UNIVERSIDADE CATÓLICA PORTUGUESA

ENERGY SAVINGS BEHAVIOR IN THE CONTEXT OF THE ENERGY CRISIS IN GERMANY – EXPLORING THE INFLUENCE OF SELF-EFFICACY AND SUBJECTIVE KNOWLEDGE

Dissertation presented to Universidade Católica Portuguesa
to obtain a Master's Degree
in Psychology in Business and Economics

By

Lara Dinkel

Faculty of Human Sciences

January 2024

UNIVERSIDADE CATÓLICA PORTUGUESA

ENERGY SAVINGS BEHAVIOR IN THE CONTEXT OF THE ENERGY CRISIS IN GERMANY – EXPLORING THE INFLUENCE OF SELF-EFFICACY AND SUBJECTIVE KNOWLEDGE

Dissertation presented to Universidade Católica Portuguesa
to obtain a Master's Degree
in Psychology in Business and Economics

By

Lara Dinkel

Faculty of Human Sciences

Under the supervision of Professor Filipa de Almeida

January 2024

Abstract

Title: *Energy Savings Behavior in the Context of the Energy Crisis in Germany – Exploring the Influence of Self-Efficacy and Subjective Knowledge*

Author: *Lara Dinkel*

The European energy crisis of 2021/2022 caused by gas shortages and demand surges had a massive impact on Germany's economy and forced the country to rethink its energy policy, improve its energy security situation, and address the underlying weaknesses exposed by these times. Reduced households' energy consumption significantly contributes to mitigating this crisis which highlights the need to promote their energy savings behavior by stimulating its influencing factors. This thesis aims to close a research gap and examine the influence of crisis self-efficacy (CSE) and subjective crisis knowledge (SCK) on energy savings behavior (ESB) in a post-crisis context at home, using two validated instruments by Park (2016) and Flynn and Goldsmith (1999). Data was collected in December 2023 from the population of German households through an online survey which resulted in a valid sample of 394 participants. Subsequent data analysis using SPSS (v. 29.0) and SPSS AMOS (v. 26.0) for structural equation modeling to test the hypotheses revealed that both CSE and SCK have a direct and significant positive effect on ESB. Additionally, the relationship between SCK and ESB is partially mediated by CSE, thus also indicating an indirect effect between the two variables, meaning that higher levels of SCK and CSE not only independently but also in combination increase ESB. The results suggest that individual assessments of knowledge and capabilities are decisive when it comes to exhibiting relevant measures for crisis mitigation and prevention. Therefore, the findings lead to several recommendations for effective policymaking and overall crisis management making use of the gained insights on factors influencing energy savings during and after a crisis.

Keywords: *European energy crisis, energy crisis 2021/2022, energy consumption behavior, energy savings behavior, crisis self-efficacy, subjective crisis knowledge, environmental psychology, crisis response, crisis policymaking*

Resumo

Título: *Comportamento de Poupança de Energia no Contexto da Crise Energética na Alemanha - Explorando a Influência da Auto-Eficácia e do Conhecimento Subjetivo*

Autor: *Lara Dinkel*

A crise energética europeia de 2021/2022, causada pela escassez de gás e pelos picos de procura, teve um enorme impacto na economia alemã e obrigou o país a repensar a sua política energética, a melhorar a sua situação em termos de segurança energética e a resolver as fragilidades subjacentes expostas por estes tempos. A redução do consumo de energia dos agregados familiares contribui significativamente para atenuar esta crise, o que realça a necessidade de promover o seu comportamento de poupança de energia, estimulando os seus factores de influência. Esta tese tem como objetivo colmatar uma lacuna de investigação e examinar a influência da autoeficácia de crise (CSE) e do conhecimento subjetivo de crise (SCK) no comportamento de poupança de energia (ESB) num contexto de pós-crise em casa, utilizando dois instrumentos validados por Park (2016) e Flynn e Goldsmith (1999). Os dados foram recolhidos em dezembro de 2023 junto da população de agregados familiares alemães através de um inquérito online que resultou numa amostra válida de 394 participantes. A análise subsequente dos dados utilizando o SPSS (v. 29.0) e o SPSS AMOS (v. 26.0) para a modelação de equações estruturais para testar as hipóteses revelou que tanto a CSE como a SCK têm um efeito positivo direto e significativo na ESB. Além disso, a relação entre a CSC e a CSE é parcialmente mediada pela CSE, indicando assim também um efeito indireto entre as duas variáveis, o que significa que níveis mais elevados de CSC e CSE, não só de forma independente mas também em combinação, aumentam a CSE. Os resultados sugerem que as avaliações individuais de conhecimentos e capacidades são decisivas quando se trata de adotar medidas relevantes para a atenuação e prevenção de crises. Por conseguinte, os resultados conduzem a várias recomendações para a elaboração de políticas eficazes e para a gestão global de crises, utilizando os conhecimentos adquiridos sobre os factores que influenciam a poupança de energia durante e após uma crise.

Palavras-chave: *crise energética Europeia, crise energética 2021/2022, comportamento de consumo de energia, comportamento de poupança de energia, auto-eficácia em caso de crise, conhecimento subjetivo da crise, psicologia ambiental, resposta à crise, elaboração de políticas em caso de crise*

Table of Contents

List of Figures

List of Tables

Introduction – On the Energy Crisis in Germany

Germany has recently faced a phase of turbulence, marked by a series of challenges that have tested the country's resilience and resolve. The worldwide COVID-19 pandemic, the Russian invasion of Ukraine, and the resulting European energy crisis have significantly threatened Germany's economic stability, social cohesion, and environmental goals. However, particularly the energy crisis that hit Germany by the end of 2021 and especially in 2022 following the pandemic, served as a stark reminder of the country's vulnerability to risks around energy security, affordability, and dependence. Ultimately, all these events have forced the country to rethink its energy policy, improve its energy security situation, and address the underlying weaknesses exposed by these times.

Prior to 2022, Germany had been heavily reliant on Russian natural gas, accounting for roughly 40% of its imports (IEA, 2022). However, this dependence became a concern when Russia began first reducing, and then halting gas deliveries entirely. The reduced gas supply combined with an increased energy demand due to the economic recovery after the COVID-19 pandemic led to skyrocketing energy prices, with wholesale gas prices reaching record highs (Gilbert et al., 2021).

In the first place, next to the overall energy security risks, the energy crisis posed significant difficulties for Germany's economy. High energy costs weighed heavily on industrial production, leading to factory closures and job losses (Chen et al., 2023; Stern, 2022). As a result, especially households were affected by the energy crisis, having to deal with considerable increases in costs for heating and electricity use as shown in Figure 1 (Zander et al., 2024), as well as fuel for vehicles, accompanied by an overall high inflation rate, as shown in Figure 2 (Statista Research Department, 2024; Rudnicka, 2024). Many families struggled to afford their heating and electricity bills in addition to experiencing a decline in their purchasing power, leading to concerns about energy poverty (Hussain et al., 2023).

Moreover, the renewed reliance on coal-fired power plants to compensate for the reduced natural gas supply resulted in increased greenhouse gas emissions, which posed a threat to Germany’s climate goals and energy transition aiming to achieve climate neutrality by 2045 (IEA, 2023; Zakeri, 2022). As part of the efforts to reduce the country’s reliance on fossil fuels, the government decided to bring forward the ban on new oil and gas boilers from 2024, leading to further strain on households (Chazan, 2023).

Figure 1. *Gas & electricity price development in Germany from 2021 to 2023*

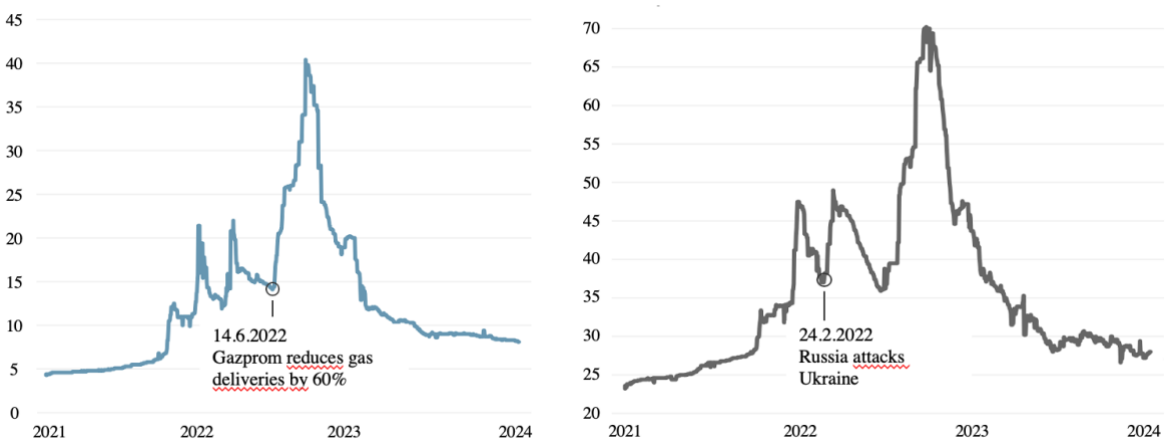
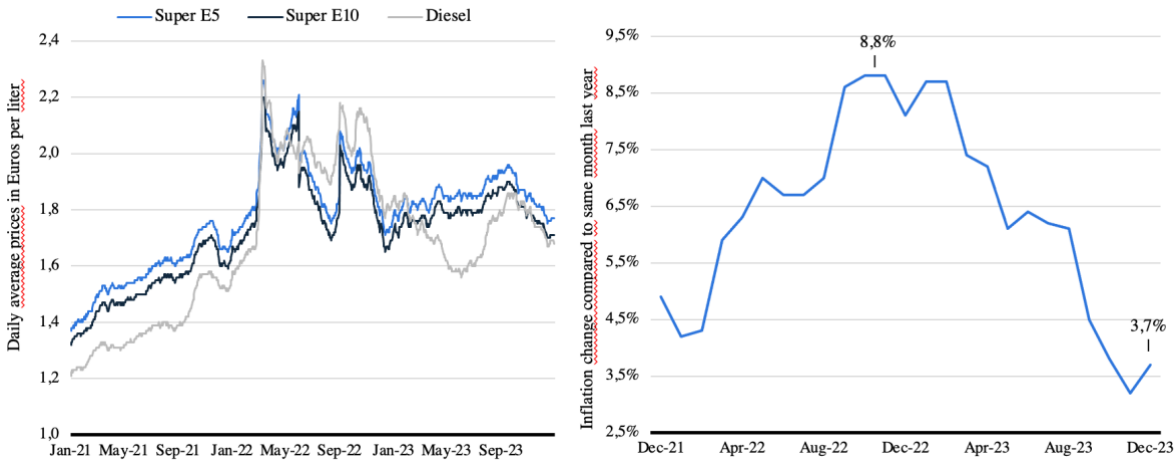


Figure 2. *Fuel price & inflation rate development in Germany from 2021 to 2023*



Although the government implemented several measures to alleviate the burden on German citizens, including subsidies and price caps, these efforts only provided temporary relief. In 2023, the consequences of the crisis were still present, especially after the end of all financial aid for households, the continued elevated prices, and the uncertainty about securing sufficient and affordable energy for the upcoming winter (Chen, 2023; Tagesspiegel, 2023).

All in all, dealing with the effects of the European energy crisis and recognizing its lessons gained the utmost importance for Germany. Since households are responsible for an average of 25% of the nation's energy (gas and electricity) consumption (IEA., 2023), it is important not only to support them financially but above all to better understand and

promote their energy savings behavior. The aim during energy crises is to mitigate an acute state of crisis and prevent its recurrence after the crisis by both means, tailored government policies and compliance with and support for these policies by households (Werfel, 2017; OECD, 2023; Rausser et al., 2023). Reducing their energy consumption will not only help to contain the crisis but will also facilitate the transition to climate neutrality if the reductions are sustainable.

Even if the immediate crisis may have subsided, its long-term effects on energy consumption and savings behavior are still being experienced (Krapp, 2023; Rausser et al., 2023). Germany's chancellor Olaf Scholz states: "It is also clear (...) that we must not let up in overcoming the energy crisis under any circumstances. That would not be responsible and would jeopardize our future." (Scholz, 2023, November 28). Winter is yet again putting additional strain on energy supplies and potentially intensifying the effects of the energy crisis. It is therefore crucial to understand how households' consumption behavior has evolved in the face of past challenges, how they behave in times after the acute crisis, and how their self-perception could provide an approach to positively influence this behavior.

Research Aims and Question

So far, the majority of research on energy concerns focused on supply logistics and energy research, ignoring the human element, despite the fact that energy conflicts, environmental degradation, and climate change are growing global threats primarily mitigatable through societal change and adaptation. (Sovacool et al., 2021). As previously highlighted, behavioral changes are essential to preventing and managing energy shortages (Steg et al., 2015).

Investigations into the psychological foundations underlying the crisis responses that are important for resilience have scarcely been studied to date. Of the studies that have examined the psychological factors determining altered savings behavior, especially relating to energy conservation habits, the focus has been more on routine savings decisions than on crisis-driven behavior (Wang et al., 2014; Pothitou et al., 2016; Liu et al. 2021). Additionally, while energy-saving behavior can be readily observed during a crisis, it is unclear whether these effects persist beyond the state of short-term heightened distress and can be recalled in the event of a renewed crisis. (Rausser et al., 2023). Furthermore, none of the existing studies have focused on the case of Germany, as the single largest European economy and one,

which was impacted disproportionately due to high energy supplier dependence as well as a heavy export-driven industrial economy (Glunz & Prittwitz, 2024). Finally, and most importantly, there has been extensive research on self-efficacy and knowledge as predictors of behavior, however, no study has yet linked the construct of crisis self-efficacy or even general self-efficacy to energy savings behavior in an energy crisis context. And nothing has been done to examine their interplay and combined effect following prolonged crises (Wang et al., 2014; Pothitou et al., 2016; Tanveer at al., 2021).

Therefore, the present study seeks to close this research gap, by focusing on the factors that drive consumption decisions after the prolonged energy crisis in Germany and investigates the direct as well as the mediated effect of both self-efficacy and knowledge. In this regard, the present thesis will address the following research question:

How do the individual factors 'crisis self-efficacy' and 'subjective crisis knowledge' influence the energy-savings behavior within German households in the aftermath of the European energy crisis of 2021/2022 and what implications does this have for the country's policymaking and crisis management?

By measuring crisis individual levels of self-efficacy, subjective crisis knowledge, and general energy savings behavior, it is aimed to add to existing literature and shed light on how individuals perceived the crisis, their understanding of the situation, and their ability to make adjustments in their energy consumption behavior, especially post-crisis. Additionally, by assessing demographic aspects we gain a more holistic understanding of the factors influencing energy savings behavior in the context of an energy crisis. The findings have potential relevance in their utilization as a theoretical framework to explain and predict consumers' behaviors. In addition, practical implications can be developed for policymakers and general crisis management by uncovering psychological knowledge that could inform targeted interventions, laws, and programs to promote resilient and ecologically friendly energy-related responses.

