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THE NEW EU ENERGY LABEL FOR SMARTPHONES: PERCEPTION AND INFLUENCE ON PURCHASE DECISIONS AMONG GENERATION Z IN SPAIN

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Abstract

This study examines how Generation Z consumers in Spain perceive the new EU energy label for smartphones and to what extent it influences their purchase decisions. As the European Union extends energy labelling from household appliances to digital devices through Commission Delegated Regulation (EU) 2023/1669, understanding how young consumers interpret and integrate this new information into their decision-making has become particularly relevant. To address this, the research adopts a mixed-method approach combining 9 semi-structured interviews and an online questionnaire answered by 94 respondents aged between 18 and 25. The findings reveal that the label remains largely unknown among this generation, that sustainability is consistently rated as the least important purchase factor and that brand loyalty along with battery-related concerns dominate the decision process. While respondents express moderate environmental concern in hypothetical scenarios, this disposition rarely translates into actual behavior, due to limited label visibility, partial comprehension of its secondary parameters and the absence of a financial transmission mechanism comparable to that of household appliances. The study contributes to current discussions on the design and communication of energy labels in digital markets by indicating that, at this stage, the label functions as a residual tiebreaker rather than as a decisive driver of choice. These findings call for complementary visibility strategies – such as in-store explanatory communication and digital adaptations of the label – and point to future research exploring whether contextualizing the label through brief, consumer-facing explanations could meaningfully influence Generation Z’s purchase behavior.

Keywords: Energy labels; Generation Z; Sustainable consumption; Smartphones; Consumer behavior; EU regulation.

Resumen

Este estudio analiza cómo los consumidores de la Generación Z en España perciben la nueva etiqueta energética de la Unión Europea para smartphones y en qué medida esta influye en sus decisiones de compra. A medida que la Unión Europea extiende el etiquetado energético desde los electrodomésticos hacia los dispositivos digitales a través del Reglamento Delegado (UE) 2023/1669, comprender cómo los consumidores jóvenes interpretan e integran esta nueva información en su proceso de decisión adquiere especial relevancia. Para abordar esta cuestión, la investigación adopta un enfoque de métodos mixtos que combina 9 entrevistas semiestructuradas y un cuestionario online respondido por 94 participantes con edades comprendidas entre los 18 y los 25 años. Los resultados revelan que la etiqueta sigue siendo en gran medida desconocida en esta generación, que la sostenibilidad se valora de forma sistemática como el factor de compra menos importante y que la lealtad a la marca, junto con las preocupaciones relacionadas con la batería, dominan el proceso de decisión. Si bien los encuestados expresan una preocupación medioambiental moderada en escenarios hipotéticos, esta predisposición rara vez se traduce en un comportamiento real, debido a la limitada visibilidad de la etiqueta, a la comprensión parcial de sus parámetros secundarios y a la ausencia de un mecanismo de transmisión financiera comparable a los de los electrodomésticos. El estudio contribuye a los debates actuales sobre el diseño y la comunicación de las etiquetas energéticas en los mercados digitales, al señalar que, en esta etapa, la etiqueta funciona como un criterio de desempate residual más que como un impulsor decisivo de la elección. Estos hallazgos ponen de manifiesto la necesidad de estrategias complementarias de visibilidad – como la comunicación explicativa en el punto de venta y las adaptaciones digitales de la etiqueta – y señalan futuras líneas de investigación orientadas a analizar si contextualizar la etiqueta mediante explicaciones breves dirigidas al consumidor podrían influir de manera significativa en el comportamiento de compra de la Generación Z.

Palabras clave: Etiquetas energéticas; Generación Z; Consumo sostenible; Smartphones; Comportamiento del consumidor; Regulación de la UE.

2. Introduction

In recent years, the European Union has progressively reinforced its sustainability agenda by introducing regulatory instruments designed to guide both manufacturers and consumers toward more energy-efficient choices. Among these instruments, energy labels have played a particularly visible role, providing standardized information at the point of sale and allowing energy performance to be considered alongside other purchase criteria (Boyano et al., 2020; Kamaludin et al., 2025). Although the labelling system was originally developed for household appliances such as refrigerators or washing machines, its scope has recently been extended to electronic devices through Commission Delegated Regulation (EU) 2023/1669, which has made energy labelling mandatory for new smartphones sold in the European market since June 2025. This expansion reflects a broader shift in EU policy, in which information-based instruments are applied to product categories characterized by high innovation rates and short replacement cycles (Kesselring, 2025).

Previous research has highlighted both the potential and the limitations of energy labels as policy tools. Several studies show that labels can effectively shift consumer choices toward more efficient products and incentivize manufacturers to redesign their offer when the information is salient and easy to compare (Doganoglu et al., 2025; Boyano et al., 2020). However, their effectiveness is conditional on factors such as label design, prior consumer knowledge and the broader context of the purchase decision (Elsen & Leenheer, 2022; De Ayala et al., 2020). Beyond these design considerations, the literature also documented a recurrent gap between environmental attitudes and actual purchasing behavior, particularly when sustainable options are perceived as more expensive, less convenient or harder to interpret (Gaspar & Antunes, 2011; Skourtos et al., 2021).

Despite this growing body of research, the extension of energy labelling to digitally intensive products remains underexplored. Most existing studies focus on durable appliances with stable usage patterns and direct financial implications for consumers, leaving products such as smartphones outside the analytical frame (Kesselring, 2025). This gap is particularly relevant in the case of Generation Z, a cohort that has grown up with smartphones as the center of daily life and that frequently expresses pro-environmental values without consistently translating them into purchasing behavior (Walters, 2021; Brîndusa et al., 2024). The interaction between standardized environmental information and technology-driven motivations in this segment therefore raises important questions about whether the new EU smartphone energy label can effectively shape consumer choices.

The main objective of this study is to analyze how young consumers in Spain perceive the new EU energy label for smartphones and to what extent this label influences their purchase decisions. More specifically, the research aims to identify the level of awareness and understanding of the label among Generation Z, to compare its relative weight against other decision factors such as brand, price or technical features, and to examine the conditions under which environmental information becomes relevant, or remains residual, within the smartphone purchasing process.

To address these objectives, the study adopts a mixed-method approach combining qualitative and quantitative techniques. The qualitative phase is based on 9 semi-structured interviews aimed at exploring participants' perceptions, reasoning and interpretations of the label, while the quantitative phase consists of an online questionnaire answered by 94 respondents aged between 18 and 25, designed to identify broader patterns and trends. This combination allows for a more comprehensive understanding of how young Spanish consumers evaluate the new label and integrate it into their decision-making.

The remainder of this thesis is structured as follows. The next chapter presents the theoretical framework, reviewing existing literature on energy labelling, consumer behavior and Generation Z. This is followed by the research methodology, including sample selection, data collection and analysis techniques. The qualitative and quantitative results are then presented and discussed in relation to literature. Finally, the thesis concludes with the main findings, study limitations and directions for future research.

3. Theoretical framework

3.1 Energy labels: origin, evolution and European regulatory framework

The European Union established energy labels as a regulatory instrument specifically designed to reduce information asymmetries between producers and consumers in markets for energy-related products (Kamaludin et al., 2025). The primary objective of this framework has been to provide consumers with reliable information on energy performance at the point of sale, allowing energy efficiency to be considered alongside other purchase criteria (Boyano et al., 2020). In parallel, energy labels were conceived as a market-based policy tool capable of influencing manufacturers' incentives by making energy performance visible and comparable across products (Kamaludin et al., 2025).

As technological progress accelerated during the 2000s, the original A–G energy efficiency scale gradually lost its capacity to differentiate effectively between products, as a growing share of appliances concentrated in the highest efficiency classes (Boyano et al., 2020). To address this issue, additional classes (A+, A++, A+++) were introduced between 2003 and 2010 with the aim of preserving differentiation among top-performing products (Boyano et al., 2020; Kamaludin et al., 2025). However, subsequent research indicates that this extension of the scale often compromised label clarity, making it more difficult for consumers to correctly interpret efficiency differences (Kamaludin et al., 2025). Boyano et al. (2020) argue that, rather than improving consumer understanding, the multiplication of top-rated classes weakened the original signaling function of the label.

In response to these limitations, the European Union adopted Regulation (EU) 2017/1369, which established a revised framework for energy labelling and mandated a return to a simplified A–G scale. The regulation aimed to recover the communicative effectiveness of the label by ensuring that the highest efficiency classes would remain largely unoccupied at the time of introduction, thus providing room for future technological progress (Regulation (EU) 2017/1369). Kesselring (2025) emphasizes that this reform reflects a broader shift in EU energy policy, in which label design is increasingly used to shape market outcomes rather than merely inform consumers.

The significance of this regulatory shift is supported by empirical evidence. Doganoglu et al. (2025) find that the introduction of the rescaled energy label in 2021 contributed to improvements in the average energy efficiency of appliances sold in several

EU countries, although the magnitude of this effect varies across national contexts. At the same time, Kesselring (2025) highlights that the impact of energy labels depends on factors such as consumer trust and comprehension, which condition how regulatory information is interpreted. Within this policy context, the extension of energy labelling to smartphones and slate tablets through Commission Delegated Regulation (EU) 2023/1669 represents a further stage in the evolution of EU energy policy, applying the established logic of energy labels to technologically complex devices characterized by rapid innovation cycles (Regulation (EU) 2023/1669; Kamaludin et al., 2025).

3.2 Extension of energy labelling to electronic devices

The extension of energy labelling to electronic devices represents a significant departure from its traditional application to household appliances with relatively stable usage patterns and easily measurable energy consumption (Schischke et al., 2023). Unlike products such as refrigerators or washing machines, electronic devices, particularly computers, smartphones and tablets, are characterized by a wide range of configurations, usage profiles and performance requirements, which complicates the assessment and communication of energy efficiency (Rückschloss et al., 2024), meaning that the transfer of the energy label framework to this product category has required substantial methodological and regulatory adaptation.

One of the central challenges identified in the literature concerns the heterogeneity of electronic devices sold under the same model name. Rückschloss et al. (2024) demonstrate that computers, and by extension other digital devices, can be marketed with multiple hardware configurations that differ significantly in terms of energy consumption and performance, despite sharing a common product identifier. This high degree of variability creates difficulties for energy labelling, as testing and labelling every possible configuration would be impractical for manufacturers and regulators alike (Rückschloss et al., 2024). To address this, Schischke et al. (2023) argue that this challenge has required the development of simplified testing approaches that seek to balance scientific accuracy with regulatory feasibility. To synthesize the main differences identified in the literature, Table 1 provides a comparative overview of the key dimensions along which energy labelling for traditional appliances and electronic devices diverges.

Table 1. *Comparative overview of energy labelling challenges in traditional appliances and electronic devices.*

Dimensions	**Traditional appliances**	**Electronic devices (smartphones, tablets)**
Usage patterns	Relatively usage patterns (Schischke et al., 2023)	High variable; heavily dependent on user behavior, software optimization and usage intensity (Schischke et al., 2023)
Product configurations	Generally homogeneous within a model	Multiple hardware configurations under the same model name, with significant differences in consumption (Rückschloss et al., 2024)
Energy measurement	Relatively easily measurable energy consumption (Schischke et al., 2023)	Requires simplified testing approaches that balance accuracy and feasibility (Schischke et al., 2023)
Label content	Focused primarily on energy consumption during use	Multidimensional: energy efficiency, battery endurance, durability, repairability, resistance to physical stress (Regulation (EU) 2023/1669)
Cognitive demand on consumers	Single, easily comparable metric	Requires interpretation and integration of multiple indicators (Kesselring, 2025)

Source: *Own elaboration based on Schischke et al. (2023), Rückshloss et al. (2024), Kesselring (2025) and Commission Delegated Regulation (EU) 2023/1669.*

Beyond technical measurement issues, the literature also underscores the importance of adapting energy labels to the way consumers interact with electronic devices. Schischke et al. (2023) emphasize that energy consumption in electronic products is highly dependent on user behavior, software optimization and usage intensity, factors that are less relevant in traditional appliance categories. Consequently, energy efficiency metrics for electronic devices aim to capture average or representative usage scenarios rather than actual real-life consumption for each individual user (Rückschloss et al., 2024). As noted in the research, this introduces an additional layer of abstraction that may affect consumer understanding of the label's meaning.

Beyond the challenge of defining comparable testing methodologies, the extension of energy labelling to smartphones and tablets also implies a shift in the type of information communicated to consumers. Unlike traditional appliance labels, which focus primarily on energy consumption during use, the EU energy label for mobile devices incorporates a broader set of performance dimensions, including energy efficiency, battery endurance, durability, reparability and resistance to physical stress (Commission Delegated Regulation (EU) 2023/1669). This multidimensional approach reflects an attempt to align energy labelling with the environmental profile of products characterized by frequent replacement cycles and intensive daily use (Kesselring, 2025). However, by expanding the scope of what is measured and displayed, the label also increases the cognitive demands placed on consumers, who are required to interpret and integrate multiple indicators rather than a single, easily comparable metric (Kesselring, 2025). As a result, the informational richness of the label may simultaneously enhance its environmental relevance and complicate its practical use in real-world purchasing decisions.

From a policy perspective, Kesselring (2025) interprets the extension of energy labelling to electronic devices as part of a broader strategic shift in EU sustainability regulation, whereby information-based instruments are increasingly applied to sectors with high innovation rates and short product lifecycles. According to Kesselring (2025), this expansion reflects the growing environmental relevance of digital devices, driven not only by their direct energy consumption, but also by their rapid replacement cycles and increasing market penetration. In this context, the inclusion of smartphones and tablets within the scope of EU energy labelling can be seen as an attempt to align consumer information tools with evolving consumption patterns in digital markets (Schischke et al., 2023; Rückschloss et al., 2024).

