developing countries: A review of options for food security. Biotechnology advances, 28(1), 160-168.

Barr, S. (2007). Factors influencing environmental attitudes and behaviors: A UK case study of household waste management. Environment and behavior, 39(4), 435-473.

Bartelings, H., & Sterner, T. (1999). Household waste management in a Swedish municipality: determinants of waste disposal, recycling and composting. Environmental and resource economics, 13, 473-491.

Bartkus, K. R., Hartman, C. L., & Howell, R. D. (1999). The measurement of consumer environmental knowledge: Revisions and extensions. Journal of Social Behavior and Personality, 14(1), 129.

Beatson, A., Gottlieb, U., & Pleming, K. (2020). Green consumption practices for sustainability: an exploration through social practice theory. Journal of Social Marketing, 10(2), 197-213.

Beatty, C., Fothergill, S., & Powell, R. (2007). Twenty years on: has the economy of the UK coalfields recovered?. *Environment and Planning A*, *39*(7), 1654-1675.

Bernstein, J. A., Bernstein, I. L., Bucchini, L., Goldman, L. R., Hamilton, R. G., Lehrer, S., & Sampson, H. A. (2003). Clinical and laboratory investigation of allergy to genetically modified foods. Environmental health perspectives, 111(8), 1114-1121.

Boström, M., & Klintman, M. (2008). Eco-standards, product labelling and green consumerism. *Basingstoke: Palgrave Macmillan*.

Boudreau, G. (2010). Behavioural change in environmental education. *J Environ Science Public Health* 2017, 1(2), 120-133.

Brick, P., & Cawley, R. M. (2008). Producing political climate change: the hidden life of US environmentalism. Environmental Politics, 17(2), 200-218.

Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). Exploring Attitudes towards GMO Labelling: A Study on the Czech Population. Ukrainian Food Journal. Forthcoming

Brož, D., Čábelková, I., Hlaváček, M., Smutka, L., & Procházka, P. (2023). It starts from home? Explaining environmentally responsible resource and waste management. Frontiers in Environmental Science. 27 June 2023 Volume 11 - 2023 | https://doi.org/10.3389/fenvs.2023.1136171

Brulle, R. J., Carmichael, J., & Jenkins, J. C. (2012). Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the US, 2002–2010. *Climatic change*, *114*(2), 169-188.

Cabelkova, I., Smutka, L., & Strielkowski, W. (2022). Public support for sustainable development and environmental policy: A case of the Czech Republic. *Sustainable Development*, *30*(1), 110-126.

Cabelkova, I., Strielkowski, W., Firsova, I., & Korovushkina, M. (2020). Public acceptance of renewable energy sources: A case study from the Czech Republic. Energies, 13(7), 1742.

Calabro, G. (2007). The EU-policy of promoting green purchases: the role of ecological labelling. *In Forum Ware International* (Vol. 1, pp. 1-7).

Carrus, G., Passafaro, P., & Bonnes, M. (2008). Emotions, habits and rational choices in ecological behaviours: The case of recycling and use of public transportation. Journal of environmental psychology, 28(1), 51-62.

Cerri, J., Testa, F., & Rizzi, F. (2018). The more I care, the less I will listen to you: How information, environmental concern and ethical production influence consumers' attitudes and the purchasing of sustainable products. *Journal of Cleaner Production*, 175, 343-353.

Černý, O., & Ocelík, P. (2020). Incumbents' strategies in media coverage: A case of the Czech coal policy. *Politics and Governance*, 8(2), 272-285.

Chen, Y., Ghosh, M., Liu, Y., & Zhao, L. (2019). Media coverage of climate change and sustainable product consumption: Evidence from the hybrid vehicle market. *Journal of Marketing Research*, 56(6), 995-1011.

Colbry, S., Bienenstock, J., & Smith, M. (2017). The Impact of a Community Garden on Fruit and Vegetable Consumption: A Pilot Study. *Journal of Hunger & Environmental Nutrition*, 12(1), 116-123.

Connolly, J., & Prothero, A. (2003). Sustainable consumption: consumption, consumers and the commodity discourse. Consumption, Markets and culture, 6(4), 275-291.

Cymru, W. W. F. (2002). The Footprint of Wales. A Report to the Welsh Assembly Government WWF Cymru, Cardiff, UK

Calabro, G. (2007). The EU-policy of promoting green purchases: the role of ecological labelling. In Forum Ware International (Vol. 1, pp. 1-7).

Carmichael, J. T., & Brulle, R. J. (2017). Elite cues, media coverage, and public concern: an integrated path analysis of public opinion on climate change, 2001–2013. *Environmental Politics*, *26*(2), 232-252.

Carrus, G., Passafaro, P., & Bonnes, M. (2008). Emotions, habits and rational choices in ecological behaviours: The case of recycling and use of public transportation. Journal of environmental psychology, 28(1), 51-62.

Castro, P. J., Aráujo, J. M., Martinho, G., & Pereiro, A. B. (2021). Waste management strategies to mitigate the effects of fluorinated greenhouse gases on climate change. Applied Sciences, 11(10), 4367.

Černý, O., & Ocelík, P. (2020). Incumbents' strategies in media coverage: A case of the Czech coal policy. Politics and Governance, 8(2), 272-285.

Cerri, J., Testa, F., & Rizzi, F. (2018). The more I care, the less I will listen to you: How information, environmental concern and ethical production influence consumers' attitudes and the purchasing of sustainable products. *Journal of Cleaner Production*, *175*, 343-353.

Cetiner, I., & Shea, A. D. (2018). Wood waste as an alternative thermal insulation for buildings. *Energy and Buildings*, *168*, 374-384.

Challcharoenwattana, A., & Pharino, C. (2016). Wishing to finance a recycling program? Willingness-to-pay study for enhancing municipal solid waste recycling in urban settlements in Thailand. *Habitat International*, *51*, 23-30.

Chan, R. Y. (2001). Determinants of Chinese consumers' green purchase behavior. *Psychology & marketing*, *18*(4), 389-413.

Chen, M. F., & Li, H. L. (2007). The consumer's attitude toward genetically modified foods in Taiwan. Food Quality and preference, 18(4), 662-674.