Structure of the Thesis

Following this introduction, the subsequent parts of the thesis are structured as follows. In part I the current state of knowledge on the variables crisis self-efficacy (CSE) and subjective crisis knowledge (SCK) as determinants of household energy savings behavior (ESB) is presented and examined, to develop a grounding for the research framework and

hypotheses. Additionally, by reviewing existing articles and relevant research papers, it aims to gain a comprehensive understanding of the European energy crisis and how environmental psychology can be employed within energy research. Based on this, part II presents the research methodology to explain how the study empirically complements the previously conducted literature review in order to add new findings to the current state of knowledge. In doing so, the approaches of the quantitative research design, the data collection, and data analysis procedures are disclosed, and the instruments, measures, as well as the sampling strategy are explained in more detail. Subsequently, part III presents the Structural Equation Modeling approach and opens the room for a discussion of the results obtained. It is intended to provide insights on overall participant characteristics such as demographic information, next to the developed measurement model, structural model, the results of direct and partial mediation hypotheses testing, and additional correlation analyses. Lastly, part IV evaluates and interprets the results obtained relating to the research question, and existing literature. As part of this, the significance of the findings will be explained and their implications and recommendations for savings behavior targeted interventions discussed, to then suggest possible areas for future energy research.

Part I: Literature Review

Energy Crises

The term ‘energy crisis’ refers to a severe disruption or shortage in the availability of key energy resources like oil, gas, coal, and electricity that critically impairs a region's economic and social functioning (Garrison, 1981). In this regard, energy crises most commonly occur when energy demand chronically surpasses available supply, triggered by geopolitical conflicts, natural disasters, changes in government policy, market dynamics, steadily increased energy consumption across the economy, or unexpected crashes in domestic energy production capacities, and they are typically marked by escalated prices for energy resources such as oil, gas, and electricity (Zhao, 2019; Lynch & Russel, 1983).

However, the consequences of energy crises are much more far-reaching, impacting not just the availability and cost of energy, but also having broader economic and social effects. Economic impacts can include inflation, reduced industrial production or even shutdowns, and financial instability, which in turn can lead to job losses and a decline in living standards (Zakeri et al., 2022). On a social level, energy crises can exacerbate inequalities and cause public discontent, as energy accounts for an increasing share of household expenses (Bacigalupe & Escolar-Pujolar, 2014). Furthermore, energy crises can have significant environmental implications because the search for alternative energy sources in response to past crises has led to increased interest and investment in renewable energy technologies (Dabija, 2021). Yet in energy crises, the exploitation of remaining fossil fuel reserves is a short-term solution that can exacerbate environmental degradation and climate change (Wilkinson et al., 2007).

When looking closer at the socioeconomic effects, prolonged states of energy insecurity therefore directly threaten the attainment of sustainable development goals in areas such as poverty reduction, public health, resilient infrastructure, and climate change mitigation, which essentially depend on affordable and reliable access to electricity and heating or cooling fuels for the population (Sovacool, 2012).

Especially nowadays, our modern societies are highly dependent on reliable access to affordable energy resources in order to supply households, businesses, industries, and transportation networks with gas and electricity (Chu & Majumdar, 2012). However, the finite reserves of fossil fuels and the vulnerability of centralized energy infrastructure mean

that energy crises can occur suddenly and unexpectedly, unpredictably leading to short or long-term supply shortages (Mccabe, 1998). For this reason, the consideration of all underlying causes, the socioeconomic implications across industries and income groups, the cascading environmental impacts, as well as the historical case studies of major energy crises, such as the recent European energy crisis is crucial for contextualizing the behavioral responses they elicit in individuals when it comes to crisis coping and mitigation.

Development and Consequences of the Energy Crisis in Germany

Specifically in Europe, an energy crisis emerged in 2021 after the COVID-19 period. The rapid economic upturn following the pandemic led to surpassing the energy supply and thus resulted in shortages and rising prices in the oil, gas, and electricity markets (Gilbert et al., 2021). Due to a reliance on Russian natural gas imports that cover almost 40% of Europe's total gas consumption and around 45% of its total imports before the start of the crisis, the energy crisis intensified and peaked during the Russian-Ukrainian war in 2022 (IEA, 2022). Especially Germany uses around 55% of Russian natural gas for its industry, as well as household heating, electricity, and fuel generation (Oltermann, 2022; Mannhardt et al., 2023). This import dependence made Germany vulnerable to external supply shocks and market manipulations.

Already in 2014, when Russia annexed Crimea, a part of Ukraine, severe tensions and conflicts between the two countries were triggered, which in turn led the European Union and other Western states to jointly impose economic sanctions against Russia (Abely, 2023). These sanctions included restrictions on technology transfer, access to capital markets, and the export of certain goods and services to Russia and thus particularly targeted its energy sector, which represents a significant source of revenue for the country (Giumelli et al., 2020). Consequently, long-term supply contracts with individual countries and companies were terminated from the Russian side, often without clear reasons. In addition, the 2022 Russian invasion of Ukraine fostered an acute energy crisis through further reductions of gas flows to Europe and thus to Germany and spiking prices across European energy markets which were already facing scarcity and inflationary issues in the post-COVID19 recovery (Abely, 2023). Following an initial delivery stop in July 2022 and a subsequent reduction in the delivery amount to 20%, at the end of August 2022, the Russian gas company Gazprom

decided not to fill its European gas storage facilities and completely stopped supplying the spot market (Tamme, 2022).

During the energy crisis, Russia was blamed for using its position as a major supplier to Europe to manipulate prices and leverage political influence. While experts argue the nation deliberately limited its gas exports to Europe to raise prices and increase its revenues, others pointed out that Russia itself faced supply and production issues due to maintenance problems and low levels of investment in the energy infrastructure (Surwillo, 2023). This latest crisis also follows previous disputes between Russia and Ukraine which led to several temporary disruptions of European gas supplies with Ukraine acting as a transition state, indicating recurring external threats to energy security (Surwillo, 2023). When considering the heightened geopolitical tensions in Europe, particularly between Russia and some European countries, Russia's role as a major supplier of natural gas to Europe has raised concerns about its ability to use energy supplies as a political tool and to exert influence over European politics and policies. Overall, this emphasizes the call for greater energy independence and greater diversification of energy sources in Europe, including the development of domestic energy sources and greater investment in renewable energy sources (Wolff & Gritz, 2023).

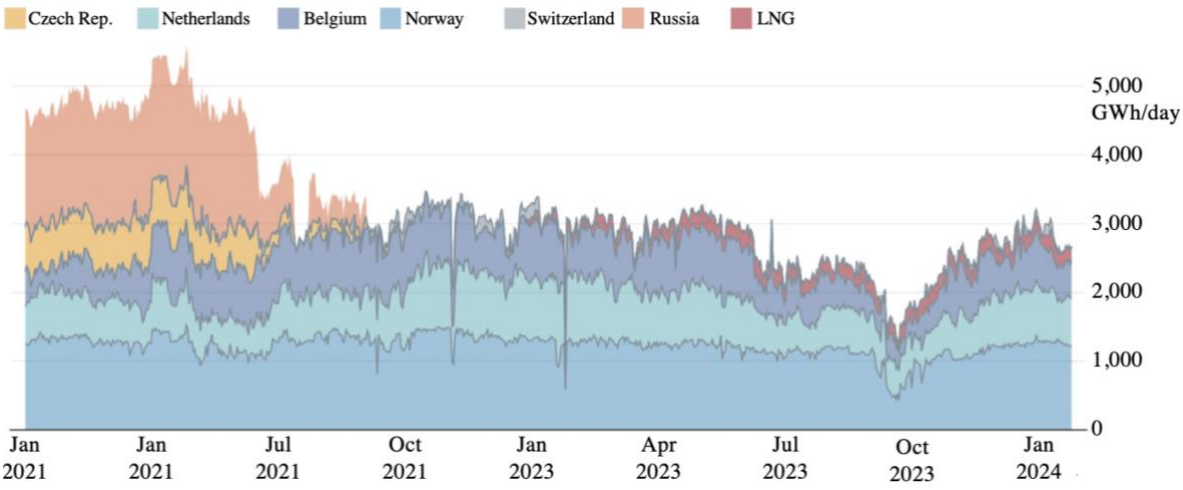
However, as another side effect, the European energy crisis has led to increased reliance on coal-fired power plants for electricity generation, to cover the supply deficits (IEA, 2023). To avoid further shortages during winter, the German government introduced the law to reactivate coal-fired power plants from October 2023 to March 2024, expecting this would curb the gas supply and spare natural gas reserves (Holly, 2022). As they are far more harmful to the environment than natural gas-fired systems, this could ultimately result in rising CO2 emissions in parts of Europe, which counteracts efforts to reduce greenhouse gas emissions and emphasizes the importance of implementing renewable energy sources becoming more prominent.

To summarize, although global demand for natural gas has increased worldwide after the pandemic driving up prices, the main influence on European gas prices, especially for Germany, has been lower gas supplies from Russia. In addition to the loss of affordable Russian gas, there was a drought-related decline in coal transportation on German rivers, which also hindered alternative energy generation (Höland., 2022). As a result, the skyrocketing energy prices threatened to close industry, spike household costs of living,

and cause potential blackouts during winter, and as such, not only unleashed an unprecedented economic and political, but also a social crisis throughout Germany (Gilbert et al., 2021; Abely, 2023; Kyllmann & Wettengel, 2022)

For this reason, it becomes obvious how appropriate demand response plays a major role in maintaining a well-running economy. Given Europe's long-term decline in domestic natural gas production, the continent has increasingly turned to liquefied natural gas (LNG) as a replacement that is easier to transport (Di Bella et al., 2022). In this course, Germany made several efforts to minimize its dependence on Russian gas supplies following the crisis, such as diversifying all energy suppliers by establishing natural gas from other European countries like Norway, the Netherlands, or Belgium, and LNG mainly from the United States (Srikandam et al.,2023; Bundesnetzagentur, 2023). Germany, for its part, has still not purchased any more Russian natural gas since the supply was stopped in August 2022 as shown in Figure 3 (Bundesnetzagentur, 2024).

Figure 3. *Gas imports to Germany per country from 2022 to 2023*



In addition, Germany has committed to reducing its dependence on fossil fuels and accelerating the transition to renewable energy sources. In this context, the decision to accelerate the ban on new fossil fuel boilers has caused controversy, with some arguing that it will lead to higher heating costs for households and businesses (Chazan, 2023).

When looking at the effects of the energy crisis at a microeconomic level, it becomes clear that households are particularly affected by the crisis. Since energy prices have risen sharply during the crisis and are still on an elevated level post the crisis, they continue to

suffer from loss of purchasing power, fuel poverty, and increased costs of living due to inflation in essential energy services (Chen, 2023; Szymańska et al., 2023). Around 75% of German households were heating their homes with gas (50%) or oil (25%) before the start of the crisis (Bundesministerium für Wirtschaft und Klimaschutz, 2019) which has forced many households to take measures to reduce their energy consumption in order to mitigate the drastic rise in heating costs (Szymańska et al., 2023). This has already led to a fear of energy insecurity and growing dissatisfaction with government practices, as well as a feeling of inadequate support and information sharing (MDR, 2022). According to a recent survey by the German consumer centre, 48% expect their situation as energy consumers to deteriorate over the next ten years (Tagesspiegel, 2023).

Considering the government's response to the direct consequences for German households, several financial support measures called “Relieving packages 1, 2, & 3” have already been implemented to relieve their cost load (Bundesfinanzministerium, 2022; Bundesregierung, 2024). Their most important points include:

- One-time energy subsidy of 100 to 300€ depending on employment status
- Reduction of energy tax on fuels for three months from June to August 2022
- Public transport cost reduction in the period from June to August 2022
- One-time heating subsidy of around 200 to 300€ depending on household size and employment status
- Supporting the installation of photovoltaic systems by eliminating VAT
- EEG (Renewable Energies Act) levy is no longer applicable since July 2022
- Electricity price brake and gas price brake from January to December 2023 that capped prices for consumers

The fact that heating costs in winter 22/23 were unexpectedly moderate and considerable savings could be achieved was mainly due to the remaining Russian gas stocks, the mild winter, and the above-mentioned government support measures, but also to the particular economic behavior as a result of the crisis concerns and the calls for savings. In winter 23/24, these supporting factors will no longer apply. Energy security therefore depends heavily on the savings behavior of consumers (Mannhardt et al., 2023).

Environmental Psychology in Crisis Situations

During crises, individuals and communities are subject to stress due to complex decision-making processes that are accompanied by shifting priorities, as well as coping processes to adapt to scarcity and uncertainty (Rosenthal & Kouzmin, 1997). Psychological factors such as risk awareness, emotions, efficacy beliefs, social trust, and motivations fundamentally shape crisis responses that can either enhance resilience or promote maladaptive behaviors (Veer et al., 2020; Gifford, 2014). Environmental psychology, as a field, aims to investigate these interactions between individuals and their physical surroundings, emphasizing the impact of the environment on human behavior and well-being (Gifford, 2014). In crisis situations, this field extends to explore how environmental stressors that come with the crisis influence psychological states and behaviors.

In general, environmental psychology offers explanations for why people behave differently in crisis situations than under normal circumstances by bringing psychological theories into this relationship. Here, the concept of situativity, as discussed by Merkebu et al. (2020), plays an important role because it emphasizes that behaviors, including those related to energy conservation, are context-specific, meaning that the way individuals respond to situations is strongly influenced by their immediate context and environment. Gifford (2014) and Sörqvist (2016) additionally emphasize the role of environmental psychology in the study of factors that either inhibit or promote sustainable and future-proof choices and energy-saving practices and therefore also highlight the importance of this field in understanding and influencing human behavior in times of crisis. This involves individual factors such as self-efficacy and knowledge appraisal, both of which relate to coping behavior in response to an adverse crisis situation (Abrahamse and Steg, 2011).

The findings underline the relevance of environmental psychology when it comes to crisis-related behaviors, and the importance of analyzing the psychological dimensions of savings behavior during and after energy crises to provide explanations for these energy-related behaviors. Therefore, the basis for research into sustainable energy transformations in times of crisis lies in environmental psychology and the question of how individuals perceive and react to environmental challenges.

Energy Savings Behavior

More broadly speaking, energy savings behavior, also called energy conservation behavior, describes the deliberate reduction of energy consumption and the adoption of more sustainable energy solutions by individuals, households, organizations, or communities. This includes regularly reducing energy consumption by increasing efficiency, reducing discretionary consumption and making small or large investments in renewable energy sources (Zaidan et al., 2021). In more detail, on a per-household level, this includes reduced energy use for heating or cooling rooms, for water use, or for other electricity-consuming devices (Evans, 2019).

The increased awareness of energy consumption caused by the effects of the energy crisis may result in a conscious process of self-reflection concerning consumption habits. An introspective view could shift the previously automated way of carrying out daily activities, as the disruption created by rising energy prices and increased consumption awareness of energy consumption significantly challenges the established norms for greater energy consumption (Vuković, Jurič, & Ojdenić, 2014; Shove; 2003). Hence the energy crisis can also be seen as an opportunity for crisis management to make use of this awareness development.