3.3 Consumer behavior toward environmental information and labelling

Current research regarding consumer behavior toward environmental information consistently demonstrates that energy labels are not processed as purely technical data, but rather as “heuristic cues” that simplify complex evaluations at the point of decision-making (Skourtos et al., 2021). Instead of engaging in a detailed analysis of energy consumption figures, consumers tend to rely on salient elements of the label, such as efficiency classes or visual design, to form quick judgments about product sustainability (Skog & Sörqvist, 2025). Consequently, the effectiveness of energy labels depends not only on the accuracy of the information provided, but also on how this information is cognitively perceived and interpreted by consumers (Elsen & Leenheer, 2022).

A critical challenge identified in the literature is that environmental information competes with other decision-making criteria, including price, brand reputation and perceived product quality (Bartiaux, 2008; Gaspar & Antunes, 2011). Bartiaux (2008) argues that even environmentally concerned consumers may prioritize economic or functional considerations when the perceived trade-offs are substantial. Similarly, Gaspar and Antunes (2011) find that environmental attitudes do not automatically translate into pro-environmental purchasing behavior, particularly when sustainable options are perceived as more expensive or less convenient. This divergence between attitudes and actual behavior is widely described as the “value–action gap” in sustainable consumption research (Skourtos et al., 2021).

From a theoretical perspective, this gap can be interpreted through the Theory of Planned Behavior (Ajzen, 1991). Ajzen (1991) states that behavior is preceded by behavioral intention, which is determined by attitudes toward the behavior, subjective norms, and perceived behavioral control. Attitude is defined as “the degree to which a person has a favorable or unfavorable evaluation of the behavior in question” (Ajzen, 1991, p. 188) and is formed on the basis of underlying behavioral beliefs about expected outcomes. Within this framework, environmental information may influence purchasing decisions insofar as it contributes to the formation or modification of beliefs regarding the environmental consequences of buying a specific product. However, Ajzen (1991) also emphasizes that only salient and cognitively accessible beliefs are likely to influence attitudes and intentions. This theoretical assumption is consistent with empirical findings showing that consumers rely primarily on accessible visual cues rather than engaging in analytical processing of technical data (Skog & Sörqvist, 2025).

Empirical evidence further indicates that the impact of energy labels is conditional and moderated by individual factors. Beck and Toulouse (2023) demonstrate that the presence of an energy label can enhance the perceived ecological value of a product, which in turn positively affects purchase intention, although this effect depends on correct interpretation. Elsen and Leenheer (2022) similarly emphasize that the impact of sustainability labels is moderated by prior knowledge and involvement, noting that more engaged consumers show higher responsiveness to environmental information.

Recent studies have further revealed that energy labels may generate unintended psychological effects. Stasiuk and Maison (2022) find that the introduction of new or unfamiliar label formats can increase perceived social or functional risk, particularly when consumers are uncertain about how to interpret efficiency classes. This perception of risk may weaken purchase intention, even when the product is objectively more energy efficient (Stasiuk & Maison, 2022). In contrast, Skog and Sörqvist (2025) demonstrate that design elements such as color coding and scale range play a crucial role in stabilizing consumer judgments, as they provide contextual cues that help consumers make relative comparisons between products.

From a broader policy perspective, Kesselring (2025) argues that consumer responses to energy labels should be understood within an institutional and informational environment shaped by trust, familiarity and regulatory credibility. According to Kesselring (2025), labels are more likely to influence behavior when consumers perceive them as reliable and when the "informational burden" imposed by the label remains manageable. In this sense, energy labels act as behavioral nudges whose effectiveness is contingent upon both individual cognitive processes and the broader regulatory framework in which they are embedded (De Ayala et al., 2020; Kesselring, 2025).

Finally, consumer responses to environmental information are not homogeneous. Wedel and Kamakura (2000) argue that systematic differences in demographic, psychographic, and behavioral characteristics generate variation in information processing and decision-making across market segments. From this segmentation perspective, the influence of energy labels on attitudes and intentions may differ depending on environmental involvement, product knowledge, and price sensitivity. This provides a theoretical basis for examining generational differences, including potential variations in how Generation Z interprets and integrates environmental information into purchasing decisions.

3.4 Generation Z: characteristics, values and technological consumption habits

The emergence of Generation Z, typically defined as individuals born between the late 1990s and the early 2010s, has introduced new dynamics into the study of sustainable consumption. Unlike previous cohorts, Generation Z is frequently characterized in the literature as the first generation to grow up with a heightened awareness of environmental and social issues, shaped by early exposure to digital information, climate discourse and sustainability narratives (Walters, 2021). Several studies indicate that members of this generation tend to express strong pro-environmental values and a preference for brands perceived as responsible or transparent (Andruszkiewicz et al., 2023; Bełch et al., 2024). However, research suggests that this value orientation does not necessarily imply consistent pro-environmental behavior across all consumption contexts, particularly in markets where functional performance and personal relevance are highly salient (Walters, 2021).

Research focusing on Generation Z's purchasing behavior reveals a recurring tension between declared values and actual decision-making. Andruszkiewicz et al. (2023) demonstrate that while environmental concern is frequently reported as important, it is often ranked below factors such as price, perceived usefulness and prior experience when concrete trade-offs arise. Similarly, Bełch et al. (2024) find that, in the context of electronic products, durability, expected lifespan and brand familiarity tend to overshadow environmental labels in shaping final purchase decisions. These findings indicate that sustainability functions more as a secondary evaluative criterion rather than as a dominant driver of choice for many Generation Z consumers (Bełch et al., 2024).

The technological consumption habits of Generation Z further complicate the relationship between sustainability values and behavior. Brîndușa et al. (2024) emphasize that smartphones and digital devices occupy a central role in the daily lives of younger consumers, serving not only functional purposes but also social, symbolic and identity-related functions. Consequently, purchasing decisions in this category are often influenced by design, perceived innovation and peer comparison, which can diminish the relative importance of environmental considerations (Brîndușa et al., 2024). Walters (2021) argues that this strong emotional and social attachment to technology may explain why environmentally motivated intentions do not consistently translate into more sustainable choices in high-involvement product categories.

Despite these barriers and limitations, the literature also points to specific conditions under which sustainability information becomes more impactful for Generation Z. Bełch et al. (2024) note that environmental considerations tend to gain importance when they align with other valued attributes, such as product quality or long-term cost savings. Furthermore, Andruszkiewicz et al. (2023) suggest that clear, credible and easily interpretable information increases the likelihood that sustainability cues are integrated into the decision-making process. From this perspective, Generation Z should not be understood as indifferent to environmental information, but rather as selectively responsive depending on how sustainability is framed and combined with other product attributes (Walters, 2021; Brîndușa et al., 2024).

Taken together, these findings underline the relevance of examining how standardized environmental information interacts with technology-driven motivation in high-involvement digital product categories. Given the central role of smartphones in Generation Z's daily life (Brîndușa et al., 2024), the way in which sustainability signals are interpreted within rapidly evolving technological markets becomes particularly pertinent.

3.5 Previous studies on the influence of energy labels in other product categories

Empirical research concerning the influence of energy labels across various product categories demonstrates that their effects on consumer decision-making are neither uniform nor unconditional. Several studies indicate that energy labels effectively guide consumers toward more energy-efficient products, particularly in categories where energy consumption is salient and comparable across alternatives (Boyano et al., 2020; Doganoglu et al., 2025). For example, empirical evidence from household appliance markets shows that the revision and rescaling of EU energy labels contributed to a measurable shift in the distribution of products sold toward higher efficiency classes (Doganoglu et al., 2025). This suggests that labels can influence market outcomes not only through individual consumer choice but also through manufacturer adaptation and product redesign. However, these effects tend to vary across contexts and remain heavily dependent on how consumers process and prioritize the information provided.

A recurrent finding in the literature is that energy labels rarely operate as a standalone determinant of purchase decisions. Instead, their influence is mediated by other factors such as price sensitivity, perceived product quality and prior habits (Gaspar & Antunes, 2011; Skourtos et al., 2021). Gaspar and Antunes (2011) show that even consumers with positive environmental attitudes may disregard energy information when it conflicts with short-term economic considerations. Skourtos et al. (2021) similarly report that energy labels primarily function as supportive cues rather than decisive drivers, reinforcing preferences that are already aligned with sustainability rather than fundamentally reshaping choices.

Research has also documented significant cognitive and psychological mechanisms that condition the effectiveness of energy labels. Elsen and Leenheer (2022) highlight that consumers' ability to use sustainability labels depends on their prior knowledge and involvement, noting that lower engagement leads to superficial processing of label information. De Ayala et al. (2020) argue that when information complexity exceeds consumers' cognitive capacity, labels may lose effectiveness or even be ignored altogether. These findings imply that the informational benefits of energy labels are strongly dependent on their design and on consumers' capacity to integrate them into simplified decision heuristics (Skourtos et al., 2021).

More recent studies have pointed to potential unintended effects associated with changes in label design. Stasiuk and Maison (2022) find that the introduction of new or unfamiliar energy label formats can increase perceived risk and uncertainty, particularly during transition periods when consumers are exposed to multiple labelling schemes. This increased uncertainty may reduce purchase intention, even when the label objectively signals higher energy efficiency (Stasiuk & Maison, 2022). Kesselring (2025) interprets these findings as evidence that energy labels must be analyzed not only as informational tools, but also as institutional signals whose credibility and familiarity dictate consumer responses.

Overall, the existing literature suggests that energy labels have the potential to influence consumer behavior, but that their impact is highly context dependent. Boyano et al. (2020) emphasize that the effectiveness of energy labelling policies emerges from the complex interaction between regulatory design, market structure and consumer interpretation. Similarly, Kesselring (2025) argues that energy labels should be understood as part of a broader policy mix, whose outcomes depend on behavioral responses rather than on the mere provision of information. Taken together, these studies underline both the relevance of energy labels as a policy instrument and the limits of their influence across different product categories and consumer segments (Doganoglu et al., 2025; Elsen & Leenheer, 2022).

3.6 Research gap and contribution of the present study

The existing literature provides substantial evidence on the role of energy labels as a policy instrument designed to shape consumer behavior and improve market-level energy efficiency outcomes (Boyano et al., 2020; Doganoglu et al., 2025; Kesselring, 2025). Previous research has examined the effectiveness of energy labels across a range of product categories, though the focus has rested primarily on household appliances and other durable goods with relatively stable usage patterns (Skourtos et al., 2021; Gaspar & Antunes, 2011). These studies highlight that while energy labels can influence consumer choices, their impact is contingent upon factors such as label design, consumer understanding and the broader decision context (Elsen & Leenheer, 2022; De Ayala et al., 2020).

Despite this growing body of research, several important gaps remain unaddressed. First, empirical evidence on the influence of energy labels within the specific context of electronic devices, characterized by high innovation rates and short replacement cycles, remains limited. Most existing studies focus on appliances where energy consumption is more salient and easier to compare, leaving digitally intensive products underexplored (Boyano et al., 2020; Kesselring, 2025). It remains unclear to what extent the mechanisms identified in traditional product categories can be transferred to markets such as smartphones and tablets, where symbolic, functional and social attributes play a central role in consumer decision-making.

Second, although consumer behavior toward environmental information has been widely studied, insufficient attention has been paid to generational differences in the interpretation and use of energy labels. While prior research acknowledges that socio-demographic and attitudinal factors shape responses to sustainability information, Generation Z has often been treated as part of broader consumer samples rather than as a distinct group with specific consumption patterns and values (Skourtos et al., 2021; Elsen

& Leenheer, 2022). Given the technological centrality of smartphones for this cohort and their frequently reported sustainability concerns, further research is needed to understand how energy labels are perceived and prioritized by younger consumers (Kesselring, 2025).

Finally, recent regulatory changes introduce an additional layer of complexity that has not yet been adequately addressed in the literature. The introduction of revised energy labels and their extension to new product categories represent a structural shift in EU energy policy, the behavioral implications of which are still being assessed (Doganoglu et al., 2025; Kesselring, 2025). Existing studies suggest that changes in label design and scope may generate both positive effects and unintended consequences, such as increased uncertainty or misinterpretation during transition phases (Stasiuk & Maison, 2022). However, empirical research examining these dynamics in the context of newly labelled electronic devices remains scarce.

In light of these gaps, the present study seeks to contribute to the literature by analyzing how the new EU energy labels for smartphones influence purchase decisions among Generation Z consumers. In addition, it addresses a context that remains largely unexplored in existing research: the very early stage of implementation of the smartphone energy label. The mandatory introduction of the EU energy label for smartphones in June 2025 represents a recent regulatory development, and at the time this fieldwork was conducted, less than one year had passed since its entry into force. As a result, empirical evidence on its actual reception by consumers remains scarce. This temporal novelty reinforces the relevance of the study, particularly with respect to Generation Z, the cohort most exposed to smartphone purchase decisions during the label's initial phase of operation.

4. Fieldwork

4.1 Research approach

This study adopts a mixed-method research approach, combining qualitative and quantitative techniques in order to analyze how Generation Z consumers perceive and incorporate EU energy labels into their smartphone purchasing decisions. The integration of both approaches allows for a more comprehensive understanding of the research problem, as it captures not only observable patterns but also the motivations and interpretations that shape consumer behavior.