Chen, Y., Ghosh, M., Liu, Y., & Zhao, L. (2019). Media coverage of climate change and sustainable product consumption: Evidence from the hybrid vehicle market. *Journal of Marketing Research*, *56*(6), 995-1011.

Conner, M., & Armitage, C. J. (1998). Extending the theory of planned behavior: A review and avenues for further research. *Journal of applied social psychology*, *28*(15), 1429-1464.

Connolly, J., & Prothero, A. (2003). Sustainable consumption: consumption, consumers and the commodity discourse. Consumption, Markets and culture, 6(4), 275-291.

Costa-Font, M., Gil, J. M., & Traill, W. B. (2008). Consumer acceptance, valuation of and attitudes towards genetically modified food: Review and implications for food policy. Food policy, 33(2), 99-111.

Crowe, F. L., Appleby, P. N., Travis, R. C., & Key, T. J. (2014). Risk of hospitalization or death from ischemic heart disease among British vegetarians and nonvegetarians: results from the EPIC-Oxford cohort study. The American Journal of Clinical Nutrition, 100(Supplement_1), 393S-398S.

Cymru, W. W. F. (2002). The Footprint of Wales. A Report to the Welsh Assembly Government WWF Cymru, Cardiff, UK

Davies, J., Foxall, G. R., & Pallister, J. (2002). Beyond the intention–behaviour mythology: an integrated model of recycling. Marketing theory, 2(1), 29-113.

De Groot, R., & Ramakrishnan, P. S. (2005*). Cultural and Amenity Services*. Ecosystems and Human Well-Being: Current State and Trends. Findings of the Condition and Trends Working Group. Millennium Ecosystem Assessment.

Deaton, A., & Muellbauer, J. (1980). *Economics and consumer behavior*. Cambridge university press

Delgado-Zegarra, J., Alvarez-Risco, A., Cárdenas, C., Donoso, M., Moscoso, S., Rojas Román, B., ... & Yáñez, J. A. (2022). Labeling of genetically modified (GM) foods in Peru: Current dogma and insights of the regulatory and legal statutes. *International Journal of Food Science*, vol. 2022, Article ID 3489785, 12 pages, 2022. https://doi.org/10.1155/2022/3489785

Dewey, J; Bentley, A. F. (1960): *Knowing and the known*. Boston: Beacon press,

Dhir, A., Sadiq, M., Talwar, S., Sakashita, M., & Kaur, P. (2021). Why do retail consumers buy green apparel? A knowledge-attitude-behaviour-context perspective. *Journal of Retailing and Consumer Services*, 59, 102398.

Diamond, E., Bernauer, T., & Mayer, F. (2020). Does providing scientific information affect climate change and GMO policy preferences of the mass public? Insights from survey experiments in Germany and the United States. *Environmental Politics*, 29(7), 1199-1218.

Dietz, T., Fitzgerald, A., & Shwom, R. (2005). Environmental values. Annu. Rev. Environ. Resour., 30, 335-372.

Ding, Q., Cai, W., Wang, C., & Sanwal, M. (2017). The relationships between household consumption activities and energy consumption in china—An input-output analysis from the lifestyle perspective. *Applied energy*, *207*, 520-532.

Dona, A., & Arvanitoyannis, I. S. (2009). Health risks of genetically modified foods. Critical reviews in food science and nutrition, 49(2), 164-175

Dumitrescu, Delia, and Anthony Mughan. "Mass media and democratic politics." *Handbook of politics*. Springer, New York, NY, 2010. 477-491.

Ek, M., Gellerstedt, G., & Henriksson, G. (Eds.). (2009). *Wood chemistry and biotechnology* (Vol. 1). Walter de Gruyter.

ElHaffar, G., Durif, F., & Dubé, L. (2020). Towards closing the attitude-intention-behavior gap in green consumption: A narrative review of the literature and an overview of future research directions. Journal of cleaner production, 275, 122556.

Ekici, K., & Sancak, Y. C. (2011). A perspective on genetically modified food crops. African Journal of Agricultural Research, 6(7), 1639-1642.

Empacher, C., & Götz, K. (2004). 10. Lifestyle approaches as a sustainable consumption policy–a German example. In The Ecological Economics of Consumption, ed. LA Reisch, I Røpke. pp. 190–206. Cheltenham, UK: Elgar

Eriksson, C. (2004). Can green consumerism replace environmental regulation?—a differentiated-products example. Resource and energy economics, 26(3), 281-293.

EuropaBio (2019) Pricing innovation out of the EU. Accessed 23.1.2024 https://croplifeeurope.eu/wp-content/uploads/2021/05/INFOGRAPHIC_PRICING_INNOVATION_OUT_v6_final.pdf

Fekadu, Z., & Kraft, P. (2001). Self-identity in planned behavior perspective: Past behavior and its moderating effects on self-identity-intention relations. Social Behavior and Personality: an international journal, 29(7), 671-685.

Fischer, D., Reinermann, J. L., Mandujano, G. G., DesRoches, C. T., Diddi, S., & Vergragt, P. J. (2021). Sustainable consumption communication: A review of an emerging field of research. Journal of Cleaner Production, 300, 126880.

Fischer, S., & Geden, O. (2015). The changing role of international negotiations in EU climate policy. The International Spectator, 50(1), 1-7.

Fisk G. (1974) Marketing and the Ecological Crisis. New York: Harper & Row

Flynn, K. J., Cottrill, C. M., & McDonagh, P. J. (2016). The relationship between environmental consciousness and food-related behaviours: A meta-analysis. Journal of Cleaner Production, 112, 3736-3747.

Frantál, B. (2016). Living on coal: Mined-out identity, community displacement and forming of anti-coal resistance in the Most region, Czech Republic. *Resources Policy*, *49*, 385-393.

Frantál, B., & Nováková, E. (2014). A curse of coal? Exploring unintended regional consequences of coal energy in the Czech Republic. *Moravian Geographical Reports*, *22*(2), 55-65.

Food Business News (2019) Non-GMO Project growth 'extreme and consistent'. Accessed October 22, 2020, https://www.foodbusinessnews.net/articles/14368-non-gmo-project-growth-extreme.-and-consistent.