According to Mannhardt et al.'s (2023, p.12) work on crisis mitigation strategies for Europe, "Proactive energy savings are the most cost-effective strategy to overcome the energy crisis". The challenges posed by the crisis underline the need for research into the factors influencing the energy-saving behavior required by individuals. The goal of environmentally relevant behavioral change towards energy conservation is to reduce the demand for fossil fuels in the transport, heating, and electricity sectors while minimizing the negative impact on quality of life (Abrahamse et al., 2007). Implementing energy-saving strategies globally is essential in achieving a sustainable behavior transition that not only mitigates or prevents energy crises but also effectively combats climate change (Wagner et al.; 2016). Although many regulations have already been introduced to reduce the country's energy use such as reducing the room temperature of public facilities or restrictions on the lighting of commercial areas (Sagasser, 2023), these measures cannot be effective if people are not willing to save energy. Therefore, an important research agenda is to ask what drives and hinders the willingness for execution of these energy-saving behaviors.

As part of the present thesis, it is aimed to conduct a broad representation of energy savings behavior within the population of German households. Relevant literature has shown that the role of past behavior cannot be neglected when it comes to behavioral intentions and decision-making (Kidwell & Jewell, 2008; Albarracín & Wyer, 2000). For this reason, reporting of past and present behavior, and future intended behavior regarding consumption reduction and cost saving were combined into the overall energy savings behavior variable.

Crisis Self-Efficacy

The concept of self-efficacy, first introduced by Bandura (1977) in connection to his social cognitive theory, refers to a person's belief in their capability to succeed in certain situations or accomplish a task and thus influence certain events affecting their lives. In general, these beliefs play a crucial role in what goals a person chooses and how much effort they put into achieving these goals. This means that self-efficacy influences the decision of which behaviors to engage in, hence, predicting them accurately (Bandura, 1990).

Based on this, crisis self-efficacy constitutes a pivotal psychosocial variable that has been conceptualized by Park (2016, p. 8) as "(…) an individual's beliefs about whether s/he can successfully complete a given task during a crisis situation". Within the context of the present thesis, it assesses the perceived capability to effectively manage an uncertain, threatening situation – the energy crisis. Crisis self-efficacy also integrates the concept of coping self-efficacy, proposed by Chesney et al. (2006) and contextualized for the application to precarious events or life challenges that are expected to overwhelm or exceed usual resources and competencies.

According to Bandura, self-efficacy acts indirectly by stimulating planning, preparedness, and adaptive practices, while buffering unconstructive responses such as denial or helplessness that worsen personal situations (Bandura, 1997; Flammer, 2001). Flammer (1995; 2001) adds to this by suggesting that self-efficacy promotes control beliefs that can reduce stress caused by the feeling of helplessness and mitigate the effects of environmental conditions. Increased levels of crisis self-efficacy therefore have the potential to significantly improve readiness, responsiveness, and resilience to adverse events like natural disasters, pandemics, situations of unrest, or crises through behavioral and emotional regulatory effects (Park, 2016).

For this reason, Park's construct can directly be applied to the context of the energy crisis. As already noted, situations of crises are characterized as stressful events that may cause disruption or even helplessness in individuals and require adequate coping skills. Crisis self-efficacy captures the available ability to perform the necessary preventive and reactive behaviors that mitigate the effects of this disruption through adaptation and coping mechanisms while avoiding dysfunctional paralysis or a misinformed response. Individuals who exhibit higher levels of crisis self-efficacy are more likely to see the crisis as a challenge that can be overcome and can adopt the necessary saving habits if given the right guidance.

As part of a framework named the Theory of Planned Behavior (Ajzen, 1985), general self-efficacy herein often referred to as 'perceived behavioral control' has already proven to effectively shape a person's behavioral intentions and thus to be a strong predictor of behavior. For example, following Lee and Tanusia (2016), self-efficacy positively influences energy conservation intention in students, next to subjective norms and attitudes towards conserving. They also suggest that education on energy matters is important in forming a positive attitude towards energy conservation and appropriate policies to promote this attitude and self-efficacy that leads to saving practices.

But even as a stand-alone psychological variable, a number of studies have demonstrated the significant influence of self-efficacy on savings behavior. For instance, a study conducted by Pardhananga and Davenport (2002) revealed how landowners who believe that their actions are making a difference are more likely to exhibit conservation actions of scarce resources. In addition, they have found that programs that strengthen landowners' self-efficacy are critical to supporting and sustaining conservation behavior. Another study has already shown that there is a strong correlation between self-efficacy and energy use in the residential sector, which even exceeds the influence of habit (Barry et al., 2016).

To effectively assess crisis self-efficacy, Park's (2016) crisis self-efficacy scale describes a measurement tool consisting of 12 items that is able to predict energy conservation behavior through a person's self-assessment on four efficacy dimensions – action, preventive, achievement, and uncertainty management – that has been validated by several studies. As such, crisis self-efficacy has already effectively demonstrated its positive influence on other forms of crisis-related behaviors such as the work commitment of

education workers during the COVID-19 pandemic (Baloran & Hernan, 2020). In addition, another study by Baguri et al. (2022) used this instrument to show that crisis self-efficacy mediates the relationship between factors like self-esteem or hope and teacher's resilience during the COVID-19 pandemic.

There are many suggestions on how to improve self-efficacy, especially in an academic or work context. In this regard, the authors Margolis and McCabe (2006) discuss three potential sources of self-efficacy – enactive mastery, vicarious experiences, and verbal persuasion – that teachers can directly address to foster student's beliefs in themselves and their abilities. They suggest many strategies, including training of improvement strategies, verbal communication such as encouragement, highlighting previous achievements, or corrective feedback, and control of task difficulty, which may also be applied in crisis interventions. Koponen et al. (2021) confirm this within their study, by performing a self-efficacy intervention on students that aimed at improving their mathematic skills. According to their findings, an integrated approach using both skill training and self-efficacy intervention worked best and significantly increased the student's math abilities.

Despite all these insights, on the beneficial effects of self-efficacy on behavior or skill demonstration, no study has yet linked the construct of crisis self-efficacy or even general self-efficacy to energy savings behavior in an energy crisis context. Besides other psychosocial factors, self-efficacy has proven to be amongst the most powerful instruments in promoting energy savings and therefore has the potential to be effectively employed as a tool for energy crisis management.

Subjective Crisis Knowledge

Incorporating general definitions of knowledge, subjective crisis knowledge is referred to within this thesis as an individual's understanding of various information concerning the energy crisis, including those necessary for appropriate crisis evaluation and response. In the context of crisis management, it encompasses a range of elements such as the identification of a crisis, understanding its dynamics, and the implementation of strategies to manage and resolve it (Wang & Belardo, 2009). The researchers Flynn and Goldsmith (1999, p. 57) emphasize the need for distinction between "subjective knowledge, what the consumer thinks he or she knows, and objective knowledge, an actual knowledge construct as measured by some sort of test (…)" and have therefore developed an instrument for

the area of consumption that measures self-reported knowledge reliably and simply and is also easy to adapt.

Generally, since knowledge is known to improve skills, existing research has confirmed the direct impact of environmental knowledge on environmental behavior. According to Zsóka et al. (2013), appropriate education on environmental concerns strongly correlates with knowledge about the same, which then promotes environmental behaviors such as decreasing energy consumption. Vicente-Molina et al. (2013) confirm and found that there is a strong correlation between subjective knowledge and pro-environmental behavior. Students who received education about environmental issues were more likely to recycle or use public transportation. The findings of Pothitou et al. (2016) present knowledge as a key factor in pro-environmental behavior changes and executing energy conservation behaviors. They found that knowing a lot about energy saving in the home positively influences whether people actively save energy and whether they are able to achieve savings through habit change, and negatively influences the perception of inconvenience in saving energy. Moreover, it has been established that a lack of relevant knowledge constitutes a barrier to energy savings behavior (Kennedy et al., 2009). With regard to the 2021/2022 energy crisis, Corbos et al. (2023) were already able to demonstrate a positive influence of crisis knowledge on individual savings behavior for household electricity during the crisis.

Other studies have shown that subjective knowledge is directly related to a person's attitude towards saving energy and suggest that knowledge could also lead to increased energy savings behavior given this effect on environmental attitudes (Wang et al., 2014). This indicates that there may also be other indirect relationships between knowledge and behavior and that their connection can be explained by a mediating factor such as self-efficacy. However, no study to date has proven a relationship between subjective knowledge and energy-saving behavior being mediated by self-efficacy.

Already in 1959, White established the Effectance Theory that is conceptualized as an intrinsic motivation to engage with the environment that causes a feeling of efficacy. Based on this, Bandura (1977) claimed that this motivation is enhanced by the acquisition of knowledge. This ultimately implies that knowledge and the motivation to perform an action are closely related to the feeling of self-efficacy and the belief in own capabilities.

In summary, the presented findings support the idea that an increased subjective understanding a crisis may constitute an important driver of necessary behaviors to mitigate

the crisis' consequences alongside other factors, although not yet confirmed. Since people seek to inform themselves as much as possible about a crisis to better deal with its consequences (Ferreira & Borges, 2020), and therefore often have increased crisis knowledge, it can be assumed that the influence on behavior is additionally strengthened in such a situation. Nevertheless, targeted crisis management is important in order to convey the right knowledge in an appropriate manner. Therefore, there is great potential to supplement crisis management and implement measures that promote targeted energy-saving behavior through knowledge.

Research Framework and Hypotheses

In response to the research gaps at the intersection of environmental psychology and energy research and to answer the present research question, a research framework (Figure 4) on energy savings behavior is proposed that incorporates the constructs of crisis self-efficacy (CSE) and subjective crisis knowledge (SCK) as determinants of household energy savings behavior (ESB) in Germany during the energy crisis and its aftermath.

As supported by existing literature (Zsóka et al., 2013; Vicente-Molina et al., 2013; Corbos et al., 2023) it is hypothesized that increased subjective crisis knowledge positively relates to heightened energy savings behavior.

H1: *There is a significant positive relationship between SCK and ESB.*

Moreover, following Bandura's (1977) indications it is hypothesized that subjective knowledge in turn increase a person's level of crisis self-efficacy.

H2: *There is a significant positive relationship between SCK and CSE.*

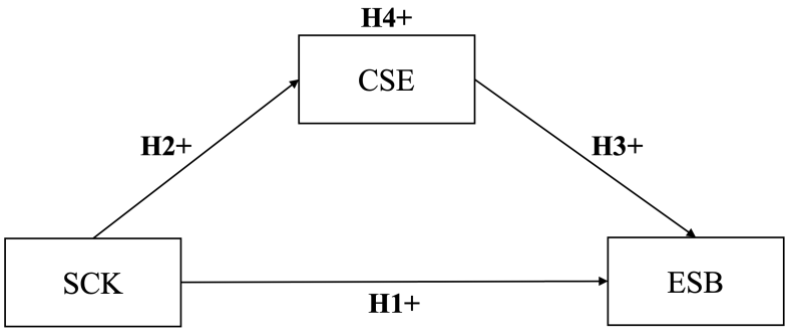
In accordance with Park's (2016) explanations on crisis self-efficacy, it is hypothesized that heightened levels of crisis self-efficacy will lead to increased energy savings behavior.

H3*: There is a significant positive relationship between CSE and ESB.*

Lastly, since there appears to be a general connection between the three variables as reflected by current literature (Bandura, 1977; Wang et al., 2014; Corbos et al., 2023) it is hypothesized that the relationship between crisis self-efficacy and energy savings behavior is partially mediated by subjective crisis knowledge.

H4: *The relationship between SCK and ESB is partially mediated by CSE.*

Figure 4. *Research Framework*



Part II: Methodology

Research Design

To start with, this study uses a quantitative approach, as this is particularly suitable for describing, explaining, and interpreting complex relationships between the variables under investigation using numerical data. A large sample can be analyzed, which allows for representative results and thus leads to generalizable findings (Mertler, 2021).

Furthermore, the data collection for this study utilizes a cross-sectional design, where data is collected from a sample of participants at a single point in time to infer causation. This approach is particularly relevant to the present research as it provides a snapshot of the current state within the specified population, thus providing a descriptive picture of the variables and enabling comparisons across different demographic or social factors (Mann, 2003). In addition, this not only facilitates the recruitment of study participants through a one-time survey, but also eliminates the need for systematic control of influencing and changing environmental factors over time (Wang & Cheng, 2020).

Moreover, the study design includes both descriptive and correlational analysis of latent constructs (CSE, SCK & ESB) in Structural Equation Modeling (SEM) (Schuhmacker & Lomax, 2004). While descriptive statistics are used to summarize and characterize the data and provide a comprehensive overview of the characteristics and expression of the variables in the sample, inferential statistics such as correlation analysis are used to make estimates based on the sample data and allow for testing of hypotheses (Stapor, 2020). The relationships between the variables of interest are evaluated by testing hypotheses to explore potential associations and patterns. This combination of methods will provide a detailed understanding of the variables influencing energy savings behavior and offer insights into the potential underlying factors.

It is important to note that all areas of this study are characterized by the consideration of the highest ethical standards set by the American Psychological Association that ensure the protection of participants' rights and well-being (American Psychological Association, 2002). In the beginning, informed consent was obtained from all participants, with the objectives and procedures of the study being clearly explained to them. Participants were also informed of their right to withdraw from the study at any time without consequences. As the study was conducted online under absolute anonymity, the data collected could not

be traced back to individual participants. Confidentiality was therefore guaranteed throughout the study, with data processing and storage procedures carried out in strict compliance with data protection regulations.

Instrument and Measures

The research method used in this study was a quantitative survey to obtain data and statistics from a representative sample and to then analyze averages, frequencies, and correlations within this sample. As a survey instrument, a self-administered standardized questionnaire was used, which enabled simple, anonymous, and self-determined implementation for a large sample (De Leeuw, 2008). The questionnaire which is displayed in Appendix A consisted of a total of 30 items, which were divided into five sections – three of them to measure the three constructs implemented to answer the main research question, the first and last section to develop further findings and implications.

All Likert-scale items used were following a 7-point answer format asking participants to select their level of agreement from 1 = 'Strongly disagree' to 7 = 'Strongly agree'. An attention check item was integrated between items 17 and 18 to increase data quality (Curran, 2016). An overview of the questionnaire parts including all items, instructions, and answer options can be found in Appendix A.

First, the 'Energy Crisis General' (G) section consisted of nine multiple-choice, as well as 7-point Likert-scale single-choice items, to explore the participants' general opinion on the energy crisis topic and to assess the impact of the crisis and its consequences for private households. Participants were asked to prioritize the intensity of the effects experienced, select measures to cope with the energy crisis, evaluate media awareness and sources of information about the energy crisis, and indicate their perception of political actors and support.

Second, the 'Energy Saving Behavior' (ESB) section consisted of four items aimed at assessing past behavior in dealing with previous or current energy consumption and cost reduction as well as future behavioral intentions in terms of energy savings and cost reduction. The created ESB scale thus is intended to be a brief and feasible instrument combining the two parts of saving behavior, reported or actual (present and past) behaviors and intended (future) behaviors following Evan-Lacko et al.'s (2011) Reported and Intended Behavior Scale (RIBS) which is based on the Star Social Distance Scale (Star, 1952,

Philips, 1967). In general, the assessment aimed to facilitate the generation of policy implications based on the importance given to these energy savings aspects and acts as a theoretical dependent variable within this research. The item format was a 7-point Likert-scale asking for an indication of agreement with the four statements given. The internal consistency was good, with Chronbach's $\alpha = 0.850$.