The research follows a sequential logic in which the qualitative phase precedes the quantitative phase. This structure is particularly relevant given the exploratory nature of the topic. The initial qualitative insights obtained through interviews make it possible to identify key perceptions and potential variables that are later incorporated into the design of the questionnaire. In this way, the quantitative phase is grounded in real consumer perspectives, improving the coherence of the research.

4.2 Research design

The study is designed as a cross-sectional research project, as all data is collected at a specific point in time. This approach is adequate given that the objective is to analyze current attitudes, perceptions and behaviors and not long-term changes. The research focuses on the context of smartphone purchasing, which is relevant due to the recent inclusion of these devices within the scope of EU energy labelling regulation.

The design combines an exploratory qualitative phase with a descriptive quantitative phase. The qualitative phase aims to understand how consumers interpret energy labels and how these interact with other purchase criteria, while the quantitative phase aims to measure the extent to which these perceptions are shared across a broader sample. This combination allows the research to move from in-depth understanding to general patterns, ensuring both richness and clear analysis.

4.3 Population and sample

The target population of this study consists of Generation Z consumers, defined as individuals born between the mid-1990s and early 2010s. This group is relevant for the research due to its high level of technological engagement and its relevance as a consumer segment in digital markets.

The sample is primarily composed of young individuals based in Spain, most of whom are university students, although some variations exist as of age and professional situation. The qualitative phase includes 9 participants, while the qualitative phase reaches approximately 95 to 100 respondents through an online questionnaire. Participants were selected using a convenience sampling method, based on accessibility through university networks and personal contacts.

4.4 Data collection techniques

4.4.1 Interview (guide and procedure)

The qualitative phase is based on 9 semi-structured interviews conducted with individuals belonging to Generation Z. The objective of these interviews is to explore in depth how consumers perceive energy labels, how they interpret the information provided, and how this information interacts with other factors in the purchasing process.

The interviews were conducted predominantly online through Microsoft Teams, with one interview carried out in person. Each session lasted between 40 and 65 minutes, allowing enough time to explore the topics while maintaining engagement on the topic. A semi-structured format was used, combining a predefined set of guiding questions with the flexibility to adapt the conversation according to the responses of each participant.

This approach ensures a balance between consistency and depth as it allows for comparability between interviews while capturing unexpected insights.

4.4.2 Online questionnaire (instrument and variables)

The quantitative data was collected through an online questionnaire distributed using Google Forms. The survey was designed in Spanish in order to facilitate comprehension and participation among respondents. The structure of the questionnaire combines different types of closed questions, including multiple choice and Likert-scale questions, which allow for the measurement of perceptions and behaviors in a more structured way.

The questionnaire focuses on several key variables related to the research objectives. These include the level of awareness and understanding of energy labels, the perceived importance of energy efficiency in purchasing decisions, and the relative weight of other attributes such as price or brand. Questions related to purchase intention and behavioral preferences are also included in order to capture how these perceptions translate into decision-making processes.

This structured approach allows for the collection of comparable data across repondents, which can later be analyzed using descriptive statistical methods.

4.5 Data analysis process

The data analysis process combines qualitative and quantitative techniques in line with the mixed-methods approach adopted in the study. The qualitative data obtained from the interviews was analyzed by identifying recurring patterns, common answers and relevant divergences in participants' responses. Particular attention was paid to unexpected findings or contradictions, as these provide valuable insights into the complexity of consumer behavior.

The quantitative data collected through the questionnaire was analyzed using descriptive statistics. The analysis focuses on calculating percentages, averages and distributions to identify general trends within the sample. The results are later presented using visual elements such as charts and graphs, which facilitate interpretation.

Qualitative insights help explain the quantitative patterns observed, and quantitative data provides a broader context for the qualitative findings.

4.6 Study limitations

Despite the methodological coherence of the study, several limitations must be considered. First, the use of convenience sample restricts the representativeness of the sample, as participants are mainly from a specific context, particularly university environments in Spain. This limits the extent to which the findings can be generalized to the entire Generation Z population.

Second, the small sample size, especially in the qualitative phase, may not fully capture the diversity of perspectives within the target group. While sufficient for exploratory purposes, a larger sample could provide a more comprehensive understanding of the phenomenon.

Third, the questionnaire was conducted in Spanish, which may introduce linguistic limitations and reduce comparability with studies conducted in other contexts.

Apart from these limitations, the study provides valuable insight into the role of energy labels in consumer decision-making and offers a solid empirical basis for the analysis developed.

5. Results qualitative interviews

5.1 Participant profiles

9 semi-structured interviews were conducted with Generation Z participants aged between 19 and 23. Participants were recruited through convenience and snowball sampling among university students in Spain. All of them were active smartphone users who had purchased or received a smartphone within the past five years. The interviews were conducted in Spanish and lasted between 40 and 65 minutes. Table 1 represents the key characteristics of the sample.

Table 2. *Description of participants*

Participant	Age	Gender	City	Current Device	Date of acquisition	How acquired	Studies
R1	21	Female	Cartagena	iPhone 13 Pro Max	March 2025	Gift (father's old phone)	Public university
R2	21	Male	Cartagena	iPhone 13 Pro Max	2022	Second-hand (father's)	Public university
R3	22	Male	Madrid	iPhone 13	January 2024	Refurbished	Public university
R4	19	Male	Murcia	iPhone 11 Pro Max	2020	Second-hand (father's)	Public university
R5	21	Female	Madrid	iPhone 13	2023	Gift (parents)	Private university
R6	21	Female	Madrid	iPhone 16 Max	November 2025	New purchase	Private university
R7	21	Female	Madrid	iPhone 17	February 2026	New purchase	Private universit

							y
R8	23	Female	Murcia	iPhone 16	January 2025	Gift (parents)	Public universit y
R9	22	Male	Valencia	Xiaomi Mi 10 Pro	2022	New purchase	Public universit y

Note: All participants were university students at the time of the interviews.

Several aspects of these profiles are worth noting before presenting the findings. 8 of the 9 participants used an iPhone as their main device, with only R9 using a Xiaomi. This is not a coincidence; it reflects a strong pattern of brand loyalty that shaped practically every part of the interviews, from the way participants described their purchase decisions to how they responses to the energy label. It is also relevant that 5 of the 9 participants had not bought their current phone independently: three received it as a gift from their parents, and two inherited a second-hand device from a family member. For much of the sample, therefore, the most recent smartphone acquisition involved little independent decision-making. When discussing what they look for in a phone, participants frequently drew on past experience, hypothetical future purchases, or what they had observed in others, rather than describing a recent decision they had made on their own.

5.2 Purchase decision process and key selection criteria

Before being shown the energy label, all participants were asked to describe how they had chosen their most recent smartphone and to rank the factors they considered most important when buying a device. The responses across the sample showed a clear and consistent hierarchy: brand, price, battery life, and storage were always at the top, while sustainability was placed last by every single participant, without exception.

5.2.1 Brand loyalty: from a primary driver to structural constraint

Prior research consistently identifies brand and price as the two most influential factors in smartphone purchase decisions (Jabos et al., 2025). The interviews conducted in this study confirm this dominance, but they also reveal an additional dynamic: among Generation Z, brand loyalty operates not only as a positive driver, but as a structural constraint that narrows the consideration set before any sustainability-related criterion (including the new energy label) can be evaluated.

The key finding is not simply that brand ranked highly, but that for most participants, brand was not a factor they weighed against other options, it was a fixed starting point that came before any other consideration. Apple, in particular, was not described as a preference that could change under the right conditions, but as an ecosystem so integrated into participants' daily lives that switching brands felt impractical. R6 expressed this clearly*: "I don't even know the price of other devices on the market; brand is first for me. I neither consciously nor unconsciously consider changing it."* R7 explained the same logic:

> *"I always use Apple because precisely with this brand there is an ecosystem and it is very difficult to get out of it. I know how these devices work and it's more familiar."*

For R3, the situation was similar: having already bought an iPad, a Mac, and other Apple products, changing brands for a phone was ruled out before anything else was considered. This pattern shows that, for most of the sample, the real decision was not which brand to choose, but which model within their existing brand best met their immediate needs. As a result, a large part of the decision process, including any sustainability dimension, was effectively closed before comparative evaluation even began.

5.2.2 Price, battery, and storage as functional drivers

Within the narrower decision space remaining after brand loyalty had already settled the main question, participants focused on criteria directly connected to their everyday phone use. Battery life came up repeatedly, and several participants linked it directly to their most recent phone change. R7 switched from an iPhone 13 to an iPhone 17 specifically because the battery had become too slow and unreliable, while R8 also described battery decline as the real trigger for her previous phone change. This is important because it suggests that, although battery life is treated as key criterion in the abstract, its urgency tends to be felt only when the current device begins to fail, rather than when making a proactive purchase decision.

Storage capacity generated similar urgency for participants whose devices were running out of space. R1, R2, and R5 all described feeling close to needing a new phone primarily because of storage problems. Price tended to interact with the other criteria rather than acting as a standalone factor: participants were looking for the best value within the brand they had already chosen, rather than comparing phones across different brands based on price alone.

Camera quality and design were mentioned less often and usually ranked in the middle or lower positions. One interesting exception was R6, who placed battery last, below design, explaining that she had no real information to compare battery performance and simply assumed that buying the latest model guaranteed an adequate result. This suggests that some participants effectively delegate certain criteria to brand trust, treating the implicit promise of improvement from one generation to the next as a substitute for comparing specifications directly.

Sustainability was ranked last by all 9 participants. While this was not always said dismissively, as several participants explained their reasoning thoughtfully, the uniformity of this result across the entire sample is significant in itself. As R4 put it: *"It's not something that would cross my mind unless someone put it right in front of me and I had no choice but to see it."*

Table 3. *Importance of Purchase Criteria in Decision-Making*

Criterion	General Importance	Evidence from participants
Brand	Very high	Consistently ranked first; often described as non-negotiable.
Price	High	Considered in all cases, especially within the preferred brand.
Battery	High	Frequently mentioned as a key functional need, especially in daily use.
Storage	Medium	Important in specific situations (e.g., lack of space)

Performance	Medium	Expected as a baseline rather than actively compared.
Camera	Medium to low	Valued but rarely decisive in final choice.
Design	Low	Mainly aesthetic; limited influence on decision.
Sustainability	Very low or Absent	Not considered unless explicitly prompted during the interview.

5.3 Environmental awareness and the attitude-behavior gap

When asked whether they thought about sustainability or environmental impact when buying electronic devices, all 9 participants answered negatively or with clear reservations. However, their responses were not all in the same tone. Several participants, often without being prompted, reflected honestly on why their environmental values did not show up in their purchasing behavior.

5.3.1 Absence of environmental sustainability as a spontaneous consideration

For most participants, sustainability did not come to mind when thinking about buying a smartphone. R8 was direct: *"No, I don't usually think about it at all. From zero to ten, a zero."* R5 gave a similar answer, saying she would not think about sustainability even it she needed to buy a new phone the very next day. These responses do not suggest a deliberate rejection of environmental values, but rather that the habit of connecting phone purchases to environmental impact had never been formed - partly because the relevant information had never been made visible or relevant to them.

The explanation most participants gave for this was a lack of information. R2 said he had never considered sustainability when buying a phone "because I was not aware of its impact," and that no one had ever presented it as something worth thinking about. R5 offered almost the same explanation: *"I think it's the disinformation that exists, and we don't know the impact it has, so we don't take it into account."* This framing, pointing to information gaps rather than personal indifference, came up often and without prompting. This suggests that it reflects a genuine interpretation of their own behavior, rather than a face-saving rationalization.

5.3.2 Genuine concern vs. selective activation

Some participants did show real environmental concern at a general level, but this concern had not yet reached the domain of consumer electronics. R3 described it with some nuance: he did not normally think about sustainability when buying devices, *"but if the situation arises of seeing that it is more sustainable when buying, then I would consider it."* This kind of conditional openness, being willing to factor in suitability only if it is made easy and visible, appeared across several interviews and suggests that environmental motivation in this context is not absent, but latent.

R4 gave the most developed explanation for the gap between attitude and behavior. He argued that brands have an interest in keeping sustainability information hard to find, because their business model depends on consumers continuing to buy based on brand and status rather than environmental performance:

> *"I think people of my age do care quite a bit about sustainability. What happens is that we don't have knowledge about it, and neither do the brands give it enough importance, because I think the interest is there for people not to find out too much, so that we keep buying their brands regardless of energy consumption. People focus on the brand and on what it represents."*

This view, that the attitude-behavior gap is partly the result of intentional information asymmetry by manufacturers, was shared, in different ways by R7 and R9. R9 added a more skeptical layer, questioning whether even better information would reliably change behavior: *"my generation I consider quite individualistic. People love to talk about their ideals and share them, but when it comes to taking action in line with those ideals, they forget and take a step back."* This observation matters because it goes beyond the information-deficit argument: it raises the possibility that, even if the label were well known and clearly understood, behavior might not change much.

5.3.3 Sustainability conflicts with durability

A particularly interesting pattern appeared when participants were asked what they thought a "sustainable" smartphone meant. In most cases, sustainability was instinctively defined as durability, the idea that a phone which lasts longer is automatically more sustainable, because you replace it less often. R3 said: *"the first thing that comes to mind is that it lasts the maximum number of years, so I don't have to keep changing."* R6 framed her habit of buying the latest iPhone in similar terms: *"I calculate it has to last me four or five years; when I make the decision to buy a phone, I think in terms of lasting those years."*

This is analytically important because it allowed participants to interpret their existing behavior, buying flagship models from a trusted brand, as environmentally responsible, without having to consider factors like materials, manufacturing processes, or repairability. Durability and sustainability were treated as the same thing, when in reality they refer to quite different dimensions of a product's environmental impact.