Garcia-Alonso, M., Novillo, C., Kostolaniova, P., Martinez Parrilla, M., Alcalde, E., & Podevin, N. (2022). The EU's GM crop conundrum: Did the EU policy strategy to convert EFSA GMO guidance into legislation deliver on its promises?. EMBO reports, 23(5), e54529.

Gerber, P. J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., ... & Tempio, G. (2013). Tackling climate change through livestock: A global assessment of emissions and mitigation opportunities. Food and Agriculture Organization of the United Nations.

Gibson, J., Greig, J., Rampold, S., Nelson, H., & Stripling, C. (2022). Can you cite that? Describing Tennessee consumers' use of GMO information channels and sources. Advancements in Agricultural Development, 3(2), 1-16.

Gizaw, Z. (2019). Public health risks related to food safety issues in the food market: a systematic literature review. Environmental health and preventive medicine, 24, 1-21.

Godin, G., & Kok, G. (1996). The theory of planned behavior: a review of its applications to health-related behaviors. *American journal of health promotion*, *11*(2), 87-98.

Green, N. L. (2023) An analysis of some ethical argumentation about genetically modified food. Argument & Computation. 1 Jan. 1-20. DOI: 10.3233/AAC-220014

Gubanov, D., & Petrov, I. (2019, October). Multidimensional model of opinion polarization in social networks. In 2019 *Twelfth International Conference" Management of large-scale system development"(MLSD)* (pp. 1-4). IEEE.

Gupta, S., & Ogden, D. T. (2009). To buy or not to buy? A social dilemma perspective on green buying. Journal of consumer marketing, 26(6), 376-391.

Halder, P., Hansen, E. N., Kangas, J., & Laukkanen, T. (2020). How national culture and ethics matter in consumers' green consumption values. Journal of cleaner production, 265, 121754.

Han, S., Lerner, J. S., & Keltner, D. (2007). Feelings and consumer decision making: The appraisal-tendency framework. Journal of consumer psychology, 17(3), 158-168.

Hanafiah, M. M., Hendriks, A. J., & Huijbregts, M. A. (2012). Comparing the ecological footprint with the biodiversity footprint of products. *Journal of Cleaner Production*, 37, 107-114.

Hansen, T. (2005). Perspectives on consumer decision making: An integrated approach. *Journal of Consumer Behaviour: An International Research Review*, *4*(6), 420-437.

Haron, S. A., Paim, L., & Yahaya, N. (2005). Towards sustainable consumption: an examination of environmental knowledge among Malaysians. International Journal of Consumer Studies, 29(5), 426-436.

Hasell, A., & Stroud, N. J. (2020). The differential effects of knowledge on perceptions of genetically modified food safety. International Journal of Public Opinion Research, 32(1), 111-131.

Henion KE, Kinnear TC. 1976. Ecological Marketing. Chicago, IL: Am. Mark. Assoc.

Hertwich, E. G., & Peters, G. P. (2009). Carbon footprint of nations: a global, trade-linked analysis. *Environmental science & technology*, *43*(16), 6414-6420.

Hilbeck, A., Meyer, H., Wynne, B., & Millstone, E. (2020). GMO regulations and their interpretation: how EFSA's guidance on risk assessments of GMOs is bound to fail. Environmental Sciences Europe, 32, 1-15.

Hlaváček, M., Čábelková, I., Brož, D., Smutka, L., & Prochazka, P. (2023). Examining green purchasing. The role of environmental concerns, perceptions on climate change, preferences for EU integration, and media exposure. Frontiers in Environmental Science, 11, 1130533.

Hines F, Peattie K. (2006). Critical Review of Data for Environmental Impacts of Household Activities: Executive Summary Report. Cardiff, UK: BRASS Res. Cent.

Huang, H., Long, R., Chen, H., Li, Q., Wu, M., & Gan, X. (2022). Knowledge domain and research progress in green consumption: A phase upgrade study. Environmental Science and Pollution Research, 29(26), 38797-38824.

Hughner, R. S., McDonagh, P., Prothero, A., Shultz, C. J., & Stanton, J. (2007). Who are organic food consumers? A compilation and review of why people purchase organic food. Journal of Consumer Behaviour: *An International Research Review*, 6(2-3), 94-110.

Huijbregts, M. A., Hellweg, S., Frischknecht, R., Hungerbühler, K., & Hendriks, A. J. (2008). Ecological footprint accounting in the life cycle assessment of products. *Ecological economics*, 64(4), 798-807.

Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *The journal of environmental education*, 21(3), 8-21.

Hůnová, I. (2020). Ambient air quality in the Czech Republic: past and present. *Atmosphere*, *11*(2), 214.

Jackson, T. (2005). Motivating sustainable consumption. Sustainable Development Research Network, 29(1), 30-40.

Jain, V. K., Gupta, A., Tyagi, V., & Verma, H. (2020). Social media and green consumption behavior of millennials. Journal of Content, Community and Communication, 10(6), 221-230.

Jalan, J., & Somanathan, E. (2008). The importance of being informed: Experimental evidence on demand for environmental quality. *Journal of development Economics*, *87*(1), 14-28.

Janssen, M. (2018). Determinants of organic food purchases: Evidence from household panel data. Food quality and preference, 68, 19-28.

Jati, I. P. P., & Rahayu, D. B. S. (2020, January). Media Agenda Setting as Strengthening Environmental Awareness and Concern in Youth. In Third International Conference on Social Transformation, Community and Sustainable Development (ICSTCSD 2019) (pp. 194-197). Atlantis Press.

Jenkins, R. R., Martinez, S. A., Palmer, K., & Podolsky, M. J. (2003). The determinants of household recycling: a material-specific analysis of recycling program features and unit pricing. Journal of environmental economics and management, 45(2), 294-318.

Jiang, S., & Fang, W. (2019). Misinformation and disinformation in science: examining the social diffusion of rumours about GMOs. Cultures of Science, 2(4), 327-340.

Johnson, C. Y., Bowker, J. M., & Cordell, H. K. (2004). Ethnic variation in environmental belief and behavior: An examination of the new ecological paradigm in a social psychological context. Environment and behavior, 36(2), 157-186.