Third, 'Crisis-Self Efficacy' (CSE) was measured using Park's (2016) Crisis-Self-Efficacy Scale which was adapted accordingly. The scale provided a useful tool for assessing individual levels of crisis self-efficacy, including the ability to perform protective actions, the level of crisis preparedness, the goal achievement conviction, and the ability to manage uncertainty, in the context of the energy crisis in Germany to gain a better understanding of the individual aspects that influence energy-saving behavior. As demonstrated in Ecker et al.'s (2022) research paper, the scale was shortened from its original 12 items down to 4 items, one of each of the 4 factors (action, preventive, achievement, and uncertainty management) with the highest load on the factor. In this way, it was possible to measure crisis self-efficacy in a concise yet reliable way by taking into account each factor of the original scale in order to keep the duration of the survey as short as possible for the participants and thus not to lose their attention. The internal consistency of used items in the sample was good, with Chronbach's $\alpha = 0.851$.

Fourth, 'Subjective Crisis Knowledge' (SCK) was measured by adapting Flynn and Goldsmith's (1999) Subjective Knowledge Scale, which was developed to provide a reliable and valid tool for assessing individual levels of self-reported knowledge that can be applied to different subject areas and data collection methods. In this case, the five items in a 7-point Likert-scale format were used to capture participants' subjective knowledge of the energy crisis and its effects. The scale showed good internal consistency in the sample, with Chronbach's $\alpha = 0.838$.

Finally, detailed demographic data was collected from the participants in the 'Demographic Characteristics' part (D). In this fifth section of the survey, information on gender, age, residency, education level, employment status, monthly household income, household size, as well as number of children was to be specified using eight single-choice items. An overview of the participants' characteristics recorded will be given in Part III – the study's results and can also be found in Appendix B.

Data Collection and Sampling

Looking at the data collection and sampling process to collect the research data, the present survey was conducted in the first week of December 2023 for a period of one week via the online platform Qualtrics. Thus, it was possible to distribute the survey via a link, which generally contributed to simplifying the sampling process. As a widely recognized online survey platform, Qualtrics was chosen as a tool for data collection due to its user-friendly interface, versatile question formats, and ability to generate two survey language options – German and English ("Statistical & Qualitative Data Analysis Software: About Qualtrics", 2023).

The timing of the survey was deliberately chosen to coincide with the onset of winter in Germany, as this reminded the participants yet again of a key factor in the energy crisis - heating. The researchers Bradburn et al. (1987) found that episodic memory plays a significant role when answering autobiographical questions about a point in the past. Additionally, according to Williams et al. (2022), especially positive and negative episodic memories facilitate remembering a moment, situation, or experience from the past, since they are disproportionately represented in an individual's memory. When individuals are faced with circumstances that fundamentally resemble the original episode stored in their memory, the directing power of episodic memory is frequently strong, thus providing an ideal background for conducting the present survey (Kuwabara & Pillemer 2010; Pillemer, 2003).

The survey was targeted at German households of all sizes and constellations and aimed at a broad representation of the population. To ensure relevance and compliance with ethical standards, only answers from adult participants over the age of 18 were considered. Since the energy crisis in Germany and therefore only German households were the subject of the study, the main requirement was a German residence, which helped to ensure that the interviewees had the necessary experience and knowledge to provide relevant insights for this study. It is important to note that only participants living abroad were excluded from the analysis and not those of foreign origin living in Germany. In summary, the following exclusion criteria were defined for the analysis of the data: minors under 18 years old, non-residents of Germany, next to a failed attention check, and non-completion of the survey.

Looking at the sampling procedure itself, a non-probability approach was chosen, combining the methods of convenience sampling and snowball sampling to gather as many responses as possible (Meadows, 2003). Convenience sampling was used to reach individuals who were readily available and willing to participate. At the same time, snowball sampling was used to leverage the networks of existing participants and extend the reach to individuals who would not have been reached by conventional means. This dual approach was intended to mitigate potential bias and increase the overall representativeness of the sample. Recognizing the limitations of relying solely on personal networks, a further 50 participants were recruited via Prolific, a renowned online participant recruitment platform regarding high-quality responses (Peer et al., 2021). This approach ensured a more diverse sample and complemented the initial convenience and snowball methods.

To incentivize participation, respondents were offered the option to win an Amazon voucher upon completion of the survey. This not only increased motivation to participate, but also contributed to overall participation and completion rates (Biemer et al., 2018). All in all, an adequate sample size of 610 participants was generated, which totaled 394 valid responses after taking into account the exclusion criteria.

Data Analysis Method

In research, it is commonly accepted to utilize a technique named Structural Equation Modelling (SEM) which provides a standardized form of measuring, analyzing, and reporting relationships, especially between latent variables and constructs that are unobservable and measured via surveys or questionnaires (Anderson and Gerbing, 1988).

As such, this paper made use of this technique to test and validate Hypotheses 1 to 4. To conduct this analysis, the most recent versions of both SPSS (v. 29.0) and SPSS AMOS (v. 26.0) were used. First, a measurement model was constructed and its validity was tested to measure and assess the relationships between latent variables and their corresponding survey items. Secondly, a structural model was constructed and validated in order to measure relationships and path directionalities between the latent variables themselves.

The data used in the SEM as well as other statistical analyses were corrected for outliers which were defined as any value in the constructs that exceeded 3 standard deviations from its respective mean (Osborne & Overbay, 2019). This resulted in a sample of 389 that was considered for the purpose of data analysis.

Part III: Results

Participant Characteristics

After data cleaning, a representative size of 394 responses from the population of German citizens remained. As displayed in Table 1, the sample consisted of 47.7% female, 48.7% male, and 3.6% non-binary respondents, ranging from the age of 18 to 82 with an average of 37.69 years and a standard deviation of 12.327. A total of 54.1% held a university degree, 75.7% were in part-time or full-time employment, the household income group with the most frequent expression was €3,000 to €4,999, and 57.1% had children living in their household during the crisis, compared to 42.9% without children.

Table 1. *Frequencies Distribution: Demographic Characteristics (N =394)*

		Frequencies	*%*
Gender	Woman	188	47,7%
	Man	192	48,7%
	Non-binary	14	3,6%
	Other, please state	0	0,0%
Education	No school diploma	0	0,0%
	Lower secondary school diploma	6	1,5%
	Secondary school diploma	36	9,1%
	High school diploma / A levels	65	16,5%
	Completed vocational training	67	17,0%
	Bachelor degree	115	29,2%
	Master degree	84	21,3%
	Doctor	14	3,6%
	Other, please state	7	1,8%
Employment	Full-time working	228	57,9%
	Part-time working	70	17,8%
	Retired	15	3,8%
	Unemployed / Job seeking	15	3,8%
	Studying	54	13,7%
	I prefer not to answer	12	3,0%
Income	No income	13	3,3%
	Up to 900€	17	4,3%
	1.000€ to 2.999€	76	19,3%
	3.000€ to 4.999€	125	31,7%
	5.000€ to 6.999€	73	18,5%
	7.000€ and over	58	14,7%
	I prefer not to answer	32	8,1%
Household size	Only me	55	14,0%
	2	87	22,1%
	3	151	38,3%
	4	74	18,8%
	More than 4	27	6,9%
Children	0	169	42,9%
	1	137	34,8%
	2	80	20,3%
	3	7	1,8%
	More than 3	1	0,3%

Around 70% of the Participants (Table 6) agreed or strongly agreed with the statement *"I felt affected by the energy crisis or have experienced its effects"*. As displayed in Table 2 regarding the statement "*I felt affected by the energy crisis or have experienced its effect."* around 90% of the participants already experienced rising heating costs during the crisis, close to 90% indicate the same for rising fuel costs, over 90% for rising electricity prices, and around 87% for decreased purchasing power (according to the responses 'somewhat agree', 'agree', and 'strongly agree')

With the multiple-choice item "*What would you have wished for from political"* around 50-60% of participant selected each of the following options: 'More transparency', 'More investment in green energy for the future', 'More financial support for private households (e.g. heating subsidy as a permanent right)', 'Greater reduction in energy prices for private households', and 'Increased promotion of energy-saving measures (e.g. subsidies for the construction of photovoltaic systems for households)' (Table 7).

The frequency distribution for all remaining items can be found in Appendix B.

Table 2. *Frequency Distribution: G2 – Effects Experienced (N =394)*

			Frequencies	*%*
I felt affected by the energy crisis or have experienced its effects.	Rising heating costs	Strongly disagree	1	0,3%
		Disagree	7	1,8%
		Somewhat disagree	16	4,1%
		Neither agree nor disagree	18	4,6%
		Somewhat agree	60	15,2%
		Agree	153	38,8%
		Strongly agree	139	35,3%
	Rising fuel costs	Strongly disagree	11	2,8%
		Disagree	13	3,3%
		Somewhat disagree	14	3,6%
		Neither agree nor disagree	12	3,0%
		Somewhat agree	52	13,2%
		Agree	118	29,9%
		Strongly agree	174	44,2%
	Rising electricity prices	Strongly disagree	4	1,0%
		Disagree	6	1,5%
		Somewhat disagree	7	1,8%
		Neither agree nor disagree	13	3,3%
		Somewhat agree	62	15,7%
		Agree	162	41,1%
		Strongly agree	140	35,5%
	Decreased purchasing power (Inflation)	Strongly disagree	2	0,5%
		Disagree	15	3,8%
		Somewhat disagree	11	2,8%
		Neither agree nor disagree	24	6,1%
		Somewhat agree	60	15,2%
		Agree	123	31,2%
		Strongly agree	159	40,4%

Measurement Model

Initially, a measurement model, which relates the variables to the constructs is proposed as part of the SEM model (Iacobucci, 2009). To begin the analysis of the measurement model for reliability and validity, first, a confirmatory factor analysis (CFA) was conducted. Upon inspection of the results, especially factor loadings, it was determined that one factor, namely SCK3 / Item 20 was below the recommended threshold (0.6) with its loading at 0.42 and was therefore dropped from the analysis (Guadagnoli & Velicier, 1988). After rerunning the CFA analysis, all factor loadings were within acceptable ranges (Table 3) and model validity was assessed. In general, the measurement model showed a good fit across all relevant measures, indicating an adequate representation of the dataset. The following measures were tested and accepted: Chi-Square to degrees of freedom (χ^2 /df) was 2.6, goodness-of-fit index (GFI / AGFI) was 0.95 and 0.92 respectively, Tucker-Lewis index (TLI) was 0.95, comparative fit index (CFI) was 0.97, incremental fit index (IFI) was 0.97. Additionally, the model was accepted based on a standardized root mean square residual (SRMR) of 0.06 and a root mean square error approximation (RMSEA) of 0.06.

After the model itself was validated, construct reliability was validated using Cronbach's Alpha and Composite Reliability, where Cronbach Alpha scores for each construct were above the threshold of 0.7 (Hair et al., 2013) while Composite Reliabilities were in the range of 0.82 and 0.86 for each construct, also above the threshold of 0.7 (Hair et al., 2013), allowing for the establishment of overall construct reliability.

Next, the scale items' convergent validity was tested using Average Variance Extracted (AVE) which yielded values above the threshold of 0.5 and allows for the confirmation of scale validity in the overall model (Fornell & Larcker, 1981).

Finally, discriminant validity was assessed using both the Fornell and Larcker Criterion as well as the Heterotrait Monotrait ratio (HTMT). While the Fornell and Larcker Criterion has for decades been the de facto standard of testing discriminant validity, Henseler et al.'s relatively newly established HTMT ratio demonstrated superior performance in assessing discriminant validity in their paper (Hamid et al., 2017). In the measurement model, both the Fornell and Larcker Criterion as well as the HTMT ratios establish discriminant validity, with ratios all less than the required threshold of 0.85 (Henseler et. al, 2015).

Table 3. *Factor Loadings of Measurement Model (N = 389)*

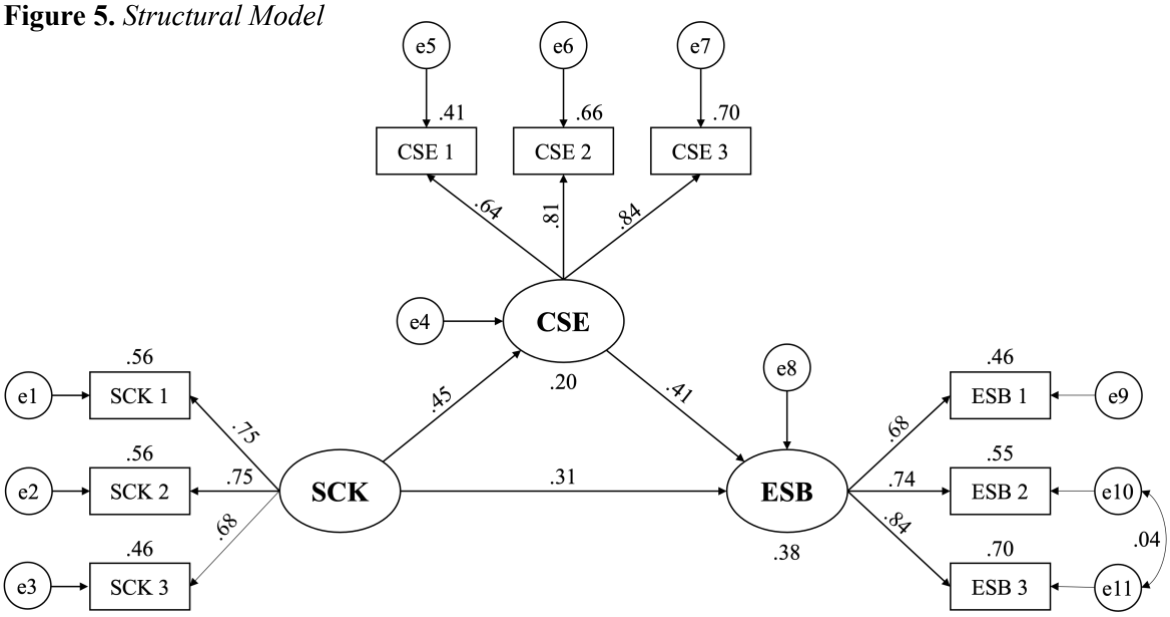
Construct	*Items*	*Standardized Factor Loading*	*Cronbach's Alpha*	*Composite Reliability*	*AVE*
Crisis Self Efficacy (CSE)	CSE1	.849***	.851	.833	.558
	CSE2	.808***			
	CSE3	.664***			
	CSE4	.647***			
Subjective Crisis Knowledge (SCK)	SCK1	.718***	.838	.824	.540
	SCK2	.793***			
	SCK4	.741***			
	SCK5	.684***			
Energy Savings Behavior (ESB)	ESB1	.860***	.850	.858	.603
	ESB2	.783***			
	ESB3	.789***			
	ESB4	.663***			

Note: Significant at *** $p < 0.001$.

Structural Model

After the measurement model was validated, a structural model was constructed as presented in Figure 5 and validated in order to measure the paths and directionalities of the relationships (Iacobucci, 2009). After checking the initial results, it was found that the standardized residual covariances for CSB4 as well as CSE3 were not all below the cut-off of 2.58, and these items were thus excluded (Jöreskog & Sörbom, 1993). Subsequently, the model was tested and validated across all relevant indices with the following results: χ^2 /df = 2.4, GFI = 0.97, AGFI = 0.94, TLI = 0.96, CFI = 0.98, SRMR = 0.04, RMSEA = 0.06. The squared correlation of ESB was 0.38, implying that 38% of this construct's variance can be explained by the linear combinations of both CSE and SCK.