Only R4 and R7 mentioned the environmental costs of manufacturing and component materials without being prompted, noting that battery production and mineral extraction are significant issues. R6 and R9 briefly raised the question of what happens to devices at end-of-life, but both admitted knowing very little about it. For the rest of the sample, sustainability remained essentially synonymous with how long the phone lasts, a definition that conveniently aligned with what they already valued.

5.4 Awareness and understanding of the EU smartphone energy label

One of the clearest findings in this study was that none of the 9 participants had ever seen or heard of the EU energy label applied to smartphones before the interview. Every participant confirmed this without hesitation. Some reacted with simple denial, others with visible surprise. R3 responded to the initial mention of the label with a question*: "Does it exist?"* R2 was straightforward: *"I have never seen this label in my life."* R6, who had bought her iPhone 16 Max at the Apple Store in November 2025, after the label had already become mandatory, said she had not noticed it: *"I didn't see it, and I think I didn't realize because for me it's not important at all."*

This complete unawareness stands in clear contrast to participants' familiarity with the same label applied to household appliances. All 9 participants recognized the appliance label and could explain basic logic, that A is the most efficient and G the least. Several mentioned that their parents consulted it when buying fridges or washing machines, the key reason participants gave for paying attention to appliance labels, and not to phone labels, was financial: an appliance running continuously for years turns its energy class directly into a higher or lower electricity bill. For smartphones, no such connection exists. As R9 put it: *"going to see appliances in large stores, you can see the label is very visible. I think it's something people do look at for that type of product."* The implication is clear: the label's relevance is not seen as automatic, but as depending on the context in which it appears.

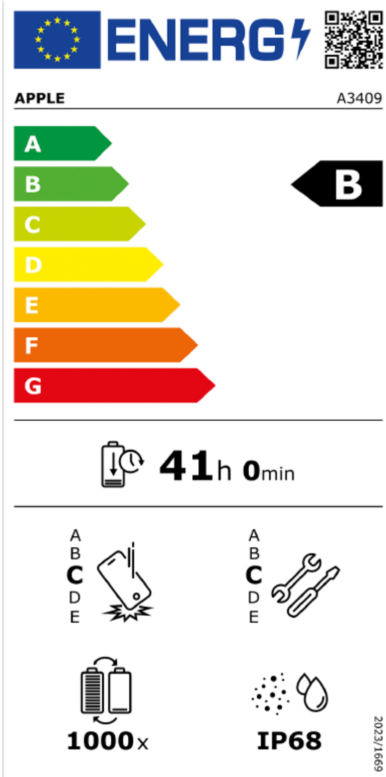


Figure 1. *EU smartphone energy label used during the interviews.*

5.4.1 Partial and uneven label comprehension

When participants were shown the smartphone energy label for the first time, most were able to read the A-to-G energy efficiency scale without much difficulty, drawing on their familiarity with the appliance version. However, comprehension dropped noticeably when they looked at the five secondary parameters shown in the lower half of the label: battery duration, drop resistance, repairability index, battery lifecycle, and water and dust resistance.

It is worth noting that the label used in the interviews was the official EU energy label for the iPhone 16 E, which served as a concrete and realistic stimulus. This choice was intentional: using a real, commercially available device made the exercise more grounded and allowed participants to relate the parameters to a phone they could actually encounter in a store. The label showed an energy efficiency class of B, a battery duration of 41hours, a drop resistance rating of C, a repairability index of C, a battery lifecycle indicator expressed as a ratio with 1000x, and an IP68 water and dust resistance classification.

The battery duration figure of 41 hours was correctly associated with battery life by most participants but was almost universally dismissed as unrealistic. R1 said: *"I think it's a lie, nowhere near 41 hours. Seven hours maximum."* R4 suggested that *"Apple tends to exaggerate its figures in general", and R7 pointed out that "no one uses their phone for only half an hour a day, so this doesn't reflect reality."* Participants were not just skeptical of the number itself; they also questioned the usefulness of a standardized figure that bore no resemblance to how they actually used their phones.

The battery life cycle indicator, shown as a ratio of 1000x, was consistently the hardest element on the label to understand. Several participants could not assign it any meaning at all before receiving an explanation. R3 described it as *"very difficult"* and said he could not interpret the ratio. R6 said: *"with the image, I don't understand anything; maybe it's because I have no idea about technology."* R7 called it *"super difficult"* and said, *"the number just isn't understood."* Even after being explained, some participants felt the visual design of this parameter did not match its importance.

The drop resistance and repairability classifications were unknown to all participants, none had ever heard that these dimensions were measured and rated for consumer smartphones. The IP68 water and dust resistance classification was the most recognizable of the secondary parameters: R9 was the only participant who could explain what IP ratings meant before being told, and a few others had a rough sense that it related to water resistance, though most did not know that dust resistance was also involved.

R6 described the overall experience of reading the label well:

"The scale I understand, the colors also make it easier. But everything below, I don't understand anything. I think the scale from A to G is well indicated, but the symbols lead me to complete confusion."

This pattern, comfortable reading of the main scale, confusion about the specific parameters, was consistent across the sample. It suggests that the label manages to give a general impression of relative sustainability, but does not succeed in communicating the detailed, comparable information that could actually help someone choose between two models at the point of purchase.

5.4.2 Credibility and trust

Participants were also asked whether they trusted the information on the label. Most expressed a moderate level of trust, grounded mainly in the fact that it is backed by the European Union. R4 said: *"I imagine so, because putting the EU as backing, I* *understand there is a reason to trust it, it seems official."* R5 was more direct*: "I trust the label; I think the EU is doing this well."* A smaller group expressed more cautious or skeptical views. R8 questioned how the measurements were made and suggested that even the EU could be influenced by industry interests. R9 went furthest in this direction, arguing that both brands and regulators have incentives that shape what the label shows and how:

> *"I think these labels, many times, the brands know what to put and what not to put so that their numbers come out better, and they come out benefiting from sales, not because they really make an effort for these factors to improve for the final customer."*

This range of responses, from moderate institutional trust to open skepticism, is worth noting. Most participants were willing to accept the label as broadly credible, but this trust had not been strong enough to motivate any prior interest in finding it or reading it.

5.5 The role of the energy label in purchase decisions

After exploring awareness and comprehension, participants were asked directly whether the energy label could influence their purchasing decisions, and under what circumstances. Responses across the sample pointed in the same direction: thew label would not be a decisive factor in a real purchase situation, but could, at best, play a secondary role once the main criteria had already been satisfied. Within this overall picture, some nuance emerged when participants discussed specific parameters and the conditions under which they could imagine the label becoming more relevant.

5.5.1 The label as a tiebreaker, not a driver

The most common view was that the energy label could only matter in a very specific and relatively unlikely scenario: when two phones were already similar in every primary respect. R9 put it directly: *"if the energy label is the only differentiating factor with another phone, yes, it influences me; but if the differentiating factor is also the battery, the battery carries much more weight for me.*" R1 expressed the same logic: *"if they give me two similar phones to choose from, then yes I'd look at it, but otherwise I wouldn't look at it much."* Even in these hypothetical comparisons, brand remained a limit that no label parameter could cross. R7 was clear: *"if Apple is a D and Xiaomi is an A, I* *think I'd still stay with Apple. Now, within Apple, I would choose the best scale."* R3 put it simply: *"if they put a Samsung A versus an Apple B, it would be Apple."*

This pattern, the label only relevant within the same brand, never across brands, significantly limits its practical scope. Given that 8 of the 9 participants had already settled the brand question before anything else, the label could at most help them choose between two models from the same manufacturer. And even then, participants acknowledged that they would usually be comparing the latest and second-latest model, where price difference and new features would typically carry more weight than an energy rating.

5.5.2 Battery-related parameters as partial exceptions

Among the label's individual parameters, those most readily accepted as useful were the ones already aligned with participants' primary purchase concerns: battery duration and battery lifecycle. These were the only parameters that several participants said they would actively seek out, even independently of the label as a whole. R2 said that battery duration and repairability were the parameters that *"could be decisive in my decision."* R7 was direct: *"battery is my primary reason for changing phone; 100% I'd pay more for a better battery."*

The connection between battery performance and purchase motivation was strong enough that some participants made a distinction between their interest in battery-related parameters as practical information and their interest in the label as a sustainability tool. The former was real and consistent; the latter was limited. This is relevant because it suggests that the label's best chance of influencing behavior may not come from its environmental framing, but from its role as a source of practical technical information, particularly on battery performance, that is otherwise hard to find and compare across models.

5.5.3 Brand identity as the dominant override

The most consistent barrier to the label having any real influence was not difficulty understanding it, distrust of data, or low environmental awareness, it was brand loyalty. For eight of the 9 participants, the brand decision had been madre before any other evaluation started, and no parameter in the label was strong enough to change it. Participants acknowledged this openly. R6: *"if I were aware and saw the label, a G would be a problem for me, but it wouldn't lead me to change an Apple for a Xiaomi just for the energy efficiency scale, there would have to be more things."* R4 put it even more plainly:

"what you end up buying is what you've always bought."

This raises a fundamental question about the label's reach. If the most important decision this demographic makes - which brand to buy - falls completely outside what the label can influence, then the label can only realistically operate in the remaining space: choosing between two models within the same brand. In that space, sustainability differentiation is already likely to be small.

5.5.4 The moment of purchase as a cognitive threshold

Several participants also reflected on the mental state they were in when buying a phone and described it as difficult to combine with the kind of careful, multi-criteria comparison that consulting an energy label would require. R3 described the *"urge to buy it now and have it now"* as something that pushes other considerations aside: *"if I know I want that phone no matter what, and everything else doesn't matter to me."* R6 described arriving at the Apple Store having already made her decision, so that any additional information was filtered through a lens of confirmation rather than open comparison. This points to a broader pattern: smartphone purchases for this group are often triggered by a specific functional problem, like running out of battery, or running out of space, that creates urgency and narrows the decision down quickly. In that context, a tool designed to support reflective comparison between products is unlikely to be consulted.

5.6 Perceived usefulness and limitations of the label

Beyond whether the label would influence their decisions, participants were asked to reflect on the label itself, what it did well, where it fell short, and what would need to change for it to be more useful. Their responses revealed a set of consistent limitations, alongside a small number of elements that were genuinely valued. Several participants, especially after understanding what each parameter meant, said they would be more open to consulting the label in future purchases. But this openness was always conditional: the label would need to be clearer, better designed, and much more visible for it to make a real difference.

5.6.1 Design and comprehension barriers

The most frequently mentioned weakness of the label was its visual design. Participants generally liked the color-coded A-to-G scale, recognizing it as familiar and easy to read. But the secondary parameters were widely described as too vague, too technical, or too inconsistent to be useful. Several participants pointed specifically to the mix of formats: letter-based scales (A-to-G), technical standards (IP68), and numerical ratios (1000x) sitting side by side, each requiring a different kind of prior knowledge to interpret. R3 was direct: *"all scales should be the same; if you classify from A to D, don't insert an IP68, don't make it complicated for people who don't know."* R7 agreed: *"there are only letters and colors, but in truth that doesn't tell you much more."*

The improvement suggested most often across the sample was simple: add a short text label beneath each icon, just a word or brief phrase explaining what is being measured. R7 said: *"below everything I'd add titles and a minimal explanation to understand it better."* R4 suggested pairing clearer text with more visual impact: *"I'd put something more striking to capture attention, and maybe a brief description instead of drawings, a drawing can give a wrong reading of what the parameter is."* R8 reinforced the same point: *"I'd add some clarifying words, the battery lifecycle icon I just don't understand, I'd put things like 'fall', 'repair', 'battery life'."* All of these suggestions point to the same underlying problem: the label signals that several relevant dimensions exist but do not explain what they mean in plain enough language for a general consumer to act on them.

5.6.2 Structural invisibility

Participants were also asked how visible they thought the label was in practice, both online and in physical stores. The picture they described was consistent: the label was largely hidden from view in both settings. Online, most participants assumed it would be somewhere at the bottom of a product page, below the images and technical specifications that consumers typically look at first. R2 said he had recently been browsing for phones online and had not noticed the label, even though he assumed it must have been there: *"I suppose it will be there, but if I've seen it, I've paid no attention and didn't register it."* R3 pointed out *that "when you buy a phone online, you have a huge amount of information to focus on, much more eye-catching than this label, so you don't look at it first."* R6, who had bought her iPhone 16 Max in a physical Apple Store after the label became mandatory in June 2025, said she had not noticed it there either.

In physical stores, participants expected the label to appear near the price tag, small and easy to miss among all the marketing materials around it. None of them had ever noticed or looked for this label in a store. Several participants pointed out that this invisibility was a more fundamental problem than the design issues: a label that cannot be found cannot be read, no matter how well designed it is. The comparison with the appliance label was made spontaneously by some, full-size, prominently displayed at eye level next to every product, which made the assumed marginal placement of the smartphone label feel even more inadequate.