Joshi, Y., & Rahman, Z. (2015). Factors affecting green purchase behaviour and future research directions. *International Strategic management review*, *3*(1-2), 128-143.

Kaplan, R., Kaplan, S., & Ryan, R. (1998). With people in mind: Design and management of everyday nature. Island press.

Kardash, W. J. (1974). Corporate responsibility and the quality of life: developing the ecologically concerned consumer. Ecological Marketing, American Marketing Association, Chicago, IL, 5-10.

Ketelsen, M., Janssen, M., & Hamm, U. (2020). Consumers' response to environmentally-friendly food packaging-A systematic review. *Journal of Cleaner Production*, *254*, 120123.

Kilbourne, W. E., & Beckmann, S. C. (1998). Review and critical assessment of research on marketing and the environment. Journal of marketing management, 14(6), 513-532.

Kilbourne, W. E., & Polonsky, M. J. (2005). Environmental attitudes and their relation to the dominant social paradigm among university students in New Zealand and Australia. Australasian marketing journal, 13(2), 37-48.

Kilbourne, W. E., Beckmann, S. C., & Thelen, E. (2002). The role of the dominant social paradigm in environmental attitudes: A multinational examination. Journal of business Research, 55(3), 193-204.

Kim, Y., Kim, S., & Arora, N. (2022). GMO labeling policy and consumer choice. Journal of Marketing, 86(3), 21-39.

Knight, A. J. (2009). Perceptions, knowledge and ethical concerns with GM foods and the GM process. Public Understanding of Science, 18(2), 177-188.

Krimsky, S. (2019). GMOs Decoded: A Skeptic's View of Genetically Modified Foods. MIT Press.

Kronrod, A., Tchetchik, A., Grinstein, A., Turgeman, L., & Blass, V. (2023). Promoting new pro-environmental behaviors: The effect of combining encouraging and discouraging messages. *Journal of Environmental Psychology*, *86*, 101945.

Krystallis, A., & Chryssohoidis, G. (2005). Consumers' willingness to pay for organic food: Factors that affect it and variation per organic product type. British food journal, 107(5), 320-343.

Kumar, N., & Yadav, S. (2021). Review on Genetically Modified Organism Foods. Journal of Pharmaceutical Research International, 33(60B), 2815-2823.

Lamberti, F. M., Román-Ramírez, L. A., & Wood, J. (2020). Recycling of bioplastics: routes and benefits. *Journal of Polymers and the Environment*, *28*(10), 2551-2571.

Laroche, M., Bergeron, J., & Barbaro-Forleo, G. (2001). Targeting consumers who are willing to pay more for environmentally friendly products. Journal of consumer marketing.

Lee, S., & Lee, B. (2014). The influence of urban form on GHG emissions in the US household sector. *Energy policy*, *68*, 534-549.

Legagneux, P., Casajus, N., Cazelles, K., Chevallier, C., Chevrinais, M., Guéry, L., ... & Gravel, D. (2018). Our house is burning: discrepancy in climate change vs. biodiversity coverage in the media as compared to scientific literature. Frontiers in Ecology and Evolution, 175.

Lehotský, L., & Černík, M. (2019). Brown coal mining in the Czech Republic–lessons on the coal phase-out. *International Issues & Slovak Foreign Policy Affairs*, *28*(3/4), 45-63.

Lehotský, L., Černoch, F., Osička, J., & Ocelík, P. (2019). When climate change is missing: Media discourse on coal mining in the Czech Republic. Energy Policy, 129, 774-786.

Leiserowitz, A. A., Kates, R. W., & Parris, T. M. (2006). Sustainability values, attitudes, and behaviors: A review of multinational and global trends. Annu. Rev. Environ. Resour., 31, 413-444.

Leiserowitz, A., Maibach, E., & Roser-Renouf, C. (2010). Americans' actions to conserve energy, reduce waste, and limit global warming: January 2010. Yale University and George Mason University. Yale Project on Climate Change, New Haven, Connecticut, USA. Accessed, 21.

Lenzen, M., & Murray, S. A. (2003). The ecological footprint–issues and trends. ISA research paper, 1(3).

Lin, S. T., & Niu, H. J. (2018). Green consumption: E nvironmental knowledge, environmental consciousness, social norms, and purchasing behavior. *Business Strategy and the Environment*, *27*(8), 1679-1688.

Liobikienė, G., & Poškus, M. S. (2019). The importance of environmental knowledge for private and public sphere pro-environmental behavior: modifying the value-belief-norm theory. *Sustainability*, *11*(12), 3324.

Lyndhurst, B. (2004). Bad Habits and Hard Choices: In search of sustainable lifestyles. London, Brook Lyndhurst.

Madajewicz, M., Pfaff, A., Van Geen, A., Graziano, J., Hussein, I., Momotaj, H., ... & Ahsan, H. (2007). Can information alone change behavior? Response to arsenic contamination of groundwater in Bangladesh. *Journal of development Economics*, *84*(2), 731-754.

Mancini, M. S., Galli, A., Niccolucci, V., Lin, D., Bastianoni, S., Wackernagel, M., & Marchettini, N. (2016). Ecological footprint: refining the carbon footprint calculation. *Ecological indicators*, 61, 390-403.

Mannetti, L., Pierro, A., & Livi, S. (2004). Recycling: Planned and self-expressive behaviour. Journal of environmental psychology, 24(2), 227-236.

Matakos, A., Terzi, E., & Tsaparas, P. (2017). Measuring and moderating opinion polarization in social networks. *Data Mining and Knowledge Discovery*, 31(5), 1480-1505.

Mazur, A. (2009). American generation of environmental warnings: Avian influenza and global warming. Human Ecology Review, 17-26.

McCombs, M., & Valenzuela, S. (2020). Setting the agenda: Mass media and public opinion. John Wiley & Sons.

McCright, A. M., & Dunlap, R. E. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *The Sociological Quarterly*, *52*(2), 155-194.

McDougall, J., Litzau, K., Haver, E., & Saunders, V. (2002). Rapid reduction of serum cholesterol and blood pressure by a twelve-day, very low fat, strictly vegetarian diet. American Journal of Clinical Nutrition, 75(2), 3-10.