Figure 5. *Structural Model*



Testing of Hypotheses

First, Hypothesis 1 posited a positive relation between subjective crisis knowledge (SCK) and energy savings behavior (ESB). As measured, the relationship between SCK and ESB was positive and statistically significant with $\beta = 0.310$, $t = 4.281$ and $p < 0.001$. Therefore, Hypothesis 1 can be accepted. Hypothesis 2 assumed a positive relation between SCK and crisis self-efficacy (CSE). Within the structural model, the relationship between SCK and ESB was indeed positive and statistically significant with $\beta = 0.453$, $t = 6.331$ and $p < 0.001$. Therefore, Hypothesis 2 can also be accepted. Third, Hypothesis 3 states a positive relationship between CSE and ESB, which can be accepted with $\beta = 0.414$, $t = 5.415$ and $p < 0.001$ (Table 4).

Table 4. *Results of hypotheses testing with direct and indirect effects (N = 389)*

Path	*Path coefficients* β	*t-Values*	*Hypothesis*	*Results*
SCK → ESB	0.310	4.281***	H1	Supported
SCK → CSE	0.453	6.331***	H2	Supported
CSE → ESB	0.414	5.415***	H3	Supported

Note: Significant at *** $p < 0.001$.

Finally, Hypothesis 4 indicated that the relationship between SCK and ESB was partially mediated by CSE with the indirect effect resulting in $\beta = 0.133$ and $p = 0.002$ allowing for the hypothesis to be accepted (Table 5). The partial mediation indicates that there is a remaining direct effect between SCK on ESB as confirmed within H1.

Table 5. *Results of hypotheses testing with partial mediation (N = 389)*

Path	*Bootstrapping*		*95% Bias-Corrected CI*		
	Indirect Effect	*Boot S.E.*	*Boot LLCI*	*Boot ULCI*	*p-value*
SCK → CSE → ESB	0.133	0.031	0.092	0.200	0.002

Additional Data Analysis

Within the overall examination to address the fundamental research question, three scale constructs represented by multiple items and therefore valid for use within the SEM were measured and analyzed. However, for the purpose of generating additional findings that might serve as a base for future research on this topic, a further supplementary exploratory analysis was conducted based on single-item measures. To measure these items

against the constructs used in the SEM, summated scales were created for each construct and consequently treated as one item. In the scope of this exercise, several findings were made which are of interest to the overarching results of this study:

It was found that there is a moderate to strong correlation between an individual's subjective feeling of being affected by the crisis (G1) and their energy savings behavior (ESB), which was tested using a simple bivariate Pearson correlation and yielded a correlation value of 0.579 with a p-value of < 0.001.

While this paper establishes a significant relationship between subjective crisis knowledge (SCK) and energy savings behavior (ESB) in the scope of the SEM, it was also found that there exists a statistically significant difference in mean energy savings behavior (ESB) between the lower educated sample group (defined as any educational status lower than a bachelor's degree) and the higher educated sample group (D4). In order to test this, first a Kolmogorov-Smirnoff test was run on the ESB construct to check for normality, resulting in a p-value of <0.001 indicating that the data does not follow normality (Goodman, 1954). After having established non-normality, a Mann-Whitney-U test was conducted which was statistically significant at $p < 0.001$ resulting in the conclusion that there exists a statistically significant difference between educational groups and their mean energy savings behavior (MacFarland & Yates, 2016). In the case of the dataset, the lower-educated group exhibited more energy savings behavior than the higher-educated group.

An additional demographic factor found to be influential in predicting energy savings behavior (ESB) was the number of children (D7). To this extent, another Mann-Whitney-U test was conducted to analyze the mean difference across the sample group with no children, and the group with children, which was found to be significant at $p < 0.001$. The group with children exhibited significantly more energy savings behavior.

A statistically significant negative correlation was determined between the variables age (D2) and perceived support by political actors (G6) at a moderate to weak correlation coefficient of -0.184 with a p-value of < 0.01.

Part IV: Discussion

Interpretation of Findings

As highlighted above, energy savings behavior is influenced by individual factors and assessments, which was reflected by the results of the present survey. By creating a research framework based on a literature review, four hypotheses could be determined and tested within the structural equation model. The results reveal that the constructs measured were able to account for 38% of variance in energy savings behavior which confirms that the proposed model is able to show that individuals with higher levels of crisis self-efficacy as well as subjective crisis knowledge predictably exhibit higher energy savings behavior.

First, the model determined a significantly positive relationship between subjective crisis knowledge and energy savings behavior as indicated by H1. With a path coefficient of $\beta = 0.310$ this relationship was the weakest in its magnitude regarding direct relationships. The hypothesis confirms the intuitively plausible assumption that with increased perceived knowledge of a crisis situation, individuals may be better able to evaluate their actions and weigh them against potential energy saving goals and behaviors. These findings are in line with the results posited by Corbos et al. (2023) on the energy crisis.

Second, a significant positive relation between subjective crisis knowledge and crisis self-efficacy was found, thereby confirming H2. The path coefficient of $\beta = 0.453$ is the largest of the tested hypotheses, making this relationship the strongest. For this reason, the conclusion of this hypothesis is that an individual's crisis self-efficacy level is positively enhanced by their subjective crisis knowledge. This seems reasonable, as any given individual's confidence in their ability to exert control over a given situation, particularly in the context of a crisis, heavily depends on their level of knowledge, which is in line with Bandura's (1997) indications of connectedness.

Third, the model established a significant positive relation between crisis self-efficacy and energy savings behavior with a path coefficient of $\beta = 0.414$ making it the second strongest relation tested within the framework. In summary, the confirmation of this effect, as posited by H3, proves that higher levels of confidence and perceived ability to navigate complex crisis situations directly positively impact an individual's energy-saving behavior. Once again, this goes in line with the intuitive assumption that a stronger belief in one's

ability to make an impact would correlate with changed behavior and further supports the findings established by Park (2016).

Finally, the existence of a partial mediating relationship between subjective crisis knowledge through crisis self-efficacy on energy savings behavior was determined, thus confirming H4. This effect implies, that while there indeed exists a direct effect of both crisis self-efficacy and subjective crisis knowledge, there also exists an indirect effect from subjective crisis knowledge through self-efficacy to energy savings behavior. This provides additional explanatory capabilities regarding the relationship between the three measured constructs. With a path coefficient of $\beta = 0.133$, this indirect effect was the weakest demonstrated relationship within the model.

Recommendations

The present research has made contributions to the theoretical foundation and understanding of energy savings behavior in the context of acute crises and the time following thereafter. While previous studies have focused on the constructs of self-efficacy and subjective knowledge as sole predictors of behavior in general, a contribution is made by focusing on these constructs in a crisis context and analyzing not only their direct effects but also their mediated effects specifically on energy savings behavior while simultaneously narrowing the scope of the study on Germany. Generally, the findings presented in this paper underline the necessity of further understanding psychological drivers of crisis behavior, especially when applied to energy crises to mitigate potential aftershocks and to create more awareness and readiness for further crises to come.

From a policy point of view, the results offer several insights for policymakers seeking to optimize their crisis response and prevention protocols for effective mitigation approaches. First, policymakers should aim to maximize education and information dissemination around crisis behavior and energy-saving habits by means of appearances in popular media, expert panels, and lecture series, as subjective crisis knowledge plays an important role not only in directly influencing energy savings behavior, but also through its mediating effect on energy savings behavior through crisis self-efficacy. Subjectively perceived crisis knowledge with behavioral relevance is largely shaped by the comprehensibility of information (Danayiyen et al., 2022).

For this reason, the extent to which critical information and instructions are provided in terms of their scope, completeness, reliability, applicability, and accessibility plays a decisive role in how people assess and apply their subjective knowledge. Consequently, tailored information that addresses uncertainties and skill deficits is more effective than oversharing or overly generic messages, making sure to keep citizens informed and knowledgeable, and thus able to make smart decisions and increase their levels of self-efficacy. The results of this study demonstrated that crisis knowledge increases perceived self-efficacy, which has a significant influence on intentions to engage in risk-reducing behaviors. It is therefore an important aspect of improving the households' adherence to the crisis regulations. Targeted awareness campaigns for example could be used for communication, to emphasize achievements, provide feedback, or to create further awareness about attainable savings behaviors for active contribution, which may cause optimism and again increase self-effacy.

Second, policymakers should attempt to ensure full communication transparency during as well as following acute crises, without withholding relevant information. Any implemented policies should explicitly state their effective contributions to country-wide energy saving efforts in order to foster a culture of information-sharing as well as reinforce the importance of energy saving behavior. Not only would this lead to a reflected and more sustainable and backed crisis response if citizens are sure that no relevant information is being withheld from them, but additionally to a sense of cooperation, support and, most importantly, a higher level of trust. Nevertheless, attention must be paid to ensuring that the way in which information is provided is adequate and does not provoke any adverse reactions such as uncertainty or fear, leading to a decrease in self-efficacy. In turn, overly induced trust can lead to an inflated sense of safety, which is also a barrier to crisis management (Terpstra, 2011).

It becomes clear that particular consideration must be given to the way in which communication is undertaken and information is shared in times of crisis because savings behavior may be successfully guided by policies that take into account how people receive information and make choices. Information nudging as a way of passing on information has proven to be very effective in connection with the promotion of energy saving practices when people are generally interested in saving energy (Ruokamo et al., 2022). For this reason, it can also be recommended for the energy crisis.

Third, in the event of a recurrence of the crisis, repeating financial support measures might help not only help to cope with the financial strain of increased energy and heating expenses, but also has the potential to effectively prevent helplessness and resignation and again induce the feeling of support and trust in policymaking. However, if prices remain at lower levels, financial support should continue to be withheld to avoid social loafing. It is still advisable to implement further financial initiatives for the adoption of sustainable solutions, such as more support for the construction of private photovoltaic systems, reducing the tax on sustainable building modifications and similar. This can create a strong incentive for people to adopt energy-efficient behaviors.

Finally, policymakers should aim to establish clear environmental goals and energy saving practices to be adhered to within the major players of industry, creating a benchmark by which performance can be measured and evaluated, resulting in further information dissemination. Only in an environment in which adherence to stringent benchmarks can be readily observed, can progress be made in a measurable and sustainable fashion.

Since existing research has already confirmed the predictable effect of the two variables on different kinds of behavior, it can be assumed that the insights gained about energy savings behavior can also be applied to other crisis contexts of comparable scale, for example monetary savings behavior in a financial crisis, or even to a very narrow scale like work environments for managerial implications. From a managerial point of view, the recommendations are similar – upper management must strive to guarantee a proper distribution of information relating to potential crises and energy saving behavior for their employees. This could be done via group workshops, out-of-office trainings and expert sessions. Furthermore, the managers should aim to create a positive environment around their employees' capabilities, the effect of which would result in increased employee self-efficacy and therefore increased energy saving behavior also within the firm. Furthermore, in case a company has managed to execute a particularly environmentally friendly and effective energy saving practice, its managers should be encouraged to attend industry conferences and educate other managers on best-practices.

Limitations and Research Outlook

While this study provides valuable insights into the psychological dimensions of the energy crisis, several limitations should be recognized and addressed in future research.

Firstly, the results are limited to the population of German households, which represents a rather narrow geographical sample and a one with broad demographic dimensions. Especially since Germany houses the largest European economy there might be doubts about the results' generalizability for other European nations. This, however, makes it all the more relevant for Germany's highly affected energy sector. It is therefore advisable to carry out a study with a similar framework in other countries and potentially with more specific populations. Second, the study makes use of a cross-sectional approach, which records only a snapshot of the participants' assessments. Even if the study already goes one step further and combines the previous and intended behavior, a longitudinal study should still be considered in order to determine whether the influences on energy savings behavior are sustainable and extend beyond the post-crisis context. Third, due to the study's self-reported data approach, several issues arise relating to not only social desirability bias in which participants tend to feel inclined to represent themselves in a socially acceptable manner rather than providing an honest picture (Paulhus, 2017) but also to recall bias, where participants' ability to accurately report past behaviors and assessments may be inadequately reflected (Althubaiti, 2016). It is therefore advisable to use other data collection methods for observable variables such as energy savings behavior. Fourth, the study made use of a snowball-sampling technique to generate additional survey responses. This technique can also lead to a bias in which the sample group tends to become homogenous and unrepresentative as respondents recruit close friends and acquaintances which are usually from similar social circles and environments. Although measures have been taken to counterbalance this, other sampling methods can be considered in the future to increase the representativeness of the sample.

Finally, the study tested the relation and interdependence of two separate constructs on energy savings behavior, which might not be sufficient in explaining the dependent construct's variance. Since there may be additional psychological but also environmental factors influencing energy savings behavior, future research should take these into consideration for providing additional explanations.

Conclusion

All in all, the European energy crisis of 2021/2022 was driven by a complex interplay of factors and still has major sustained impacts on Germany's economy and households' everyday lives. It highlighted the need to diversify energy sources, invest in renewable energy and storage solutions, and strengthen energy infrastructure resilience, in addition to the importance of international cooperation and strengthened connections between European nations in addressing these challenges and share energy resources. Moreover, the consequences of the crisis have significantly increased Germany's public awareness of daily energy consumption.

Although the energy supply presently appears to be averted, the energy conservation and crisis management behavior of German households is still in demand to prevent the crisis from flaring up again. To bring about the desired behavior, it is essential to comprehend how individuals experience crisis and behave as a result in order to develop strategies that can combat energy conservation issues. For this reason, the present thesis examined the interconnectedness between psychological factors and sustainable energy behavior in post-crisis Germany to add to the topic's growing body of research. The aim was to uncover knowledge that could inform targeted policymaking and crisis management to promote resilient energy-related responses.

In the course of an empirical study, crisis self-efficacy and subjective knowledge proved to constitute key drivers of savings behavior, thus directly impacting crisis prevention, preparedness and response behaviors that determine outcomes. Since households account for a considerable portion of the nation's energy consumption, an increased focus should therefore be on fostering these aspects in individuals besides incentivizing them towards proactive energy savings, not only during but also after the crisis in order to promote sustainability, energy security and independence and avoid further energy shortages.

In summary, the energy crisis can be seen as a major opportunity for the country to build a more resilient economy, through uncovering behavioral knowledge. That is why policymakers and environmental psychologists who study people's behavior in an economic context should work together. Only through this collaboration, an understanding of how people react to the effects of the crisis can be established, which creates the foundation for sustainable measures, regulations and policies to overcome the crisis. The focus here should be on promoting both crisis self-efficacy and subjective crisis knowledge, as these two

factors have a particularly positive effect on energy savings behavior and not only promote saving measures on their own, but even enhance each other, which further strengthens this effect. If these integrated policy approaches also take into account the basics of effective crisis communication as well as the scope of information to promote knowledge, effective and sustainable savings measures can be guaranteed within German households.

References

Abely, C. (2023). *The Russia sanctions: The Economic Response to Russia's Invasion of Ukraine.* Cambridge University Press.