5.6.3 Differential salience compared to the appliance context

The comparison with household appliance labels arose naturally in several interviews and produced one of the most illuminating findings of this section. Participants explained that the appliance label works because energy efficiency translates directly and visibly into monthly electricity costs, a refrigerator running around the clock for years turns its energy class into a concrete and recurring financial consequence. For smartphones, there is no equivalent mechanism. R4 explained the difference clearly:

> *"For a household appliance you do give it importance, because in the end, you're paying for it monthly. A refrigerator consumes a lot of energy and electricity you pay for monthly. But a mobile phone is a bigger one-off purchase and the energy consumption at home is minimal, so I don't give as much importance to being hyper-efficient."*

R7 made the same point but more briefly: *"with appliances, people do pay attention because it's what consumes the most in a household."* R9 confirmed that his parents would use the appliance label to compare products if the difference were significant but would not apply the same reasoning to a phone because the ongoing cost dimension simply is not there.

This contrast reveals something important about how the EU energy label has managed to gain traction in some product categories but not others. For appliances, the label became relevant not primarily because of environmental motivation, but because of financial motivation. It told consumers something they cared about in practical, economic terms. For smartphones, the financial mechanism does not exist. Without it, the label has to rely on environmental values alone, and for this sample, those values are not yet strong or specific enough in the context of electronic devices to drive active information-seeking.

5.6.4 Openness to future engagement

Despite all these limitations, several participants expressed genuine, if conditional, willingness to engage with the label more in the future, now that they understood what it contained. R6 reflected: *"before, a zero, and now I think a six out of ten, it doesn't come close to other factors that are important to me, but I find them interesting and would perhaps look at them more now."* R7 gave the most positive reassessment*: "if it were well explained, it would have quite an impact on my decision, a seven or eight out of ten. Before you explained all this to me, for me it would have been a two."* R1 described a shift in how she imagined her next purchase: *"if tomorrow I go to buy a phone, I would ask a bit more now, but I'm not going to make a big effort to find the label if it's not right there next to the price. And even then, it wouldn't be decisive."*

These responses suggest that the label's limited current impact is not simply the result of deep indifference. It reflects a combination of ignorance, design problems, and structural invisibility, all of which could, in principle, be addressed. Participants consistently added conditions: the label would need to be cleared, more visible, and better explained before it would genuinely change what they do. Even R7, the most enthusiastic, was describing a hypothetical, improved version of the label, not the one that currently exists. As R9 concluded: *"I like seeing it and I like buying a phone and seeing this type of information; if it's more efficient and sustainable, great, but since it's not a differentiating factor for me, I'd give it a three out of ten."*

5.7 Summary of findings

Taken together, the findings from these 9 interviews reveal a consistent and mutually reinforcing set of barriers to the EU smartphone energy label playing a meaningful role in Generation Z purchasing decisions. Brand loyalty functions not as one criterion among many, but as a structural constraint that forecloses the decision space before any comparative evaluation – including sustainability – can begin. Within this narrow residual space, the label is further limited by near-universal unawareness, significant comprehension gaps around its secondary parameters, and structural invisibility in both physical and digital retail environments. Underlying these barriers is a broader attitude-behavior gap: participants frequently expressed environmental concern at a general level, yet this concern had not translated into active information-seeking within the domain of consumer electronics, partly due to perceived information deficits and partly due to the absence of a financial incentive mechanism comparable to that which drives engagement with appliance energy labels. The label's most realistic potential for influence, at this stage, lies in its battery-related parameters – the one dimension that already intersects with participants' primary purchase motivations. For the label to move beyond this narrow foothold, improvements in design legibility, retail visibility, and consumer awareness will be necessary conditions, though not, as several participants candidly acknowledged, necessarily sufficient ones.

6. Results quantitative questionnaire

The qualitative phase identified three core patterns: a strong dominance of brand and battery in the decision process, a low spontaneous salience of sustainability, and a partial and uneven recognition of the new EU energy label. This chapter presents the quantitative findings of the survey, designed to analyze whether these patterns generalize across a broader sample of Generation Z consumers. Where possible, the questionnaire mirrors the dimensions explored in the interviews, allowing a direct comparison between the depth of the qualitative material and the breadth of the quantitative data. A total of 94 respondents[1] aged between 18 and 25 completed the online questionnaire (Google Forms). All findings reported in this chapter are based exclusively on the answers obtained from this dataset; no external data has been incorporated. Likert-scale questions are reported using mean values (with their associated scale) and, when relevant, the proportion of respondents in the agreement (4-5) and disagreements (1-2) categories. Ranking questions, in which lower values indicate higher importance, are reported through their mean rank and ordered accordingly.

6.1 Sample characteristics and smartphone usage behavior

The final sample is composed of 94 respondents who confirmed belonging to the 18-25 age range, the operational definition of Generation Z used in this research. The age distribution is concentrated in the central segment of this range: respondents aged 20-21 and 22-23 represent 34.8% each (32 respondents per group), followed by those aged 24-25 (23.9%, 22 respondents) and 18-19 (6.5%, 6 respondents). Two respondents did not declare their age. The sample therefore reflects mainly the older half of Generation Z, which should be borne in mind when interpreting the results.

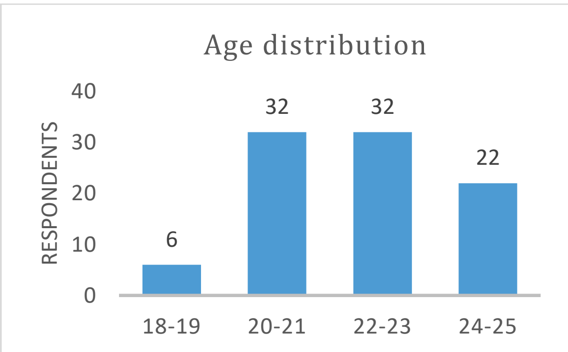
Women represent 60.2% of the sample (56 respondents) and men 39.8% (37 respondents); one respondent did not provide an answer to this question. Regarding the highest level of education achieved, the sample is highly homogeneous: 77.4% of respondents (72) hold or are pursuing a university degree, 16.1% (15) report secondary education as their highest level, and 6.5% (6) hold a master's degree or higher. As a

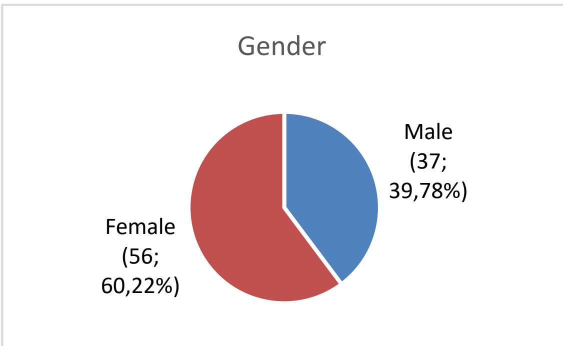
[1] Throughout this study, descriptive statistics are reported on the full sample (n=94). Item non-response affected at most two observations per question (≤2.1%) and was excluded from the corresponding calculations without material impact on the results.

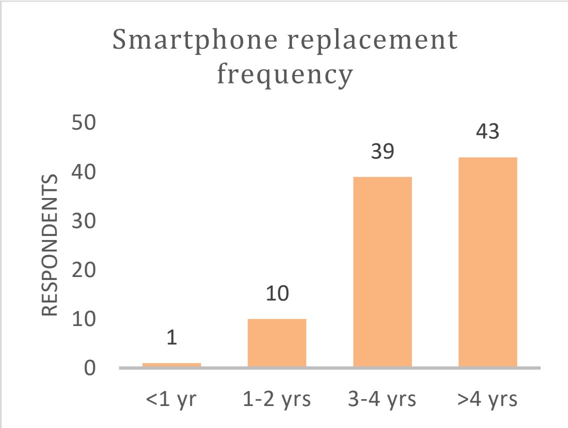
consequence, the educational profile of the sample is clearly skewed towards higher education and should be interpreted as such.

Smartphone replacement behavior in the sample is comparatively slow. Almost half of the respondents (46.2%, 43 respondents) report replacing their smartphone after more than four years, and an additional 41.9% (39) do so every three to four years. Only 10.8% (10) replace their device every one to two years, and a single respondent (1.1%) replaces it in less than a year. One respondent did not provide an answer to this question. Overall, 88.1% of the sample reports a replacement cycle of three years or more, suggesting that for most respondents smartphone purchase is an occasional and considered decision rather than a frequent one.

Spending levels in the most recent purchase are skewed towards the upper segments of the price range. The largest group, 37.2% of respondents (35), spent more than €700 on their last smartphone, followed by 29.8% (28) in the €400-€700 range. The €200-€400 segment accounts for 25.5% (24), and only 7.4% (7) spent less than €200. Approximately two thirds of respondents therefore spent €400 or more on their last device, which is consistent with the long replacement cycles observed and indicates that respondents tend to invest in mid to high range smartphones rather than entry-level models.







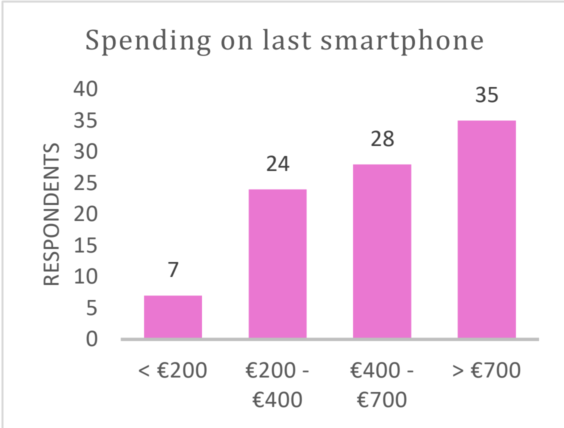


Figure 2. *Demographic and behavioral profile of the sample (age, gender, replacement frequency and spending on the last smartphone)*

6.2 Key purchase decision factors

Question 5 asked respondents to rate the importance of seven attributes when buying a smartphone, on a 1-5 scale where 1 = not important at all and 5 = very important. Mean values reveal a clearly hierarchical structure of preferences. Performance (M = 4.00) and Battery (M = 3.99) emerge as the two most important attributes, followed at very close distance by Brand (M = 3.89), Price (M = 3.86) and Camera (M = 3.77). Design occupies a lower position (M = 3.41), and Sustainability ranks last by a wide margin, with a mean of 2.67. This hierarchy is consistent with existing evidence on smartphone purchase decisions, where brand and price tend to outrank environmental considerations (Jacobs et al., 2025), and reinforces the qualitative pattern identified in Chapter 5.

The most relevant pattern is the gap between sustainability and the rest of the factors. Whereas the six traditional attributes are concentrated above the midpoint of the scale (between 3.41 and 4.00), sustainability is the only factor whose mean falls below the neutral midpoint of 3. The difference between sustainability and the highest-rated factor (Performance) is approximately 1.33 points on a five-point scale, which is the largest gap observed among any pair of attributes. Even compared with Design, the second least important factor, sustainability remains roughly 0.74 points below. This indicates that, when respondents evaluate factors in isolation and explicitly, environmental considerations are rated as the least important driver of the purchase decision.

It is also worth noting that the four most important factors (Performance, Battery, Brand and Price) are clustered in a very narrow range of less than 0.15 points. This suggests that, for this sample, no single attribute strongly dominates the decision: respondents seem to look for a balanced combination of technical capabilities, brand recognition and price, rather than looking for a single criterion. Sustainability, in contrast, is clearly excluded from this competitive cluster of priorities.

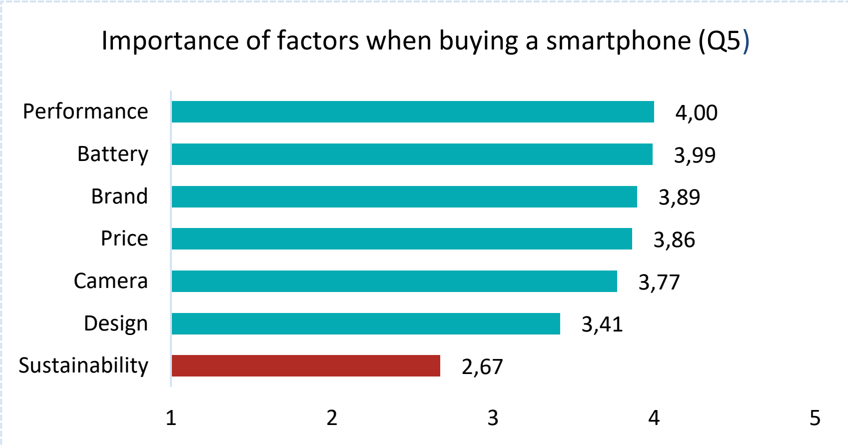


Figure 3. *Importance of purchase decision factors (Q5). Mean values on a 1-5 Likert scale.*

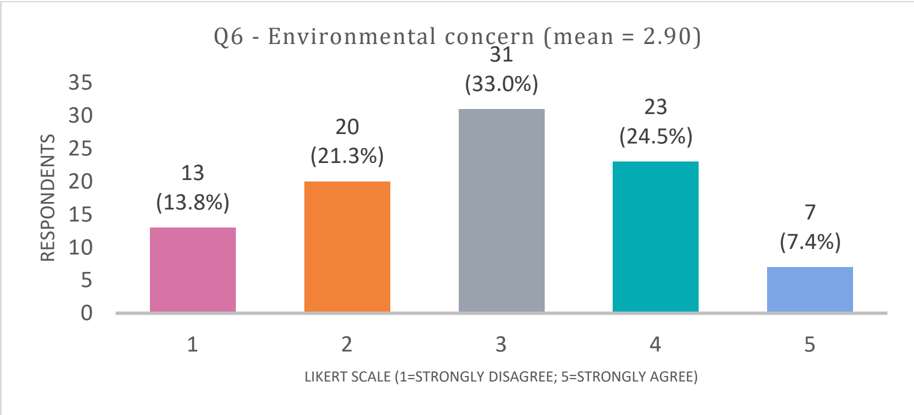
6.3 Sustainability attitudes and willingness to act

Two questions in the survey are designed to capture the underlying environmental orientation of respondents. Question 6 measures self-reported environmental concern ("I consider myself a person concerned about the environmental impact of my consumption decisions"), and Question 7 measures stated willingness to pay a price premium for a more sustainable smartphone. Both items use a 1-5 Likert agreement scale.