Miemczyk, J., Johnsen, T.E. and Macquet, M. (2012). "Sustainable purchasing and supply management: a structured literature review of definitions and measures at the dyad, chain and network levels", *Supply Chain Management*, Vol. 17 No. 5, pp. 478-496. https://doi.org/10.1108/13598541211258564

Moisander, J. (2007). Motivational complexity of green consumerism. International journal of consumer studies, 31(4), 404-409.

Moerbeek, H., & Casimir, G. (2005). Gender differences in consumers' acceptance of genetically modified foods. International Journal of Consumer Studies, 29(4), 308-318.

Moon, W., & Balasubramanian, S. K. (2004). Public attitudes toward agrobiotechnology: The mediating role of risk perceptions on the impact of trust, awareness, and outrage. Applied Economic Perspectives and Policy, 26(2), 186-208.

Moore, R. L., & Moschis, G. P. (1983). Role of mass media and the family in development of consumption norms. Journalism Quarterly, 60(1), 67-73.

Morren, M., Mol, J.M., Blasch, J.E. and Malek, Ž., 2021. Changing diets-Testing the impact of knowledge and information nudges on sustainable dietary choices. *Journal of Environmental Psychology*, *75*, p.101610.

Mostafa, M. M. (2007). Gender differences in Egyptian consumers' green purchase behaviour: the effects of environmental knowledge, concern and attitude. *International journal of consumer studies*, *31*(3), 220-229.

Mouchet, M. A., Lamarque, P., Martín-López, B., Crouzat, E., Gos, P., Byczek, C., & Lavorel, S. (2014). An interdisciplinary methodological guide for quantifying associations between ecosystem services. *Global environmental change*, *28*, 298-308.

Munksgaard, J., Pedersen, K. A., & Wien, M. (2000). Impact of household consumption on

CO2 emissions. Energy economics, 22(4), 423-440.

Munksgaard, J., Pedersen, K. A., & Wien, M. (2000). Impact of household consumption on CO2 emissions. Energy economics, 22(4), 423-440.

Nair, S. R., & Little, V. J. (2016). Context, culture and green consumption: a new framework. Journal of international consumer marketing, 28(3), 169-184.

Nassauer, J.I. Care and stewardship: From home to planet. Landsc. *Urban Plan*. 2011, 100, 321–323.

Navrátilová, B. 2021. Pět klimatických scénářů: Zemi čekají nenávratné změny, pouze jeden může naplnit Pařížskou dohodu. Irozhlas. Praha 19:00 10. srpna 2021. Available from https://www.irozhlas.cz/veda-technologie/priroda/ipcc-osn-panel-klimaticka-zmena-globalni-oteplovani-emise-sklenikove-plyny_2108101900_ban Accesed 25.10.2022

Nawaz, M. A., Mesnage, R., Tsatsakis, A. M., Golokhvast, K. S., Yang, S. H., Antoniou, M. N., & Chung, G. (2019). Addressing concerns over the fate of DNA derived from genetically modified food in the human body: A review. Food and Chemical Toxicology, 124, 423-430.

Nekmahmud, M., Naz, F., Ramkissoon, H., & Fekete-Farkas, M. (2022b). Transforming consumers' intention to purchase green products: Role of social media. *Technological Forecasting and Social Change*, 185, 122067.

Nekmahmud, M., Ramkissoon, H., & Fekete-Farkas, M. (2022a). Green purchase and sustainable consumption: A comparative study between European and non-European tourists. *Tourism Management Perspectives*, 43, 100980.

Nelson, P. (1970). Information and consumer behavior. *Journal of political economy*, *78*(2), 311-329.

Nenckova, L., Pecáková, I., & Šauer, P. (2020). Disposal behaviour of Czech consumers towards textile products. *Waste management*, *106*, 71-76.

Nixon, H., Saphores, J. D. M., Ogunseitan, O. A., & Shapiro, A. A. (2009). Understanding preferences for recycling electronic waste in California: The influence of environmental attitudes and beliefs on willingness to pay. Environment and Behavior, 41(1), 101-124.

Nunes, L. J. R., Matias, J. C., & Catalao, J. P. (2016). Wood pellets as a sustainable energy alternative in Portugal. *Renewable Energy*, *85*, 1011-1016.

Oshiro, K., Kainuma, M., & Masui, T. (2017). Implications of Japan's 2030 target for long-term low emission pathways. *Energy Policy*, *110*, 581-587.

Ozkok, G. A. (2015). Genetically modified foods and the probable risks on human health. International Journal of Nutritional Food Science 4(3), 356-363.

Panda, T. K., Kumar, A., Jakhar, S., Luthra, S., Garza-Reyes, J. A., Kazancoglu, I., & Nayak, S. S. (2020). Social and environmental sustainability model on consumers' altruism, green purchase intention, green brand loyalty and evangelism. *Journal of Cleaner production*, *243*, 118575.

Pangarkar, A., Shukla, P., & Charles, R. (2021). Minimalism in consumption: A typology and brand engagement strategies. Journal of business research, 127, 167-178.

Pavlovič, L. 2020. Jak může každý z nás zabránit klimatické změně. Greenpeace. 20 listopadu, 2020, https://secure.gravatar.com/avatar/a45d54a16b4943740cbe5b7d2e3f9c39?s=96&d=mm&r=g Accessed 25.10.2022

Pearce, D. K. (2019). Information, Expectations, and Foreign Exchange Market Efficiency1. In *International Financial Markets and Agricultural Trade* (pp. 214-270). CRC Press.

Pearce, W., Niederer, S., Özkula, S. M., & Sánchez Querubín, N. (2019). The social media life of climate change: Platforms, publics, and future imaginaries. *Wiley interdisciplinary reviews: Climate change*, 10(2), e569.

Peattie, K. (2010). Green consumption: behavior and norms. Annual review of environment and resources, 35, 195-228.

Pedersen, E. R., & Neergaard, P. (2006). Caveat emptor–let the buyer beware! Environmental labelling and the limitations of 'green'consumerism. Business strategy and the Environment, 15(1), 15-29.