Abrahamse, W., & Steg, L. (2011). Factors Related to Household Energy Use and Intention to Reduce It: The Role of Psychological and Socio-Demographic Variables. *Human Ecology Review, 18*, 30-40. https://doi.org/10.1016/j.enpol.2013.07.051

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2007). The effect of tailored information, goal setting, and tailored feedback on household energy use, energy-related behaviors, and behavioral antecedents. *Journal of Environmental Psychology*, 27, 265-276. https://doi.org/10.1016/J.JENVP.2007.08.002

Ajzen, I. (1985). From Intentions to Actions: A Theory of Planned Behavior. *In: Kuhl, J., Beckmann, J. (eds) Action Control. SSSP Springer Series in Social Psychology.* https://doi.org/10.1007/978-3-642-69746-3_2

Albarracín, D., & Wyer, R. S. (2000). The cognitive impact of past behavior: influences on beliefs, attitudes, and future behavioral decisions. *Journal of personality and social psychology*, *79*(1), 5–22. https://doi.org/10.1037//0022-3514.79.1.5

Althubaiti A. (2016). Information bias in health research: definition, pitfalls, and adjustment methods. *Journal of multidisciplinary healthcare*, *9*, 211–217. https://doi.org/10.2147/JMDH.S104807

American Psychological Association. (2002). Ethical principles of psychologists and code of conduct. *American Psychologist, 57*, 1060-1073. https://www.apa.org/ethics/code/ethics-code-2017.pdf

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411–423. https://doi.org/10.1037/0033-2909.103.3.411

Bacigalupe, A., & Escolar-Pujolar, A. (2014). The impact of economic crises on social inequalities in health: what do we know so far? *International Journal for Equity in Health*, 13, 52 - 52. https://doi.org/10.1186/1475-9276-13-52

Baguri, E. M., Roslan, S., Hassan, S. A., Krauss, S. E., & Zaremohzzabieh, Z. (2022). How Do Self-Esteem, Dispositional Hope, Crisis Self-Efficacy, Mattering, and Gender Differences Affect Teacher Resilience during COVID-19 School

Closures? *International Journal of Environmental Research and Public Health*, *19*(7), 4150. https://doi.org/10.3390/ijerph19074150

Baloran, E., & Hernan, J. (2020). Crisis self-efficacy and work commitment of education workers among public schools during COVID-19 pandemic. *Preprints.* 2020070599. https://doi.org/10.20944/preprints202007.0599.v1

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1990). Perceived self-efficacy in the exercise of personal agency. *Journal of Applied Sport Psychology, 2*(2), 128–163. https://doi.org/10.1080/10413209008406426

Bandura, A. (1997). *Self-efficacy: The exercise of control.* W H Freeman/Times Books/ Henry Holt & Co.

Barry, N. A., Harper, C. M., Berryman, C., & Farley, C. (2016). Role of Self-Efficacy in reducing Residential energy usage. *Journal of Architectural Engineering*, *22*(1). https://doi.org/10.1061/(asce)ae.1943-5568.0000196

Biemer, P. P., Murphy, J., Zimmer, S., Berry, C., Deng, G., & Lewis, K. (2018). Using bonus monetary incentives to encourage web response in mixed-mode household surveys. *Journal of Survey Statistics and Methodology*, *6*(2), 240-261. https://doi.org/10.1093/jssam/smx015

Bradburn, N. M., Rips, L. J., & Shevell, S. K. (1987). Answering Autobiographical questions: The impact of memory and inference on surveys. *Science*, *236*(4798), 157–161. https://doi.org/10.1126/science.3563494

Budesnetzagentur. (2024). *Aktuelle Lage Gasversorgung – Gasimporte in GWh/Tag.* Bundesnetzagentur. Retrieved January 11, 2024, from https://www.bundesnetzagentur.de/DE/Gasversorgung/aktuelle_gasversorgung/_svg/Gasimporte/Gasimporte.html?nn=652300

Bundesfinanzministerium. (2022, December 16). *Schnelle und spürbare Entlastungen in Milliardenhöhe.* https://www.bundesfinanzministerium.de/Content/DE/Standardartikel/Themen/Schlaglichter/Entlastungen/schnelle-spuerbare-entlastungen.html

Bundesministerium für Wirtschaft und Klimaschutz. (2019). *So heizen die Deutschen*. https://www.bmwk-

energiewende.de/EWD/Redaktion/Newsletter/2019/10/Meldung/direkt-erfasst_infografik.html#:~:text=48%2C2%20Prozent%20der%2040,etwa%20f%C3%BCr%20Zentralheizungen%20und%20%C3%96l%C3%B6fen

Bundesnetzagentur. (2023, January 6). *Bundesnetzagentur veröffentlicht Zahlen zur Gasversorgung 2022*. https://www.bundesnetzagentur.de/SharedDocs/Pressemitteilungen/DE/2023/20230106_RueckblickGasversorgung.html#:~:text=Die%20Gaslieferungen%20aus%20Russland%20sind,September%20schlie%C3%9Flich%20auf%200%20TWh%20

Bundesregierung. (2024, January 1). *Preisbremsen für Strom und Gas | Die Bundesregierung Informiert.* https://www.bundesregierung.de/breg-de/schwerpunkte/entlastung-fuer-deutschland/strompreisbremse-2125002

Chazan, G. (2023, May 26). 'Outraged and furious': Germans rebel against gas boiler ban. *Financial Times.* https://www.ft.com/content/21beeb8d-08de-46db-97c4-a976d3f0b90c

Chen,Y., Lan, T., Mineshima, A., & Zhou, J. (2023). Impact of High Energy Prices on Germany's Potential Output. *IMF Selected Issues Paper, 059) https://doi.org/10.5089/9798400248603.018*

Chesney, M. A., Neilands, T. B., Chambers, D. B., Taylor, J. M., & Folkman, S. (2006). A validity and reliability study of the coping self-efficacy scale. *British Journal of Health Psychology, 11(3),* 421-437.

Chu, S., & Majumdar, A. (2012). Opportunities and challenges for a sustainable energy future. *Nature*, 488, 294-303. https://doi.org/10.1038/nature11475

Corbos, R., Bunea, O., & Jiroveanu, D. (2023). The effects of the energy crisis on the energy-saving behavior of young people. *Energy Strategy Reviews*, *49*, 101184. https://doi.org/10.1016/j.esr.2023.101184

Curran, P. (2016). Methods for the detection of carelessly invalid responses in survey data. *Journal of Experimental Social Psychology*, *66*, 4–19. https://doi.org/10.1016/j.jesp.2015.07.006

Dabija, A. (2021). The Sun – Building Partner of All Times; Passive and Active Approaches. *Alternative Envelope Components for Energy-Efficient Buildings*. https://doi.org/10.1007/978-3-030-70960-0_4

Danayiyen, A., Kavsur, Z., & Baysan, S. (2022). The impact of comprehension of disease-related information and perceptions regarding effects and controllability on protective and social solidarity behaviors with regard to COVID-19. *Zeitschrift fur Gesundheitswissenschaften = Journal of public health*, *30*(5), 1163–1170. https://doi.org/10.1007/s10389-020-01396-8

Ecker A, Jarvers I, Schleicher D, Kandsperger S, Schelhorn I, Meyer M, Borchert T, Lüdtke M and Shiban Y (2022) Problems or prospects? Being a parent in the early phase of the COVID-19 pandemic in Germany. *Front. Psychol.* 13:901249. doi: 10.3389/fpsyg.2022.901249

Evans-Lacko, S., Rose, D., Little, K., Flach, C., Rhydderch, D., Henderson, C., & Thornicroft, G. (2011). Development and psychometric properties of the Reported and Intended Behaviour Scale (RIBS): a stigma-related behaviour measure. *Epidemiology and Psychiatric Sciences*, *20*(3), 263–271. doi:10.1017/S2045796011000308

Evans, D. M. (2019). What is consumption, where has it been going, and does it still matter? The Sociological Review, 67(3), 499–517. https://doi.org/10.1177/0038026118764028

Ferreira, G. B., & Borges, S. (2020). Media and Misinformation in Times of COVID-19: How people informed themselves in the days following the Portuguese declaration of the state of emergency. *Journalism and Media*, *1*(1), 108–121. https://doi.org/10.3390/journalmedia1010008

Flammer, A. (1995). Developmental analysis of control beliefs. *Self-efficacy in changing societies*, 69-113.

Flammer, A. (2001). Self-Efficacy. International Encyclopedia of the Social & Behavioral Sciences. 13812-13815. https://doi.org/10.1016/B0-08-043076-7/01726-5

Flynn, L. R., & Goldsmith, R. E. (1999). A short, reliable measure of subjective knowledge. *Journal of Business Research, 46*(1), 57–66. https://doi.org/10.1016/S0148-2963(98)00057-5

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.2307/3151312

Garrison, C. (1981). The energy crisis: A process of social definition. *QualitativeSociology, 4,* 312-323. https://doi.org/10.1007/BF00986743

Gifford, R. (2014). Environmental psychology matters.. *Annual review of psychology*, 65, 541-79. https://doi.org/10.1146/annurev-psych-010213-115048

Gilbert, A. L. E. X., Bazilian, M. D., & Gross, S. (2021, December). The emerging global natural gas market and the energy crisis of 2021-2022. *Foreign Policy at Brookings.* https://www.brookings.edu/wp-content/uploads/2021/12/FP_20211214_global_energy_crisis_gilbert_bazilian_gross.pdf

Giumelli, F., Hoffmann, F., & Ksiazczakova, A. (2020). The when, what, where and why of European Union sanctions. *European Security, 30(1),* 1–23. https://doi.org/10.1080/09662839.2020.1797685

Glunz, A. & Prittwitz, J. (2024). Economic Key Facts Germany. *KPMG*. Retrieved January 11, 2024, from https://kpmg.com/de/en/home/insights/overview/economic-key-facts-germany.html#:~:text=Germany%20is%20the%20fourth%20largest,the%20country%27s%20gross%20domestic%20product

Goodman, L. A. (1954). Kolmogorov-Smirnov tests for psychological research. *Psychological Bulletin, 51*(2), 160–168. https://doi.org/10.1037/h0060275

Guadagnoli, E., & Velicer, W. F. (1988). Relation of sample size to the stability of component patterns. *Psychological Bulletin, 103*(2), 265–275. https://doi.org/10.1037/0033-2909.103.2.265

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long range planning*, *46*(1-2), 1-12. https://ssrn.com/abstract=2233795

Hamid, M. R. A., Sami, W., & Sidek, M. H. M. (2017). Discriminant Validity Assessment: Use of Fornell & Larcker criterion versus HTMT Criterion. *Journal of Physics: Conference Series, 890*, 012163. https://doi.org/10.1088/1742-6596/890/1/012163

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, *43*, 115-135. https://doi.org/10.1007/s11747-014-0403-8

Höland, C. (2022, August 14). Trockenheit in Deutschland: Das Niedrigwasser im Rhein gefährdet Kohlekraftwerke. *RND.de*. https://www.rnd.de/wirtschaft/trockenheit-in-deutschland-das-niedrigwasser-im-rhein-gefaehrdet-kohlekraftwerke-NSYQHFXV3BE4RM764XV2NWTG5M.html

Holly, L. (2022, September 28). Energiekrise: Kohlekraftwerke aus Reserve dürfen weiteres Jahr am Netz bleiben. *ZEIT ONLINE.* https://www.zeit.de/wirtschaft/2022-09/kohlekraftwerke-verlaengerung-bundesregierung-gas-energiekrise

Hussain, S. A., Razi, F., Hewage, K., & Sadiq, R. (2023). The perspective of energy poverty and 1st energy crisis of green transition. *Energy*, *275*, 127487. https://doi.org/10.1016/j.energy.2023.127487

Iacobucci, D. (2009). Everything you always wanted to know about SEM (structural equations modeling) but were afraid to ask. *Journal of Consumer Psychology*, *19*(4), 673-680. https://doi.org/10.1016/j.jcps.2009.09.002

IEA. (2022). A 10-Point Plan to reduce the European Union's reliance on Russian Natural Gas. *Technical Report March (International Energy Agency).* https://www.iea.org/reports/a-10-point-plan-to-reduce-the-european-unions-reliance-on-russian-natural-gas

IEA. (2023, July 11). *Coal Overview.* https://www.iea.org/energy-system/fossil-fuels/coal

IEA. (2023). *Energy Statistics Data Browser – Data Tools.* https://www.iea.org/data-and-statistics/data-tools/energy-statistics-data-browser?country=WORLD&fuel=Energy%20supply&indicator=TESbySource

Jöreskog, K. G. (1993). Testing structural equation models. In K. A. Bollen & J. S. Long (Eds.), Testing structural equation models (pp. 294–316). Newbury Park, CA: Sage.

Kennedy, E. H., Beckley, T. M., McFarlane, B. L., & Nadeau, S. (2009). Why We Don't "Walk the Talk": Understanding the Environmental Values/Behaviour Gap in Canada. *Human Ecology Review*. http://ajph.humanecologyreview.org/pastissues/her162/kennedyetal.pdf

Kidwell, B., & Jewell, R. D. (2008). The influence of past behavior on behavioral intent: An information-processing explanation. *Psychology & Marketing*, *25*(12), 1151-1166. https://doi.org/10.1002/mar.20258

Koponen, T., Aro, T., Peura, P., Leskinen, M., Viholainen, H., & Aro, M. (2021). Benefits of integrating an explicit Self-Efficacy intervention with calculation Strategy

training for Low-Performing Elementary Students. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.714379

Krapp, C. (2023, December 15). *Heizkostenabrechnung "Der Hammer kommt noch"*. Handelsblatt. https://www.handelsblatt.com/unternehmen/energie/heizkostenabrechnung-der-hammer-kommt-noch/100002622.html

Kuwabara, K. J., & Pillemer, D. B. (2010). Memories of past episodes shape current intentions and decisions. *Memory*, *18*(4), 365-374. https://doi.org/10.1080/09658211003670857

Kyllmann, C. & Wettengel, J. (2022, December 14). Blackout or gas shortage – How would Germany deal with an energy emergency? *Clean Energy Wire.* https://www.cleanenergywire.org/factsheets/blackout-or-gas-shortage-how-would-germany-deal-energy-emergency

Lee, J., & Tanusia, A. (2016). Energy conservation behavioural intention: attitudes, subjective norm and self-efficacy. *IOP Conference Series: Earth and Environmental Science*, *40*, 012087. https://doi.org/10.1088/1755-1315/40/1/012087

Leeuw, E. (2008). Self-administered questionnaires and standardized interviews. In *The SAGE Handbook of Social Research Methods*. 313-327. https://doi.org/10.4135/9781446212165

Liu, X., Wang, Q., Jian, I. Y., Chi, H., Yang, D., & Chan, E. H. (2021). Are you an energy saver at home? The personality insights of household energy conservation behaviors based on theory of planned behavior. *Resources, Conservation and Recycling*, *174*, 105823. https://doi.org/10.1016/j.resconrec.2021.105823

Lynch, M. (1984). Geopolitics of Natural Gas. *Journal of Policy Analysis and Management*, *3*(2), 310–310. https://doi.org/10.2307/3323952

Lynch, M., & Russell, J. (1983). Geopolitics of natural gas. https://doi.org/10.2307/3323952

MacFarland, T.W., Yates, J.M. (2016). Mann–Whitney U Test . In: Introduction to Nonparametric Statistics for the Biological Sciences Using R. *Springer,* Cham. https://doi.org/10.1007/978-3-319-30634-6_4

Mann, C. (2003). Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emergency Medicine Journal*, *20*(1), 54–60. https://doi.org/10.1136/emj.20.1.54

Mannhardt, J., Gabrielli, P., & Sansavini, G. (2023). Collaborative and selfish mitigation strategies to tackle energy scarcity: The case of the European gas crisis. *iScience, 26(5),* 106750. https://doi.org/10.1016/j.isci.2023.106750

Margolis, H., & McCabe, P. P. (2006). Improving Self-Efficacy and motivation. *Intervention in School and Clinic*, *41*(4), 218–227. https://doi.org/10.1177/10534512060410040401

Mccabe, P. (1998). Energy resources; cornucopia or empty barrel? *AAPG Bulletin*, 82, 2110-2134. https://doi.org/10.1306/00AA7BEE-1730-11D7-8645000102C1865D

MDR. (2022, August 24). Große Unzufriedenheit mit Krisenmanagement der Regierung. MDRfragt-Redaktionsteam. https://www.mdr.de/nachrichten/deutschland/politik/umfrage-russland-krieg-regierung-100.html

Meadows, K. (2003). So you want to do research? 4: An introduction to quantitative methods. *British Journal of Community Nursing*, *8*(11), 519–526. https://doi.org/10.12968/bjcn.2003.8.11.11823

Merkebu, J., Battistone, M., McMains, K., McOwen, K., Witkop, C., Konopasky, A., Torre, D., Holmboe, E., & Durning, S. (2020). Situativity: a family of social cognitive theories for understanding clinical reasoning and diagnostic error. *Diagnosis*, 7, 169 - 176. https://doi.org/10.1515/dx-2019-0100

Mertler, C. A. (2021). *Introduction to educational research*. Sage publications.