Self-reported environmental concern reaches a mean of 2.90, just below the neutral midpoint. The distribution of answers is balanced: 35.1% of respondents (33) disagree (scores 1-2), 33.0% (31) are neutral (score 3), and 31.9% (30) agree (4-5). No category clearly dominates, which suggests that environmental concern is far from being a generalized attitude in this sample. If anything, the center of gravity of the distribution is slightly below the midpoint.

Willingness to pay a higher price for a more sustainable smartphone is even weaker. The mean is 2.74, and the proportion of respondents who agree (4-5) drops to 28.7% (27), while 45.7% (43) explicitly disagree (1-2). In other words, almost half of the sample is unwilling to pay a premium for sustainability, and only somewhat more than a quarter is willing to do so. The comparison between Q6 and Q7 already points to an internal weakening of pro-environmental orientation as the question moves from a general attitudinal statement to a concrete monetary commitment: concern is moderate, but the willingness to translate that concern into an additional cost is clearly lower.

Taken together with the results from Q5, where sustainability was rated as the least important purchase factor, these findings indicate that the limited weight of environmental considerations in the smartphone purchase is not only a matter of behavior but is already visible at the attitudinal level. The attitude-behavior gap discussed in Section 7.5 should therefore be interpreted on top of an already moderate baseline of environmental concern, not as a contradiction between strong attitudes and weak behavior.



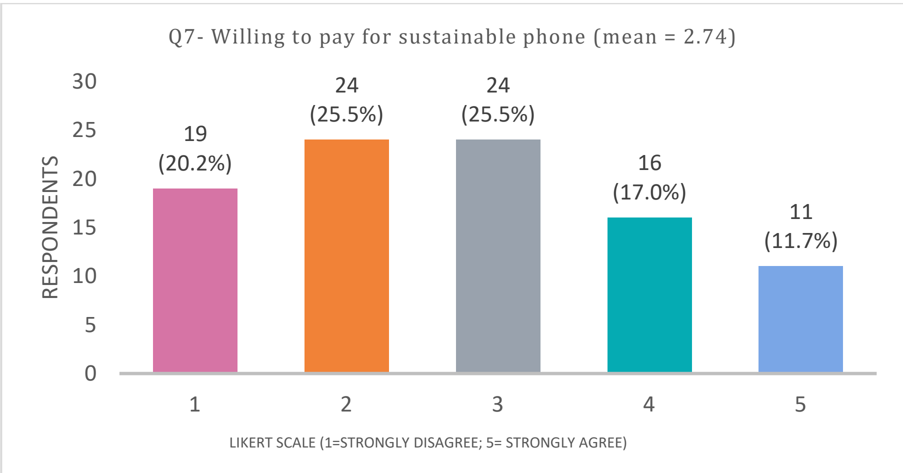
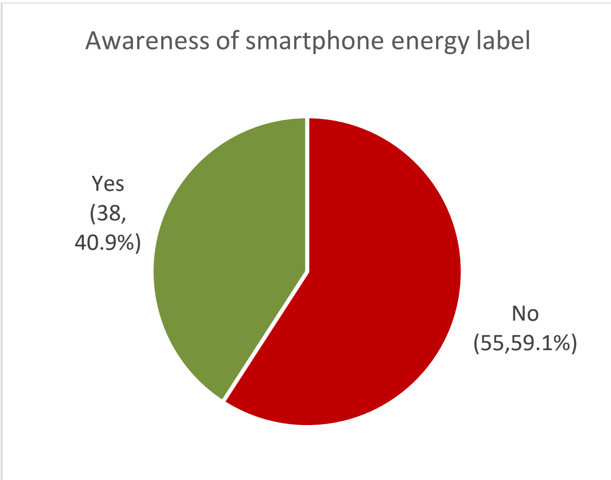


Figure 4. *Distribution of responses to environmental concern (Q6) and willingness to pay more for sustainability (Q7), 1-5 Likert scale.*

6.4 Awareness and understanding of the EU energy label

Question 8 asked respondents whether, before participating in the survey, they were familiar with the EU energy label applied to electronic devices such as smartphones and tablets. Of the 94 responses, 40.9% (38) declared themselves familiar with the label, while 59.1% (55) did not, and one did not answer this question. Therefore, the majority of Generation Z respondents in the sample had not previously been aware of the existence of this specific label, even though it has been mandatory for new smartphones in the European Union since 2025.

Question 9 asked respondents where they had seen the label, allowing multiple answers. Of the 94 responses, 31 indicated that they had never seen it; the remaining 62 respondents reported at least one channel, and one did not answer this question. Among those who had seen the label, physical stores are by far the dominant channel: 79.0% of them (49 respondents) mentioned physical stores, followed at considerable distance by online stores (33.9%, 21 respondents), advertising (21.0%, 13) and social media (12.9%, 8). It is worth noting that 24 respondents who declared not being familiar with the label in Q8 did report having seen it in some channel in Q9. This suggests that physical exposure to the label is not always sufficient to generate active recognition or recall, and that passive contact with the label does not automatically translate into perceived familiarity.



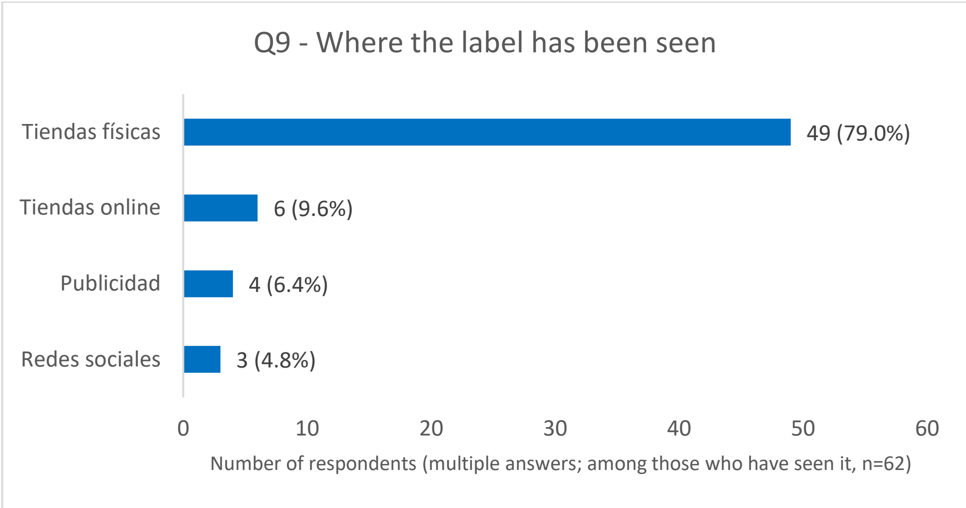


Figure 5. *Prior familiarity with the EU energy label (Q8) (n=94; 1 non-response not displayed), and channels through which respondents have seen it (Q9, multiple answers)*

Questions 10 and 11 evaluate the perceived clarity and usefulness of the label using a 1-5 agreement scale. The label is perceived as relatively easy to understand: the mean of Q10 is 3.61, which 58.1% of respondents (54) agreeing (4-5) and only 17.2% (16) disagreeing (1-2). However, when respondents are asked whether the label actually helps them compare different smartphones (Q11), the mean drops to 3.02, almost exactly the midpoint of the scale. The distribution becomes much more balanced, with 38.7% (36) agreeing and 36.6% (34) disagreeing. Respondents therefore seem to find the label visually clear, but a substantial fraction does not consider it especially useful as a tool to discriminate between alternatives at the moment of choice.

Question 12 explores the self-reported understanding of each of the parameters that appear on the label, using a 1-5 scale where 1 = does not understand at all and 5 = understands clearly. The two parameters most closely related to user experience score the highest: Battery autonomy (M = 3.99) and Drop resistance (M = 3.81). they are followed by Battery lifespan (M = 3.70), Repairability (M = 3.65), Dust and water resistance (M = 3.58) and, in last position, Energy efficiency (M = 3.56). All means are above the midpoints, so on average respondents claim to understand all parameters reasonably well. However, the relative ordering is informative: energy efficiency, the parameter most directly linked to the environmental purpose of the label, is precisely the one respondents fell they understand the least. This is consistent with the finding from Q11 that the label is not especially useful for comparison: if the comparative parameter par excellence is the one that is least well understood, the comparative function of the label is partially undermined.

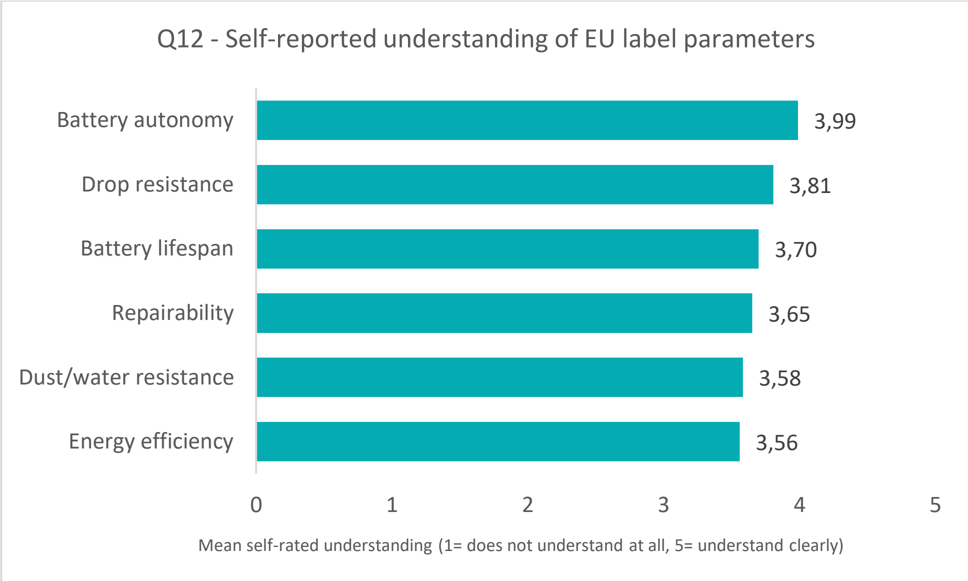
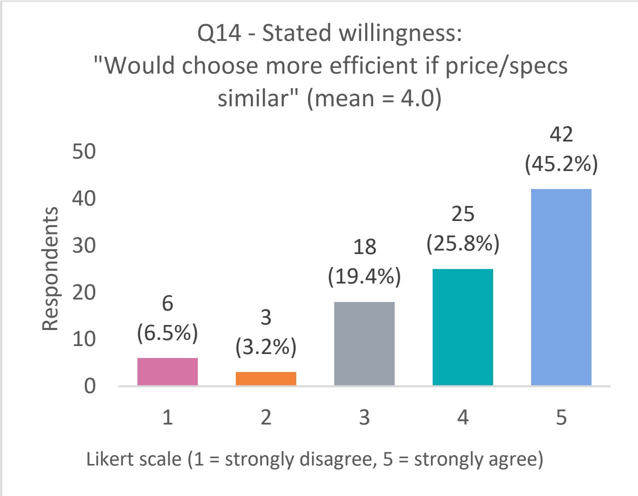


Figure 6. *Self-reported understanding of EU label parameters (Q12). Mean values on a 1-5 agreement scale.*

6.5 Influence of the energy label on decision-making

The most relevant comparison in the entire dataset is the contrast between Question 14 and Question 15. Question 14 captures stated willingness in a hypothetical scenario: if two smartphones had similar prices and technical specifications, respondents would choose the one with a better energy efficiency rating. Question 15 captures self-reported actual behavior: in the most recent smartphone usage, environmental sustainability considerations influenced the final decision.

The contrast between the two items is striking. The mean of Q4 is 4.00, with 71.0% of respondents (66) agreeing (4-5) and only 9.7% (9) disagreeing. By contrast, the mean of Q15 is 1.89, with only 12.9% (12) agreeing and 73.1% (68) disagreeing. The difference between the two means is 2.11 points on a five-point scale, which represents a major gap. Almost half of the respondents (49.5%) combine a strong agreement with the hypothetical statement of Q14 (4 or 5) with a clear disagreement with the actual past behavior in Q15 (1 or 2). In contrast, only 17.2% of respondents combine high environmental concern (Q6 $\geq$ 4) with low past influence (Q15 $\leq$ 2), and the same proportion combines high willingness to pay (Q7 $\geq$ 4) with low past influence. The largest internal contradiction in the dataset is therefore not between general environmental concerns and behavior, but between hypothetical efficiency-driven choice and real past choice.