Pellegrinelli, C., Parolin, L. L., & Castagna, M. (2022). The aesthetic dimension of care. *Organizational Aesthetics*, 11(1), 180-198

Pepper, M., Jackson, T., & Uzzell, D. (2009). An examination of the values that motivate socially conscious and frugal consumer behaviours. International journal of consumer studies, 33(2), 126-136.

Qaim, M. (2020). Role of new plant breeding technologies for food security and sustainable agricultural development. Applied Economic Perspectives and Policy, 42(2), 129-150.

Ramkissoon, H. (2023). Perceived social impacts of tourism and quality-of-life: A new conceptual model. *Journal of Sustainable Tourism*, 31(2), 442-459.

Ramkissoon, H. R., & Smith, L. D. G. (2014). The relationship between environmental worldviews, emotions and personal efficacy in climate change. International Journal of Arts & Sciences, 7(1), 93.

Rangan, A. M., Ratner, D., & Hemphill, L. (2013). Food miles and the relative climate impacts of food choices in the United States. Frontiers in Nutrition, 1, 10.

Rasch, R.; McCaffrey, S. Exploring Wildfire-Prone Community Trust in Wildfire Management Agencies. *For. Sci*. 2019, 65, 652–663.

Reid, W. V., Mooney, H. A., Cropper, A., Capistrano, D., Carpenter, S. R., Chopra, K., ... & Zurek, M. B. (2005). *Ecosystems and human well-being-Synthesis: A report of the Millennium Ecosystem Assessment*. Island Press.

Rihn, A., Khachatryan, H., & Wei, X. (2021). Perceived subjective versus objective knowledge: Consumer valuation of genetically modified certification on food producing plants. Plos one, 16(8), e0255406.

Rizqiyana, I., & Wahyono, W. (2020). The influence of eco-brand, eco-labelling and environmental advertisement on consumer purchasing behavior through Brand image. *Management Analysis Journal*, 9(2), 211-220.

Robinson, R., & Smith, C. (2002). Psychosocial and demographic variables associated with consumer intention to purchase sustainably produced foods as defined by the Midwest Food Alliance. Journal of nutrition education and behavior, 34(6), 316-325.

Rustam, A., Wang, Y., & Zameer, H. (2020). Environmental awareness, firm sustainability exposure and green consumption behaviors. Journal of Cleaner Production, 268, 122016.

Ryghaug, M., Holtan Sørensen, K., & Næss, R. (2011). Making sense of global warming: Norwegians appropriating knowledge of anthropogenic climate change. *Public Understanding of Science*, 20(6), 778-795.

Sahakian, M., & Seyfang, G. (2018). A sustainable consumption teaching review: From building competencies to transformative learning. *Journal of cleaner production*, *198*, 231-241.

Sajn, Nikolina (2020). Sustainable consumption: Helping consumers make eco-friendly choices. EPRS | European Parliamentary Research Service. Available at

https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/659295/EPRS_BRI(2020)659295_EN.pdf Accessed 21.10.2022

Samkange, F., Ramkissoon, H., Chipumuro, J., Wanyama, H., & Chawla, G. (2021). Innovative and sustainable food production and food consumption entrepreneurship: A conceptual recipe for delivering development success in South Africa. *Sustainability*, 13(19), 11049.

Saraiva, A., Fernandes, E., & von Schwedler, M. (2021). The pro-environmental consumer discourse: A political perspective on organic food consumption. International Journal of Consumer Studies, 45(2), 188-204.

Scott, A., Carter, C., Brown, K., & White, V. (2009). 'Seeing is not everything': exploring the landscape experiences of different publics. *Landscape research*, *34*(4), 397-424.

Schäfer, M. S., & Painter, J. (2021). Climate journalism in a changing media ecosystem: Assessing the production of climate change-related news around the world. Wiley Interdisciplinary Reviews: Climate Change, 12(1), e675.

Schirpke, U., Candiago, S., Vigl, L. E., Jäger, H., Labadini, A., Marsoner, T., ... & Tappeiner, U. (2019). Integrating supply, flow and demand to enhance the understanding of interactions among multiple ecosystem services. *Science of the Total Environment*, *651*, 928-941

Schmidt, A., Ivanova, A., & Schäfer, M. S. (2013). Media attention for climate change around the world: A comparative analysis of newspaper coverage in 27 countries. *Global Environmental Change*, 23(5), 1233-1248.

Schwartz, D., Loewenstein, G., & Agüero-Gaete, L. (2020). Encouraging pro-environmental behaviour through green identity labelling. *Nature Sustainability*, 3(9), 746-752.

Scialabba, N. E. H., & Müller-Lindenlauf, M. (2010). Organic agriculture and climate change. *Renewable agriculture and food systems*, 25(2), 158-169.

Shao, J., & Ünal, E. (2019). What do consumers value more in green purchasing? Assessing the sustainability practices from demand side of business. *Journal of Cleaner Production*, *209*, 1473-1483.

Sharma, N., Saha, R., Sreedharan, V. R., & Paul, J. (2020). Relating the role of green self-concepts and identity on green purchasing behaviour: An empirical analysis. Business Strategy and the Environment, 29(8), 3203-3219.

Shen, M., & Wang, J. (2022). The impact of pro-environmental awareness components on green consumption behavior: the moderation effect of consumer perceived cost, policy incentives, and face culture. Frontiers in Psychology, 13.

Shtulman, A., Share, I., Silber-Marker, R., & Landrum, A. R. (2020). OMG GMO! Parent-child conversations about genetically modified foods. Cognitive Development, 55, 100895.

Sikora, D., & Rzymski, P. (2021). Public acceptance of GM foods: a global perspective (1999–2019). Policy Issues in Genetically Modified Crops, 293-315.

Sivapalan, A., von der Heidt, T., Scherrer, P., & Sorwar, G. (2021). A consumer values-based approach to enhancing green consumption. Sustainable Production and Consumption, 28, 699-715.

Skovgaard, J. (2014). EU climate policy after the crisis. Environmental Politics, 23(1), 1-17.

Smith, M., Colbry, S., & Bienenstock, J. (2017). The impact of a community garden on fruit and vegetable intake: A randomized controlled trial. *Preventive Medicine Reports*, 5, 136-141.