OECD. (2023, April 19). Confronting the energy crisis: changing behaviours to reduce energy consumption. *OECD Policy Responses on the Impacts of the War in Ukraine*, https://doi.org/10.1787/5664e8a9-en

Oltermann, P. (2022, September 5). How reliant is Germany – and the rest of Europe – on Russian gas? *The Guardian.* https://www.theguardian.com/world/2022/jul/21/how-reliant-is-germany-and-europe-russian-gas-nord-stream

Osborne, J. W., & Overbay, A. (2019). The power of outliers (and why researchers should always check for them). *Practical Assessment, Research, and Evaluation*, *9*(1), 6. https://doi.org/10.7275/qf69-7k43

Park, S. (2016). Development and Validation of a Crisis Self-Efficacy Scale. *University of Tennessee.* https://trace.tennessee.edu/utk_graddiss/3661

Paulhus, D.L. (2017). Socially Desirable Responding on Self-Reports. *In: Zeigler-Hill, V., Shackelford, T. (eds) Encyclopedia of Personality and Individual Differences.* https://doi.org/10.1007/978-3-319-28099-8_1349-1

Peer, E., Rothschild, D., Gordon, A. *et al.* Data quality of platforms and panels for online behavioral research. *Behav Res, 54,* 1643–1662 (2022). https://doi.org/10.3758/s13428-021-01694-3

Pillemer, D. B. (2003). Directive functions of autobiographical memory: the guiding power of the specific episode. *Memory, 11(2),* 193-202. https://doi.org/10.1080/741938208

Pothitou, M., Hanna, R., & Chalvatzis, K. (2016). Environmental knowledge, pro-environmental behaviour and energy savings in households: An empirical study. *Applied Energy*, *184*, 1217–1229. https://doi.org/10.1016/j.apenergy.2016.06.017

Pradhananga, A. K., & Davenport, M. A. (2022). "I believe I can and should": self-efficacy, normative beliefs and conservation behavior. *Journal of Contemporary Water Research & Education*, *175*(1), 15–32. https://doi.org/10.1111/j.1936-704x.2021.3370.x

Rausser, G.; Strielkowski, W.; Mentel, G. (2023). Consumer Attitudes toward Energy Reduction and Changing Energy Consumption Behaviors. *Energies*, *16*, 1478. https://doi.org/10.3390/en16031478

Rosenthal, U., & Kouzmin, A. (1997). Crises and Crisis Management: Toward Comprehensive Government Decision Making. *Journal of Public Administration Research and Theory*, 7, 277-304. https://doi.org/10.1093/OXFORDJOURNALS.JPART.A024349

Rudnicka, J. (2024). *Monatliche Inflationsrate in Deutschland bis Dezember 2023.* Statista. Retrieved January 17, 2024, from https://de.statista.com/statistik/daten/studie/1045/umfrage/inflationsrate-in-deutschland-veraenderung-des-verbraucherpreisindexes-zum-vorjahresmonat/

Ruokamo, E., Meriläinen, T., Karhinen, S., Räihä, J., Suur-Uski, P., Timonen, L., & Svento, R. (2022). The effect of information nudges on energy saving: Observations from a randomized field experiment in Finland. Energy Policy, 161, 112731. https://doi.org/10.1016/j.enpol.2021.112731

Sagasser, J. (2023, January 16). Bundesregierung verlängert Maßnahmen zum Energiesparen. *DStGB*. https://www.dstgb.de/themen/energiekrise/aktuelles/bundesregierung-verlaengert-massnahmen-zum-energiesparen/#:~:text=Die%20Bundesregierung%20hat%20am%2011,bestimmten%20Zeiten%20nicht%20beleuchtet%20werden.

Scholz, O. (2023, November 28). Regierungserklärung von Bundeskanzler Olaf Scholz zur Haushaltslage vor dem Deutschen Bundestag. *Bulletin der Bundesregierung, 132-1,* https://www.bundesregierung.de/resource/blob/992814/2245544/c4135909cc5414246c924eb01554fdbd/132-1-regierungserklaerung-data.pdf?download=1

Schumacker, R. E., & Lomax, R. G. (2004). *A beginner's guide to structural equation modeling*. psychology press. https://doi.org/10.4324/9781410610904

Shove, E. (2003). Converging Conventions of Comfort, Cleanliness and Convenience. Journal of Consumer Policy, 26(4), 395–418. https://doi.org/10.1023/a:1026362829781

Sörqvist, P. (2016). Grand challenges in environmental psychology. *Frontiers in Psychology*, 583. https://doi.org/10.3389/fpsyg.2016.00583

Sovacool, B. (2012). The political economy of energy poverty: A review of key challenges. *Energy for Sustainable Development*, 16, 272-282. https://doi.org/10.1016/J.ESD.2012.05.006.

Srikandam, R., Lübbers, S., Kreidelmeyer, S., Bornemann, M., Hobohm, J. (2023): *LNG-Bedarf für die deutsche Energieversorgung im Prozess des Übergangs zur Klimaneutralität.* Studie im Auftrag der Wissenschaftsplattform Klimaschutz. Berlin. https://www.wissenschaftsplattform-klimaschutz.de/files/WPKS-Studie-LNG-Bedarfe.pdf

Stapor, K. (2020). Descriptive and Inferential Statistics. *Introduction to Probabilistic and Statistical Methods with Examples in R.*, 63-131. https://link.springer.com/book/10.1007/978-3-030-45799-0

Star, S. A. (1952). What the public thinks about mental health and mental illness: A paper. *National Opinion Research Center. https://www.norc.org/content/dam/norc-org/pdfs/StarS_What_Public_Thinks_1952.pdf*

Statista Research Department. (2024). *Kraftstoffe: Durchschnittspreise bis 14. Januar 2024.* Statista. Retrieved January 11, 2024, from

https://de.statista.com/statistik/daten/studie/1299261/umfrage/tagesdurchschnittspreise-von-kraftstoffen-in-deutschland/

Statistical & Qualitative Data Analysis Software: about Qualtrics. (2023, November 29). https://libguides.library.kent.edu/statconsulting/qualtrics

Steg, L., Perlaviciute, G., & van der Werff, E. (2015). Understanding the human dimensions of a sustainable energy transition. *Frontiers in psychology*, *6*, 805. https://doi.org/10.3389/fpsyg.2015.00805

Stern, R. (2022, October 24). Energy crisis: Quarter of German companies "plan to cut jobs." *The Local Germany*. https://www.thelocal.de/20221024/energy-crisis-quarter-of-german-companies-plan-to-cut-jobs

Surwillo, I. (2023). Reflections on the Energy Crisis in Europe. Progressive Yearbook 2023, 107-113. https://feps-europe.eu/wp-content/uploads/2023/01/Progressive-Yearbook-2023.pdf

Szymańska, E. J., Kubacka, M., & Polaszczyk, J. (2023). Households' Energy Transformation in the Face of the Energy Crisis. *Energies*, *16*(1), 466. https://doi.org/10.3390/en16010466

Tagesspiegel. (2023, November 27). Angst um Energie- und Altersversorgung: Fast die Hälfte der Bundesbürger fürchtet Verschlechterung ihrer Lage. *Tagesspiegel. https://www.tagesspiegel.de/gesellschaft/angst-um-energie-und-altersversorgung-fast-die-halfte-der-bundesburger-furchtet-verschlechterung-ihrer-lage-10841398.html*

Tamme, K. (2022, November 18). Nord Stream 1 und 2: Das Tauziehen ums Gas aus Russland. *NDR.de - Geschichte - Orte.* https://www.ndr.de/geschichte/schauplaetze/Nord-Stream-1-und-2-Das-Tauziehen-ums-Gas-aus-Russland,nordstream622.html

Tanveer, A., Zeng, S., Irfan, M., & Peng, R. (2021). Do perceived risk, perception of Self-Efficacy, and openness to technology matter for solar PV adoption? An application of the extended theory of planned behavior. *Energies*, *14*(16), 5008. https://doi.org/10.3390/en14165008

Terpstra, T. (2011). Emotions, trust, and perceived risk: affective and cognitive routes to flood preparedness behavior. *Risk Analysis*, *31*(10), 1658–1675. https://doi.org/10.1111/j.1539-6924.2011.01616.x

Veer, I., Riepenhausen, A., Zerban, M., et al. (2020). Psycho-social factors associated with mental resilience in the Corona lockdown. *Translational Psychiatry*, 11. https://doi.org/10.1038/s41398-020-01150-4

Vicente-Molina, M. A., Fernández–Sainz, A., & Izagirre-Olaizola, J. (2013). Environmental knowledge and other variables affecting pro-environmental behaviour: comparison of university students from emerging and advanced countries. *Journal of Cleaner Production*, *61*, 130–138. https://doi.org/10.1016/j.jclepro.2013.05.015

Vuković, D., Jurić, B., & Ojdenić, R. (2014). Consumer Behaviour when Purchasing Household Appliances from the Aspect of Energy Consumption in the Times of Crisis. *Collegium antropologicum, 38(1),* 59-70. https://www.researchgate.net/publication/289608259_Consumer_behaviour_when_purchasing_household_appliances_from_the_aspect_of_energy_consumption_in_the_times_of_crisis

Wagner, L., Ross, I., Foster, J., & Hankamer, B. (2016). Trading Off Global Fuel Supply, CO2 Emissions and Sustainable Development. *PLoS ONE, 11.* https://doi.org/10.1371/journal.pone.0149406

Wang, W., & Belardo, S. (2009). The role of knowledge management in achieving effective crisis management: a case study. *Journal of Information Science*, 35, 635 - 659. https://doi.org/10.1177/0165551509104234.

Wang, X., & Cheng, Z. (2020). Cross-sectional studies: strengths, weaknesses, and recommendations. *Chest*, *158*(1), S65-S71. https://doi.org/10.1016/j.chest.2020.03.012

Wang, Z., Zhang, B., & Li, G. (2014). Determinants of energy-saving behavioral intention among residents in Beijing: Extending the theory of planned behavior. *Journal of Renewable and Sustainable Energy*, *6*(5). https://doi.org/10.1063/1.4898363

Werfel, S. (2017). Household behaviour crowds out support for climate change policy when sufficient progress is perceived. *Nature Climate Change*, 7, 512-515. https://doi.org/10.1038/NCLIMATE3316.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66*(5), 297–333. https://doi.org/10.1037/h0040934

Wilkinson, P., Smith, K., Joffe, M., & Haines, A. (2007). A global perspective on energy: health effects and injustices. *The Lancet*, 370, 965-978. https://doi.org/10.1016/S0140-6736(07)61252-5

Williams, S. E., Ford, J. H., & Kensinger, E. A. (2022). The power of negative and positive episodic memories. *Cognitive, Affective, & Behavioral Neuroscience*, *22*(5), 869–903. https://doi.org/10.3758/s13415-022-01013-z

Wolff, G. & Gritz, A.(2023, November 14). Gas and energy security in Germany and central and Eastern Europe. *DGAP.* https://dgap.org/en/research/publications/gas-and-energy-security-germany-and-central-and-eastern-europe-0

Zaidan, E., Ghofrani, A., & Dokaj, E. (2021). Analysis of Human-Building Interactions in Office Environments: to What Extent Energy Saving Boundaries can be Displaced? *Frontiers in Energy Research*, *9*. https://doi.org/10.3389/fenrg.2021.715478

Zakeri, B., Paulavets, K., Barreto-Gomez, L., Echeverri, L. G., Pachauri, S., Boza-Kiss, B., Zimm, C., Rogelj, J., Creutzig, F., Ürge-Vorsatz, D., Victor, D. G., Bazilian, M., Fritz, S., Gielen, D., McCollum, D., Srivastava, L., Hunt, J. D., & Pouya, S. (2022). Pandemic, war, and global energy transitions. *Energies*, *15*(17), 6114. https://doi.org/10.3390/en15176114

Zander, C., Bellan, J., & Giesel, J. (2024). *Wie hart trifft Deutschland die Energiekrise?* FAZ.NET. Retrieved January 2, 2024, from https://www.faz.net/aktuell/wirtschaft/zahlen-zu-strom-und-gas-wie-hart-die-krise-deutschland-trifft-18232227.html

Zhao, H. (2019). Energy Crisis. *The Economics and Politics of China's Energy Security Transition*. https://doi.org/10.1016/b978-0-12-815152-5.00004-x

Zsóka, Á., Szerényi, Z. M., Széchy, A., & Kocsis, T. (2013). Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *Journal of Cleaner Production*, *48*, 126–138. https://doi.org/10.1016/j.jclepro.2012.11.030

Appendix A: Qualtrics Survey

Introduction

Thank you for participating in this 7-minute survey on the energy crisis!
Rising heating costs, fuel costs, electricity prices, and inflation - These are all consequences of the 2021/2022 energy crisis, which are still affecting German households, especially this upcoming winter.

My name is Lara Dinkel and, as part of my master's thesis at Universidade Católica Portuguesa, I am conducting the following survey to explore the role of individual factors, such as subjective knowledge and self-efficacy in dealing with energy matters.

Important: This study consists of answering questions on your past behavior and your beliefs about yourself and the energy crisis. There are no right or wrong answers. Please answer the questions truthfully according to your personal feelings. Your data will be treated **anonymously and confidentially** and will be used solely for this research. Aggregated data (never individual data) might be published or presented in scientific meetings. You may give up your participation at any moment. There are no expected side effects from participating in this study beyond the expected effects of looking at a screen for about 7 minutes.
The option to enter the raffle for a **€50 Amazon voucher** awaits you at the end. The personal data collected here cannot be traced back to their answers.