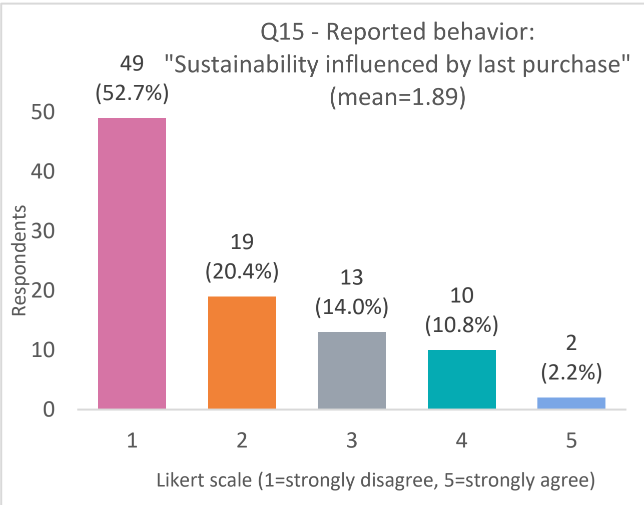


Figure 7. *Stated willingness to choose a more efficient phone under "all else equal" conditions (Q14) versus reported real influence of sustainability in the last purchase (Q15).*

Two complementary readings of this gap are possible from the dataset alone. First, the "all else equal" condition in Q14 (similar price and technical features) effectively neutralizes the most important purchase factors identified in Section 7.2. When trade-offs are removed, energy efficiency emerges as a tie-breaking criterion. Second, when respondents look back at their actual past purchase, those trade-offs are reinstated and sustainability loses most of its weight. The gap is consistent with the finding that respondents who declared themselves familiar with the label in Q8 (mean Q15 = 1.82, n=38) did not report a higher real influence of sustainability than those not familiar (mean Q15 = 1.95, n = 55). Familiarity with the label, in this sample, does not appear to translate into a stronger influence of sustainability on past purchase decisions.

Question 13 asked respondents to rank the six parameters of the label from most to least important when choosing a smartphone (1 = most important, 6 = least). Battery autonomy obtains the best (lowest) mean rank with 3.00, followed very closely with Battery lifespan (3.09). Energy efficiency comes third (3.41), ahead of Drop resistance (3.45) and Repairability (3.65), with Dust and water resistance (3.80) ranked last. Battery-related parameters therefore clearly dominate respondents' priorities within the label. Energy efficiency, despite being the parameters that most directly define the label's environmental rationale, sits in an intermediate position, ahead of repairability and resistance attributes but well behind battery metrics. Differences across parameters are however moderate (the range is 0.80 points on a six-point scale), indicating that no parameter is seen as marginal.

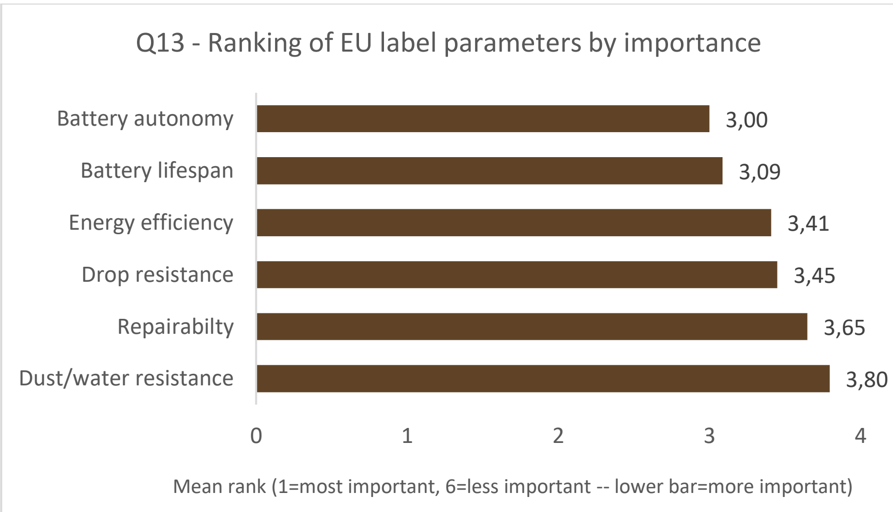


Figure 8. *Ranking of EU label parameters by importance (Q13). Mean rank: lower values indicate higher importance.*

Question 16 puts the energy label in direct competition with the four traditional purchase factors, asking respondents to rank price, brand, technical features, design and the energy efficiency label from most (1) to least (5) important. Price obtains the best mean rank (2.81), closely followed by Brand (2.86), Technical features (2.90) and Design (3.00). The energy label ranks last, with a mean of 3.18. Two observations should temper this finding. On the one hand, the differences between the four "traditional" factors are very small (less than 0.20 points), indicating that respondents distribute their priorities relatively evenly across them. On the other hand, the gap between the lowest-ranked traditional factor (Design, 3.00) and the energy label (3.18) is also modest. The label is not perceived as dramatically less important than design but is consistently placed at the bottom of the hierarchy. This reinforces, in a relative ranking format, the absolute importance result already observed in Q5.

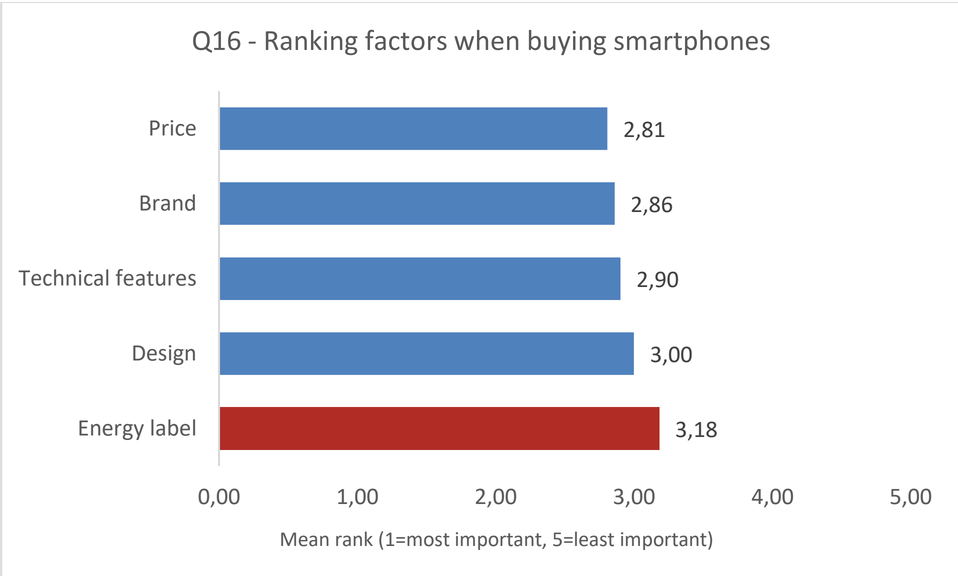


Figure 9. *Ranking of purchase factors including the EU energy label (Q16). Mean rank on a 1-5 scale; lower values indicate higher importance.*

Question 17 asked respondents to choose the option that best describes their buying behavior. The largest group, 35.5% of valid responses (33), describes itself as comparing several alternatives before deciding, and 33.3% (31) prioritizes product quality and durability. A further 21.5% (20) prefers well-known brands. Only 6.5% (6) report typically choosing the cheapest option, and just 3.2% (3) explicitly prioritize environmentally sustainable products. The fact that fewer than four out of every hundred respondents identify sustainability as their main buying logic is fully consistent with the rest of the results: although a sizable share of the sample reports moderate environmental concern and even hypothetical willingness to favor more efficient phones, the share of respondents who self-identify as a “sustainability-driven buyer” is marginal.

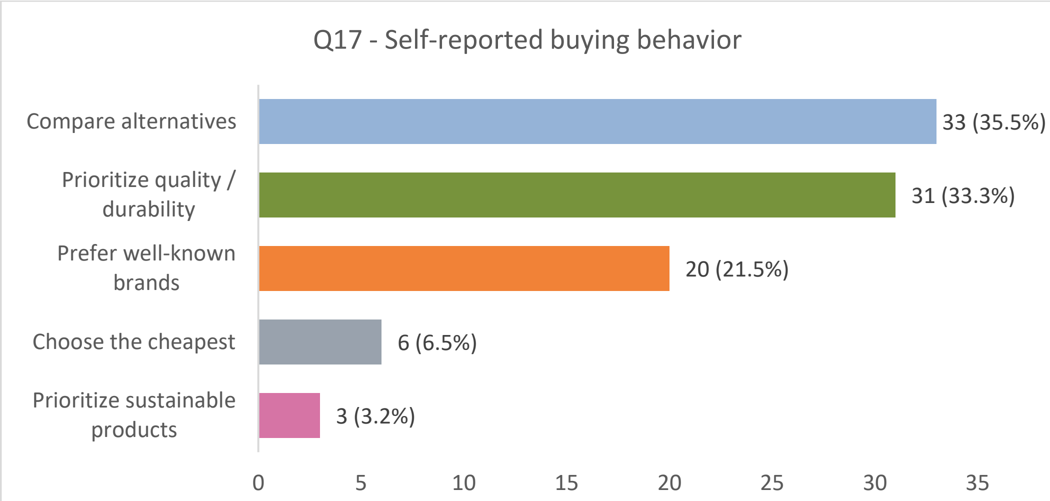


Figure 10. *Self-reported smartphone buying behavior (Q17).*

Question 18 indicates that, before buying a smartphone, 40.9% of respondents (38) search a moderate amount of information, 26.9% (25) search a lot, 24.7% (23) search some, and only 7.5% (7) search very little. Combining the categories "a lot" and "a moderate amount", almost 68% of respondents engage in an informed search process. This is a relevant finding when read jointly with the perceived usefulness of the label (Q11, mean 3.02): respondents in this sample do search for information, but the EU energy label does not consistently emerge as one of the key inputs feeding that search.

Two limitation of the analysis should be made explicit. First, although gender, education, and spending level were captured, no clear pattern emerges in the dataset linking these segmentation variables to the strength of pro-sustainability attitudes or to the influence of the label on the past purchase: differences in mean values across these subgroups are small. Second, the comparison between Q8 (familiarity) and Q15 (real influence) suggests that prior familiarity with the label is not associated with a stronger reported influenced of sustainability on the last purchase, but the limited subsample sizes make it impossible to draw conclusions beyond a descriptive observation. These limitations reinforce the cautious interpretive tone adopted throughout the chapter.

6.6 Summary of findings

The descriptive analysis of the 94 responses points to three findings. First, sustainability is consistently rated as the least important purchase factor, both in absolute Likert terms (Q5, M = 2.67) and in the comparative ranking against price, brand, technical features and design (Q16, last position with mean rank 3.18). Second, the most prominent gap in the data is not between general environmental concern and behavior, but between hypothetical efficiency-driven choice (Q14, M = 4.00) and the reported real influence of sustainability on the last purchase (Q15, M = 1.89). Almost half of the sample exhibits this specific contradiction. Third, awareness of the EU energy label is partial and asymmetric: a clear majority of respondents had no prior familiarity with it, exposure happens mainly in physical stores, the label is perceived as visually clear but only moderately useful for comparison, and the parameter most central to its environmental purpose, energy efficiency, is precisely the one respondents feel they understand the least and rank below battery-related parameters.

7. Conclusions and recommendations

This chapter brings together the empirical evidence developed in the qualitative and quantitative phases of the study and reads it against the theoretical framework presented in earlier chapters. Rather than restating findings already discussed in detail, the goal here is to interpret them: to ask why the patterns observed in the data have emerged, how they relate to existing theoretical models of consumer behavior, and what they imply for the actors involved in the design, communication and reception of the EU energy label for electronic devices.

7.1 Summary of main findings and discussion of previous literature

The starting point of any interpretation of these findings is that the influence of the new EU energy label on Generation Z purchase decisions, while real, is currently weak. Sustainability appears at the bottom of the priority hierarchy in both the interviews and the survey. This pattern is consistent with a well-documented intention-behavior gap in Generation Z consumption, where strong stated environmental concern frequently fails to materialize at the moment of purchase (Brîndusa et al., 2024). Environmental concern in the questionnaire is moderate rather than strong (M = 2.90), willingness to pay a premium for sustainability is even lower (M = 2.74), and the label itself is unknown to most respondents and was unknown to all 9 interview participants until it was shown to them. These findings, taken in isolation, may seem to confirm the attitude-behavior gap described in the literature on sustainable consumption (Gaspar & Antunes, 2011; Skourtos et al., 2021). However, a closer reading of the data suggests that the gap operates in a more specific way than the classical formulation predicts.

The classical version of the gap describes a contradiction between strong environmental attitudes and weak pro-environmental behavior. The data of this study indicate something subtly different. The largest internal contradiction is not between general environmental concern (Q6, M = 2.90) and reported behavior (Q15, M = 1.89), but between hypothetical efficiency-driven choice (Q14, M = 4.00) and the same reported behavior. When trade-offs are removed by the "all else equal" framing, environmental efficiency becomes a clear tiebreaker; when trade-offs are reinstated, it disappears. The gap, in other words, is less a contradiction between values and action than a structural property of the decision context: sustainability functions as a residual criterion that activates only when stronger criteria are neutralized. This reading is fully consistent with the qualitative finding that the label was repeatedly described not as a driver of choice but as a possible tiebreaker between two phones already similar in every primary aspect.