Smyth, S. J., McHughen, A., Entine, J., Kershen, D., Ramage, C., & Parrott, W. (2021). Removing politics from innovations that improve food security. Transgenic research, 30, 601-612.

Sociologický ústav. Akademie věd ČR. 2021. Centrum pro výzkum veřejného mínění. Naše společnost 2021 - červenec [datový soubor] [online]. Ver. 1.0. Praha: Český sociálněvědní datový archiv, 2021 [Accesed 27.10.2022]. DOI 10.14473/V2107

Sociologicky ústav (2022) (Akademie věd ČR). Centrum pro výzkum veřejného mínění Potraviny 2021 [dataset]. Ver. 1.0. Praha: Český sociálněvědní datový archiv. Cited 6.6.2023 DOI 10.14473/CSDA00294

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of environmental psychology*, *29*(3), 309-317.

Steinfeld, H., Gerber, P., Wassenaar, T., Castel, V., Rosales, M., & de Haan, C. (2006). Livestock's long shadow: Environmental issues and options. Food and Agriculture Organization of the United Nations.

Stern, D. I., & Kaufmann, R. K. (2014). Anthropogenic and natural causes of climate change. *Climatic change*, *122*(1), 257-269.

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. Journal of social issues, 56(3), 407-424.

Streiffer, R., & Hedemann, T. (2005). The political import of intrinsic objections to genetically engineered food. Journal of Agricultural and Environmental Ethics, 18, 191-210.

Suciu, N. A., Ferrari, F., & Trevisan, M. (2019). Organic and conventional food: Comparison and future research. Trends in Food Science & Technology, 84, 49-51.

Sulaiman, C., Abdul-Rahim, A. S., & Ofozor, C. A. (2020). Does wood biomass energy use reduce CO2 emissions in European Union member countries? Evidence from 27 members. *Journal of Cleaner Production*, *253*, 119996.

Švajlenka, J., & Kozlovská, M. (2018). Houses based on wood as an ecological and sustainable housing alternative—Case study. *Sustainability*, *10*(5), 1502.

Tang, C., Han, Y., & Ng, P. (2022). Green consumption intention and behavior of tourists in urban and rural destinations. Journal of Environmental Planning and Management, 1-25.

Taylor, L. D., & Houthakker, H. S. (2009). *Consumer demand in the United States: Prices, income, and consumption behavior*. Springer Science & Business Media.

Teo, T. S., & Yeong, Y. D. (2003). Assessing the consumer decision process in the digital marketplace. *Omega*, *31*(5), 349-363.

Testa, F., Iraldo, F., Vaccari, A., & Ferrari, E. (2015). Why eco-labels can be effective marketing tools: Evidence from a study on Italian consumers. *Business Strategy and the Environment*, *24*(4), 252-265.

Trivedi, R. H., Patel, J. D., & Acharya, N. (2018). Causality analysis of media influence on environmental attitude, intention and behaviors leading to green purchasing. *Journal of cleaner production*, *196*, 11-22.

Trudel, R. (2019). Sustainable consumer behavior. *Consumer psychology review*, *2*(1), 85-96.

Trunečková, D. (2015). Reprezentace problému klimatických změn v tištěných médiích. (Representation of the problem of climate change in the print media). Charles University in Prague, Czech Republic. Available from https://dspace.cuni.cz/bitstream/handle/20.500.11956/67344/120177590.pdf?sequence=1&isAllowed=y Accesed 25.10.2022

Tsatsakis, A. M., Nawaz, M. A., Tutelyan, V. A., Golokhvast, K. S., Kalantzi, O. I., Chung, D. H., ... & Chung, G. (2017). Impact on environment, ecosystem, diversity and health from culturing and using GMOs as feed and food. Food and Chemical Toxicology, 107, 108-121.

Turner, K. G., Odgaard, M. V., Bøcher, P. K., Dalgaard, T., & Svenning, J. C. (2014). Bundling ecosystem services in Denmark: Trade-offs and synergies in a cultural landscape. *Landscape and Urban Planning*, *125*, 89-104.

Turnheim, B., & Geels, F. W. (2013). The destabilisation of existing regimes: Confronting a multi-dimensional framework with a case study of the British coal industry (1913–1967). *Research Policy*, *42*(10), 1749-1767.

Valle, P. O. D., Rebelo, E., Reis, E., & Menezes, J. (2005). Combining behavioral theories to predict recycling involvement. *Environment and behavior*, *37*(3), 364-396.

Van Dam, Y. K., & Apeldoorn, P. A. (1996). Sustainable marketing. Journal of macromarketing, 16(2), 45-56.

Van Huis, A., Van Itterbeeck, J., Klunder, H., Mertens, E., Halloran, A., Muir, G., & Vantomme, P. (2013). *Edible Insects: Future prospects for food and feed security*. Rome: Food and Agriculture Organization of the United Nations. Natural Resources, University of California.

Van Foreest, F. (2012). *Perspectives for biogas in Europe*. Oxford Institute for Energy Studies. Oxford. 54.p.

Vaske, J.J.; Absher, J.D.; Bright, A.D. Salient value similarity, socialtrust and attitudes toward wildland fire management strategies. *Hum. Ecol. Rev*. 2007, 14, 223–232.

Vassanadumrongdee, S., & Kittipongvises, S. (2018). Factors influencing source separation intention and willingness to pay for improving waste management in Bangkok, Thailand. *Sustainable Environment Research*, *28*(2), 90-99.

Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer "attitude–behavioral intention" gap. Journal of Agricultural and Environmental ethics, 19, 169-194.

Vilella-Vila, M., Costa-Font, J., & Mossialos, E. (2005). Consumer involvement and acceptance of biotechnology in the European Union: a specific focus on Spain and the UK. International Journal of Consumer Studies, 29(2), 108-118.

Vita, G., Lundström, J. R., Hertwich, E. G., Quist, J., Ivanova, D., Stadler, K., & Wood, R. (2019). The environmental impact of green consumption and sufficiency lifestyles scenarios in Europe: connecting local sustainability visions to global consequences. Ecological economics, 164, 106322.