This research is supervised by Dr. Filipa de Almeida (filipadealmeida@ucp.pt). If you have any further questions or want to know more about the results of this survey, please feel free to reach out to s-ldinkel@ucp.pt

Do you wish to participate?
- o Yes
- o Nein

Thank you for accepting to participate in my study. Kindly answer the following questions to the best of your knowledge.

Energy Crisis General (G)

Instructions	Item Nr.	Construct / Item Name	Item	Answer Options
Please select your level of agreement on a scale from "Strongly disagree" to "Strongly agree".	1.	**G1**	I felt affected by the energy crisis or have experienced its effects.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
Please select all answer options that apply to you.	2.	**G2**	I felt affected by the following effects of the energy crisis: a. Rising heating costs b. Rising fuel costs c. Rising electricity	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree

			prices d. Decreased purchasing power (Inflation)	o Strongly agree
	3.	**G3**	What measures to counteract the effects of the energy crisis have you taken so far? (multiple selections possible)	o Reduced heating o Modification of heating technology o Modification of heat insulation o Reduced use of cars o Increased use of public transport o Saving electricity with household appliances or lighting o Own power generation (e.g. photovoltaics or wind power) o Reduced consumption behavior away from home o Reduced travel activities Greater savings on purchases o Reduced use of hot water o Other, please state _____ o None so far
	4.	**G4**	What were your main sources for keeping up to date with the energy crisis?	o Radio o Podcast o Television o Internet o Newspaper o Magazines o Social Media o Acquaintances/friends/family/ neighbors o Political actors o Other, please state _____ o None so far
Please select your level of agreement on a scale from "Strongly disagree" to "Strongly agree".	5.	**G5**	In general, I feel sufficiently informed by the media about the energy crisis and how to deal with its effects.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree

	6.	**G6**	In general, I felt sufficiently informed and supported by the political actors during the energy crisis.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	7.	**G7**	In general, the energy crisis had a negative impact on my trust in political actors.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	8.	**G8**	Compared to most other people I am familiar with subsidiary policies, that deal with energy consumption for private households.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
Please select all answer options that apply to you.	9.	**G9**	What would you have wished for from political actors? (multiple selections possible)	o More transparency o More investment in green energy for the future o More financial support for private households (e.g. heating subsidy as a permanent right) o Greater reduction in energy prices for private households o Increased promotion of energy-saving measures (e.g. subsidies for the construction of photovoltaic systems for households) o Other, please state _____ o None so far

Crisis Savings Behavior (CSB)

Instructions	Item Nr.	Construct / Item Name	Item	Answer Options
Please select your level of agreement on a scale from "Strongly disagree" to "Strongly agree".	10.	**CSB1**	Based on the energy crisis 21/22, I have taken increased measures to engage in energy-saving and cost-reducing behavior.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	11.	**CSB2**	Based on the energy crisis 21/22, it has been important to me to reduce my energy costs and consumption.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	12.	**CSB3**	In the future, I want to take increased measures to engage in energy-saving and cost-reducing behavior.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	13.	**CSB4**	For the future, it is important to me to take increased measures to reduce my energy costs and consumption.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree

Crisis Self-Efficacy (CSE)

Instructions	Item Nr.	Construct/ Item Name	Item	Answer Options
Please select your level of agreement on a scale from "Strongly disagree" to "Strongly agree".	14.	**CSE1**	I am certain I have the ability to take necessary action to protect myself during a crisis.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	15.	**CSE2**	I am able to use resources effectively during a crisis.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree

				o Rather agree o Agree o Strongly agree
	16.	**CSE3**	During a crisis, I can achieve most of the goals that I have set for myself.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	17.	**CSE5**	During a crisis, I can usually handle whatever comes my way.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree

Attention Check (AC)

Please select 'Strongly agree' to demonstrate your attention.		**AC**		o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree

Subjective Crisis Knowledge (SCK)

Instructions	**Item Nr.**	**Construct/ Item Name**	**Item**	**Answer Options**
Please select your level of agreement on a scale from "Strongly disagree" to "Strongly agree".	18.	**SCK1**	I know quite a lot about the reasons and consequences of the energy crisis.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	19.	**SCK2**	I do not feel very knowledgeable about the energy crisis. *(reverse coded)*	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree

	20.	**SCK3**	Among my circle of friends, I'm one of the "experts" on the energy crisis.	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	21.	**SCK4**	Compared to most other people, I know less about the energy crisis. *(reverse coded)*	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree
	22.	**SCK5**	When it comes to the reasons and consequences of the energy crisis, I really don't know a lot. *(reverse coded)*	o Strongly disagree o Disagree o Somewhat disagree o Neither agree nor disagree o Rather agree o Agree o Strongly agree

Demographic Characteristics (D)

Instructions	**Item Nr.**	**Construct/ Item Name**	**Item**	**Answer Options**
Finally, we would like to ask you for details about yourself. Please select all answer options that apply to you.	23.	**D1**	What gender do you identify with?	o Woman o Man o Non-binary o Other, please state _____
	24.	**D2**	What is your age in years?	___ Years
	25.	**D3**	Are you currently living in Germany?	o Yes o No
	26.	**D4**	What is the highest level of education you have reached?	o No school-leaving qualification o Lower secondary school diploma o Secondary school diploma o High school diploma / A levels o Completed vocational training o Bachelor degree

				o Master degree o Doctor o Other, please state _____
	27.	**D5**	What was your state of employment during the energy crisis 21/22?	o Full-time o Part-time o Retired o Unemployed / Job-seeking o I prefer not to answer
	28.	**D6**	What was your household's monthly income after taxes (net) in 2022?	o No income o Up to 999€ o 1.000€ to 2.999€ o 3.000€ to 4.999€ o 5.000€ to 6.999€ o 7.000€ and over o I prefer not to answer
	29.	**D7**	How many people (including yourself) were living in your household during the energy crisis 21/22?	o Only me o 2 o 3 o 4 o More than 4
	30.	**D8**	How many children were living in your household during the energy crisis 21/22?	o 0 o 1 o 2 o 3 o 4-6 o More than 6

Closing

Thank you for your time spent taking this survey!

Would you like to enter the anonymous raffle to win a €50 Amazon voucher?
This is completely **optional**. To enter the raffle, please select "Yes" and enter your **e-mail address** in the following. Your previous answers to the survey cannot be traced back to you. The raffle will take place at random after the research has been completed. In case you win, you will be contacted by e-mail.

o Yes
o Nein

Appendix B: Descriptive Statistics and Frequencies

Demographic Characteristics

Add. Table. *Descriptive Statistics: D2 – Age (N = 394)*

	N	*Minimum*	*Maximum*	*Mean*	*Std. Deviation*
Age	394	18	82	37,69	12,327

Add. Table *Frequency Distribution: D2 – Age (N = 394)*

	Frequencies	*%*
18	6	1,5%
19	4	1,0%
20	7	1,8%
21	2	0,5%
22	7	1,8%
23	9	2,3%
24	6	1,5%
25	9	2,3%
26	20	5,1%
27	9	2,3%
28	21	5,3%
29	13	3,3%
30	12	3,0%
31	12	3,0%
32	17	4,3%
33	20	5,1%
34	15	3,8%
35	26	6,6%
36	20	5,1%
37	5	1,3%
38	12	3,0%
39	5	1,3%
40	8	2,0%
41	10	2,5%
42	4	1,0%
43	6	1,5%
44	4	1,0%
45	7	1,8%
46	8	2,0%
47	2	0,5%
48	3	0,8%
49	3	0,8%
50	3	0,8%
51	5	1,3%
52	7	1,8%
53	5	1,3%
54	6	1,5%
Total	*394*	*100%*

Table 1. *Frequency Distribution: Demographic Characteristics (N =394)*

		Frequencies	*%*
Gender	Woman	188	47,7%
	Man	192	48,7%
	Non-binary	14	3,6%
	Other, please state	0	0,0%
Education	No school diploma	0	0,0%
	Lower secondary school diploma	6	1,5%
	Secondary school diploma	36	9,1%
	High school diploma / A levels	65	16,5%
	Completed vocational training	67	17,0%
	Bachelor degree	115	29,2%
	Master degree	84	21,3%
	Doctor	14	3,6%
	Other, please state	7	1,8%

Employment	Full-time working	228	57,9%
	Part-time working	70	17,8%
	Retired	15	3,8%
	Unemployed / Job seeking	15	3,8%
	Studying	54	13,7%
	I prefer not to answer	12	3,0%
Income	No income	13	3,3%
	Up to 900€	17	4,3%
	1.000€ to 2.999€	76	19,3%
	3.000€ to 4.999€	125	31,7%
	5.000€ to 6.999€	73	18,5%
	7.000€ and over	58	14,7%
	I prefer not to answer	32	8,1%
Household size	Only me	55	14,0%
	2	87	22,1%
	3	151	38,3%
	4	74	18,8%
	More than 4	27	6,9%
Children	0	169	42,9%
	1	137	34,8%
	2	80	20,3%
	3	7	1,8%
	More than 3	1	0,3%

Other Characteristics

Table 6. *Frequency Distribution: G1 – Crisis Experience (N =394)*

		Frequencies	*%*
I felt affected by the energy crisis or have experienced its effects.	Strongly disagree	1	0,3%
	Disagree	4	1,0%
	Somewhat disagree	20	5,1%
	Neither agree nor disagree	24	6,1%
	Somewhat agree	70	17,8%
	Agree	142	36,0%
	Strongly agree	133	33,8%

Table 2. *Frequency Distribution: G2 – Effects Experienced (N =394)*

			Frequencies	*%*
I felt affected by the energy crisis or have experienced its effects.	Rising heating costs	Strongly disagree	1	0,3%
		Disagree	7	1,8%
		Somewhat disagree	16	4,1%
		Neither agree nor disagree	18	4,6%
		Somewhat agree	60	15,2%
		Agree	153	38,8%
		Strongly agree	139	35,3%

Rising fuel costs	Strongly disagree	11	2,8%
	Disagree	13	3,3%
	Somewhat disagree	14	3,6%
	Neither agree nor disagree	12	3,0%
	Somewhat agree	52	13,2%
	Agree	118	29,9%
	Strongly agree	174	44,2%
Rising electricity prices	Strongly disagree	4	1,0%
	Disagree	6	1,5%
	Somewhat disagree	7	1,8%
	Neither agree nor disagree	13	3,3%
	Somewhat agree	62	15,7%
	Agree	162	41,1%
	Strongly agree	140	35,5%
Decreased purchasing power (Inflation)	Strongly disagree	2	0,5%
	Disagree	15	3,8%
	Somewhat disagree	11	2,8%
	Neither agree nor disagree	24	6,1%
	Somewhat agree	60	15,2%
	Agree	123	31,2%
	Strongly agree	159	40,4%

Add. Table. *Frequency Distribution: G3 – Measures Taken (N =394)*

		Frequencies	*%*	*% of Cases*
What measures to counteract the effects of the energy crisis have you taken so far? (multiple selections possible)	Reduced heating	179	10,6%	45,4%
	Modification of heating technology	116	6,9%	29,4%
	Modification of heat insulation	93	5,5%	23,6%
	Reduced use of cars	218	12,9%	55,3%
	Increased use of public transport	177	10,5%	44,9%
	Saving electricity with household appliances or lighting	227	13,5%	57,6%
	Own power generation (e.g. photovoltaics or wind power)	108	6,4%	27,4%
	Reduced consumption behavior away from home	164	9,7%	41,6%
	Reduced travel activities	147	8,7%	37,3%
	Greater savings on purchases	129	7,7%	32,7%
	Reduced use of hot water	108	6,4%	27,4%

	Other, please state	12	0,7%	3,0%
	None so far	8	0,5%	2,0%
Total		*1686*	*100%*	*427,9%*

Add. Table. *Frequency Distribution: G4 – Sources of Information (N =394)*

		Frequencies	*%*	*% of Cases*
What were your main sources for keeping up to date with the energy crisis? (multiple selctions possible)	Radio	105	7,7%	26,6%
	Podcast	91	6,7%	23,1%
	Television	224	16,5%	56,9%
	Internet	295	21,7%	74,9%
	Newspaper	180	13,2%	45,7%
	Magazines	68	5,0%	17,3%
	Choice Social Media	187	13,8%	47,5%
	Acquaintances/ friends/ family/ neighbors	135	9,9%	34,3%
	Political actors	69	5,1%	17,5%
	Other, please state	4	0,3%	1,0%
	None so far	2	0,1%	0,5%
Total		*1360*	*100%*	*345,2%*

Add. Table. *Frequency Distribution: G5 – Informed by Media (N =394)*

		Frequencies	*%*
In general, I feel sufficiently informed by the media about the energy crisis and how to deal with its effects.	Strongly disagree	8	2,0%
	Disagree	21	5,3%
	Somewhat disagree	56	14,2%
	Neither agree nor disagree	38	9,6%
	Somewhat agree	115	29,2%
	Agree	102	25,9%
	Strongly agree	54	13,7%

Add. Table. *Frequency Distribution: G6 – Informed & Supported by Political Actors (N =394)*

		Frequencies	*%*
In general, I felt sufficiently informed and supported by the political actors during the energy crisis.	Strongly disagree	30	7,6%
	Disagree	44	11,2%
	Somewhat disagree	67	17,0%
	Neither agree nor disagree	60	15,2%
	Somewhat agree	95	24,1%
	Agree	61	15,5%
	Strongly agree	37	9,4%

Add. Table. *Frequency Distribution: G7 – Trust in Political Actors (N =394)*

		Frequencies	*%*
In general, the energy crisis had a negative impact on my trust in political actors.	Strongly disagree	8	2,0%
	Disagree	12	3,0%
	Somewhat disagree	19	4,8%
	Neither agree nor disagree	47	11,9%
	Somewhat agree	117	29,7%
	Agree	113	28,7%
	Strongly agree	78	19,8%

Add. Table. *Frequency Distribution: G8 – Familiar with Subsidies (N =394)*

		Frequencies	*%*
Compared to most other people I am familiar with subsidiary policies, that deal with energy consumption for private households.	Strongly disagree	16	4,1%
	Disagree	31	7,9%
	Somewhat disagree	58	14,7%
	Neither agree nor disagree	55	14,0%
	Somewhat agree	109	27,7%
	Agree	78	19,8%
	Strongly agree	47	11,9%

Table 7. *Frequency Distribution: G9 – Wishes from Political Actors (N =394)*

		Frequencies	*%*	*% of Cases*
What would you have wished for from political actors? (multiple selections possible)	More transparency	207	17,9%	52,5%
	More investment in green energy for the future	214	18,5%	54,3%
	More financial support for private households (e.g. heating subsidy as a permanent right)	225	19,5%	57,1%
	Greater reduction in energy prices for private households	240	20,8%	60,9%
	Increased promotion of energy-saving measures (e.g. subsidies for the construction of photovoltaic systems for households)	247	21,4%	62,7%
	Other, please state	22	1,9%	5,6%
	None so far	1	0,1%	0,3%
Total		*1156*	*100%*	*293,4%*