Wagdi, O., AFIFY, A. S., & Habib, A. F. (2022). The impact of social media marketing activities on green consumption intention: evidence from emerging countries. Entrepreneurship and Sustainability Issues, 10(1).

Walia, S. B., Kumar, H., & Negi, N. (2020). Impact of socio-demographics on consumers' attitude and purchase intention towards 'eco-friendly'products. International Journal of technology management & sustainable development, 19(3), 361-371.

Wan, C., Shen, G. Q., & Yu, A. (2015). Key determinants of willingness to support policy measures on recycling: A case study in Hong Kong. *Environmental Science & Policy*, *54*, 409-418.

Wang, J., Shen, M., & Chu, M. (2021). Why is green consumption easier said than done? Exploring the green consumption attitude-intention gap in China with behavioral reasoning theory. Cleaner and Responsible Consumption, 2, 100015.

Wang, L., Zhang, G., Shi, P., Lu, X., & Song, F. (2019). Influence of awe on green consumption: the mediating effect of psychological ownership. Frontiers in psychology, 10, 2484.

Wang, Y., Li, Y., Zhang, J., & Su, X. (2019). How impacting factors affect Chinese green purchasing behavior based on Fuzzy Cognitive Maps. *Journal of Cleaner Production*, *240*, 118199.

Wagdi, O., AFIFY, A. S., & Habib, A. F. (2022). The impact of social media marketing activities on green consumption intention: evidence from emerging countries. Entrepreneurship and Sustainability Issues, 10(1).

Wojnarowska, M., Sołtysik, M., & Prusak, A. (2021). Impact of eco-labelling on the implementation of sustainable production and consumption. *Environmental Impact Assessment Review*, 86, 106505.

Weber, C. L., & Matthews, H. S. (2008). Food-miles and the relative climate impacts of food choices in the United States. Environmental Science & Technology, 42(10), 3508-3513.

Weber, E. U., & Stern, P. C. (2011). Public understanding of climate change in the United States. *American Psychologist*, *66*(4), 315.

Welfens, M. J., Nordmann, J., & Seibt, A. (2016). Drivers and barriers to return and recycling of mobile phones. Case studies of communication and collection campaigns. *Journal of cleaner production*, *132*, 108-121.

Wiedenhofer, D., Guan, D., Liu, Z., Meng, J., Zhang, N., & Wei, Y. M. (2017). Unequal household carbon footprints in China. Nature Climate Change, 7(1), 75-80.

Wijekoon, R., & Sabri, M. F. (2021). Determinants that influence green product purchase intention and behavior: A literature review and guiding framework. Sustainability, 13(11), 6219.

Williams, H. T., McMurray, J. R., Kurz, T., & Lambert, F. H. (2015). Network analysis reveals open forums and echo chambers in social media discussions of climate change. *Global environmental change*, 32, 126-138.

Willnat, L., & Weaver, D. H. (2018). Social media and US journalists: Uses and perceived effects on perceived norms and values. Digital Journalism, 6(7), 889-909.

Witek, L. (2019). Attitude-behaviour gap among Polish consumers regarding green purchases. Visegrad Journal on Bioeconomy and Sustainable Development, 8(1), 31-36.

Woersdorfer, J. S. (2017). The Evolution of Household Technology and Consumer Behavior, 1800-2000. Taylor & Francis.

Wynveen, C. J., & Sutton, S. G. (2015). Engaging the public in climate change-related pro-environmental behaviors to protect coral reefs: The role of public trust in the management agency. *Marine Policy*, *53*, 131-140.

Xu, L., Ling, M., Lu, Y., & Shen, M. (2017). External influences on forming residents' waste separation behaviour: Evidence from households in Hangzhou, China. *Habitat International*, *63*, 21-33.

Xu, S., Chu, C., Zhang, Y., Ye, D., Wang, Y., & Ju, M. (2018). Entangled stakeholder roles and perceptions of sustainable consumption: An evaluation of sustainable consumption practices in Tianjin, China. *Journal of environmental management*, *223*, 841-848.

Yang, L., Wu, Y., Yang, F., Wu, X., Cai, Y., & Zhang, J. (2021). A wood textile fiber made from natural wood. *Journal of Materials Science*, *56*(27), 15122-15133.

Yue, B., Sheng, G., She, S., & Xu, J. (2020). Impact of consumer environmental responsibility on green consumption behavior in China: The role of environmental concern and price sensitivity. Sustainability, 12(5), 2074.

Zafar, A. U., Shen, J., Ashfaq, M., & Shahzad, M. (2021). Social media and sustainable purchasing attitude: Role of trust in social media and environmental effectiveness. *Journal of Retailing and Consumer Services*, 63, 102751.

Zhang, C., Wohlhueter, R., & Zhang, H. (2016). Genetically modified foods: A critical review of their promise and problems. Food Science and Human Wellness, 5(3), 116-123.

Zheng, Q., & Wang, H. H. (2021). Do consumers view the genetically modified food labeling systems differently?“Contains GMO” versus “Non-GMO” labels. The Chinese Economy, 54(6), 376-388.

Zhu, L., Dang, B., Zhang, K., Zhang, J., Zheng, M., Zhang, N., ... & Zheng, R. (2022). Transparent Bioplastics from Super-Low Lignin Wood with Abundant Hydrophobic Cellulose Crystals. *ACS Sustainable Chemistry & Engineering*, *10*(41), 13775-13785.

Zube, E. H. (1987). Perceived land use patterns and landscape values. *Landscape ecology*, 1, 37-45.

Zube, E. H. Sell, James L., J., Taylor, G. (1982): Landscape perception: Research, application and theory, *Landscape Planning*, Volume 9, Issue 1, 1-33.

Zukin, S., & Maguire, J. S. (2004). Consumers and consumption. Annu. Rev. Sociol., 30, 173-197.

Abraham, C., & Sheeran, P. (2015). The health belief model. Predicting health behaviour: Research and practice with social cognition models, 2, 30-55.

Maiman, L. A., & Becker, M. H. (1974). The health belief model: Origins and correlates in psychological theory. Health education monographs, 2(4), 336-353.

16. List of Tables