Why sustainability remains residual can be understood through the lens of the Theory of Planned Behavior (Azjen, 1991). According to Azjen, behavioral intentions are shaped by attitudes, subjective norms and perceived behavioral control, but only those beliefs that are salient and cognitively accessible at the moment of decision-making actually translate into intention. In the smartphone context, the relevant environmental beliefs are neither salient not accessible: the label is unfamiliar to a clear majority of respondents (59.1%), often invisible at the point of purchase, and opaque in its secondary parameters. Even when the broad A-to-G scale is read intuitively, the secondary indicators that carry much of the label's environmental content remain confusing. The paradox that energy efficiency itself is the parameters respondents feel they understand the least (M = 3.65) is perhaps the most revealing finding of the quantitative phase: the cognitive accessibility of the label collapses at its environmental core. The conditions under which environmental information could plausibly enter the decision process, in Ajzen's terms, are therefore not yet met.

This interpretation gains additional depth when read against the literature on heuristic processing of environmental labels (Skog & Sörqvist, 2025; Skourtos et al., 2021). According to this strand of research, consumers do not engage with energy labels as analytical artefacts but as visual heuristics that simplify complex evaluations. The A-to-G scale works as a heuristic because it has been embedded in consumer experience for decades through household appliances, and most participants in this study could read it without effort. The smartphone label, however, juxtaposes letter-based scales with technical standards (IP68) and numerical ratios (1000x) each requiring a different interpretive frame. This combination does not simplify; it complicates. The multidimensional design of the smartphone label introduces a level of cognitive complexity that exceeds what the typical consumer is willing or able to process in a routine purchase, an effect already anticipated in the literature (De Ayala et al., 2020; Kesselring, 2025).

A second structural mechanism is the role of brand and identity in smartphone consumption. The qualitative phase showed that 8 of the 9 interview participants had effectively closed the brand question before any other consideration entered the decision space. Apple was not described as a preference subject to revision but as an ecosystem so embedded in everyday life that switching brands felt impractical. This pattern aligns with the argument advanced by Brîndusa et al. (2024) that smartphones werve symbolic, social and identity-related functions in the lives of Generation Z consumers, and with Walters (2021) on the strong emotional attachment that this generation develops toward technology. The analytical consequence of brand pre-selection is that the label can only operate in a residual decision space, choosing between models within the same brand, where the differences in label parameters are unlikely to be significant. The label's reach is therefore bounded not by the consumer's environmental motivation but by the prior closure of the most important decision.

A further layer of explanation concerns the timing of the label within the decision process. Several interview participants described smartphone purchases as triggered by specific functional problems, typically battery decline or storage saturation, that generate urgency and narrow the decision down quickly. In this context, a tool designed for reflective, multi-criteria comparison is unlikely to be consulted, particularly when the label is also low in physical and visual salience. The descriptive finding that 24 respondents who declared themselves unfamiliar with the label had nonetheless reported having seen it through some channel illustrates this point well: passive exposure to a low-visibility cue does not translate into active recognition. The label exists in the environment but does not enter cognition.

Finally, the comparison with the household appliance label, which arose spontaneously in the qualitative phase, helps to clarify the conditions under which energy labels manage to influence behavior at all. Appliance labels gained traction not primarily through environmental motivation, but through financial transmission mechanism: the energy class of an appliance running continuously for years is converted into a recurring electricity cost that the consumer experiences directly. For smartphones, this mechanism is absent. The label thus arrives at the digital device market without the economic feedback loop that historically embedded labelling into routine consumption (Boyano et al., 2020; Doganoglu et al., 2025), and this left to rely on environmental motivation alone. Combined with the cognitive complexity of the secondary parameters and the conflation of sustainability with durability observed in the interviews, where buying a flagship device intended to last several years was reframed as inherently sustainable, the result is a label whose environmental purpose is structurally under supported by its informational design and its market context.

7.2 Implications and recommendations for companies, public institutions and consumers

7.2.1 Implications and recommendations for companies and smartphone manufacturers

For manufacturers, the findings point in two complementary directions. On the one hand, brand loyalty currently protects established brands from label-driven differentiation: as long as the brand decision is made before label parameters are consulted, the disruptive potential of the label is contained. On the other hand, manufacturers that perform well on battery autonomy, battery lifespan and repairability can leverage the label as an institutional endorsement of attributes that already drive purchase, integrating sustainability into existing logics rather than treating it as a separate narrative. As the label becomes more familiar, segmentation logic suggests that the absence of a strong rating may begin to act as a negative signal among the more environmentally engaged segments of Generation Z, even if these remain a minority within the cohort (Wedel & Kamakura, 2000). Brands that anticipate this shift and design devices with the label in mind, rather than adapt their communication after the fact, may secure a credibility advantage that is difficult to replicate later.

Manufacturers and retailers should complement the visual energy label with a brief explanatory caption – physically next to the label in stores and as a tooltip in e-commerce listings – clarifying that the durability and repairability ratings translate into environmental benefits that the consumer might otherwise associate only with personal value (longer device life). Given that the qualitative interviews show Generation Z conflating sustainability with durability, this re-framing leverages an existing mental model rather than fighting it. A natural extension of this thesis would be an experimental test of whether this explanatory paragraph measurably shifts purchase intention.

7.2.2 Implications and recommendations for public institutions and EU policy makers

For policymakers, the most pressing implication concerns the visibility and comprehensibility of the label. The combination of low awareness, ineffective passive exposure and confusion about secondary parameters indicates that the label is currently not meeting the basic preconditions of the label at the point of sale, ensuring its consistent placement across physical and digital retail channels, and simplifying the secondary parameters to reduce the cognitive complexity identified in the qualitative phase. The paradox that energy efficiency itself is the least understood parameter deserves particular attention, since it suggests that the cognitive complexity of the current design may be undermining the environmental purpose for which the label was created. Moreover, the absence of a financial transmission mechanism for smartphone means that, in this product category, energy labelling will likely need to be complemented by additional instruments – educational campaigns, repairability incentives, or signaling tied to manufacturer practices – if it is to generate meaningful change. At the same time, however, the interview evidence that Generation Z prioritizes battery longevity above all other smartphone attributes converges with the policy direction set by Regulation (EU) 2023/1542, which from February 2027 will require portable batteries – including those in smartphones – to be easily removable and replaceable by the end-user. While the two instruments operate through different levers (information disclosure in the case of the energy label and design requirements in the case of the battery regulation), they ultimately target the same user concern. This alignment suggests that the new energy label may gain salience over time, as the durability dimensions it makes visible increasingly reflect attributes that Generation Z already values. As Kesselring (2025) argues, energy labels are more usefully understood as part of a broader policy mix than as standalone information tools.

Public institutions could launch a Gen-Z-targeted communication campaign on social media (where, as the survey shows, only 12.9% of respondents have encountered the label), require online retailers to display the label at the same visual prominence as the device price during the comparison stage of the purchase journey, and align communication of the smartphone energy label with the upcoming 2027 replaceable-battery requirement (Regulation (EU) 2023/1542), so that the two instruments are perceived as a coherent durability framework rather than as isolated rules.

7.2.3 Implications for consumers, particularly Generation Z

For consumers, the findings refine rather than contradict the narrative of an environmentally aware generation (Andruszkiewicz et al., 2023; Walters, 2021). Environmental concern in this cohort is real but latent, conditional and selectively activated. The label can become a useful tool primarily when approached as a source of practical, comparable information on dimensions consumers already value, particularly battery and repairability, rather than as an environmental statement to be acted upon out of principle. The conflation between sustainability and durability observed in the interviews is particularly relevant here: by treating the longevity of a device as a sufficient marker of environmental responsibility, consumers can preserve existing buying habits while feeling environmentally aligned. Increased exposure to clearer information may, over time, help refine this understanding into a more multidimensional view of what makes a digital device sustainable.

7.3 Limitations and future research directions

The findings of this study should be read in light of the limitations inherent to its scope. The use of a convenience sampling strategy, in both the qualitative and quantitative phases, restricts the geographical and educational diversity of the sample: respondents were drawn primarily from university networks in Spain, and more than three quarters of survey participants were university students. While this profile is appropriate for an exploratory study focused on a digitally engaged segment of Generation Z, it constraints the generalization of the findings to young consumers in vocational training, in employment without university studies, or in countries with different cultural and regulatory contexts. Future research with larger and more diverse samples, ideally including respondents from several European countries and from non-university backgrounds, would help to test the robustness of the patterns identified here.

A second limitation concerns the timing of the research. The fieldwork was conducted shortly after the introduction of the EU energy label for electronic devices, when the label was almost entirely unfamiliar to the largest population. While this provides a valuable baseline against which future change can be measured, it also means that the findings reflect a transitional phase. Longitudinal designs that revisit similar populations once the label has had time to gain familiarity would help to disentangle stable pattern from purely transitional effects, and a replication of this study in two or three years’ time would constitute a natural extension of the present research.

The cross-sectional and self-reported nature of the data also imposes interpretative caution. The gap between hypothetical preferences and reported past behavior already illustrates the limits of stated-intention measures. Experimental approaches, such as choice experiments that vary label format and visibility, or in-store observation studies, would help to triangulate the findings and provide more direct evidence on actual behavior at the point of decision. Comparative studies across product categories, including tablets, laptops, and other electronic devices subject to similar labelling schemes, would clarify whether the patterns identified for smartphones are specific to this product or extend to digitally intensive markets more broadly. Larger samples, finally, would allow for inferential analysis if the demographic and attitudinal segments within Generation Z, which the descriptive scale of this study could not address with confidence.

Despite these limitations, this research provides a coherent first picture of how the EU smartphone energy label is currently received by Generation Z consumers, in a market segment where empirical evidence remains scarce. Its central contribution is to show that the label is not failing because consumers are indifferent or because the policy logic is misguided, but because the conditions that historically allowed energy labels to embed themselves in routine consumption – visibility, comprehensibility and a clear link to a tangible consumer interest – have not yet fully materialized for digital devices. Whether they do so in the coming years remains an open empirical question that future research is well placed to address.

8. Statement of Use of Generative Artificial Intelligence Tools

WARNING: From the University we consider that ChatGPT or other similar tools are very useful tools in academic life, although their use is always under the student's responsibility, since the answers provided may not be truthful. In this regard, the use of these tools to generate code in the preparation of the TFG is NOT permitted, as they are not reliable for such tasks. Even if the code works, there is no guarantee that it is methodologically correct, and it is highly likely that is not.

I hereby declare that I, Lucía Requena Guillén, a student of the Bachelor's Degree in Business Administration and Management at Universidad Pontificia Comillas, in submitting my "Trabajo de Fin de Grado" entitled "The New EU Energy Label for Smarpthones: Perception and Influence on Purchase Decisions among Generation Z in Spain", have used the generative artificial intelligence tool ChatGPT or similar tools only in the context of the activities described below:

1. Preliminary literature search and synthesis: Used to organize the structure of the theoretical framework, improve the logical flow between sections and ensure coherence between the literature review, methodology and analysis.
2. Academic writing and language improvement: Used to enhance the clarity, coherence and formal academic tone of the text in English.
3. Academic translation: Used to ensure accurate terminology and expression when moving between Spanish and English, particularly in relation to the interview transcripts and the survey instrument originally designed in Spanish.
4. Reviewer: Used to receive suggestions on how to improve and refine specific sections of the work with different levels of demand, particularly in relation to argumentative coherence and academic style.
5. Survey generator: Used to design and refine preliminary versions of the online questionnaire distributed to Generation Z respondents, with all final items reviewed and adapted independently to fit the research objectives.

I affirm that all the information and content presented in this work are the result of my own research and individual effort, except where otherwise indicated and properly acknowledged (including appropriate references in the "Trabajo Fin de Grado" and an explicit explanation of how ChatGPT or similar tools have been used). I am aware of the academic and ethical implications of submitting non-original work and accept the consequences of any violation of this declaration.

Date: 29 – 04 – 2026

Signature:

9. Bibliography

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10. Annex

10.1 Interview guide

1. To start, could you tell me a bit about the smartphone you currently use? (brand, model, how long you've had it)
2. How important is your smartphone in your daily life? Why?
3. What do you mainly use it for? (social media, work, studies, entertainment) SHORT PAUSE
4. Thinking about the last time you bought a smartphone, how did you make your decision?
   (did you compare models? ask someone? read reviews? go to a physical store?)
5. What factors were most important to you when choosing it? Why? (price, brand, design, camera, battery, performance, storage, sustainability)
   1. Please rank these factors from most to least important.
   2. Why did you rank them that way?
6. Do you usually think about sustainability or environmental impact when buying electronic devices? Why or why not?
7. In your opinion, what does it mean for a smartphone to be "sustainable"? (battery life, durability, repairability, recyclable materials, energy consumption)
8. Can you recall a specific moment when you had to choose between two smartphones?
   1. What ultimately made you choose one over the other?
   2. Did sustainability play any role in that decision?

PHOTO OF ENERGY LABEL (FRIDGE)

9. Before talking about smartphones, are you familiar with the EU energy label used for household appliances (such as fridges or washing machines)?
   1. What does it represent?
   2. Have you ever used it in a purchase decision?
10. Before this interview, were you aware of the EU energy label applied to electronic devices such as smartphones?
11. Where, if at all, have you seen this type of label before?

PHOTO OF ENERGY LABEL (SMARTPHONE)

12. Looking at this label, what do you think it is trying to communicate?

13. Do you find it easy or difficult to understand? Why?

    1. Energy efficiency class (A–G scale) – this scale shows how energy-efficient the smartphone is compared to others. A is the most efficient and G the least efficient.
        1. Do you clearly understand what this scale means?
        2. What does a class B (for example) suggest to you?
        3. How important would this energy class be for you when buying a smartphone? Why?
        4. Would you reject a smartphone because of a low energy class? In what situation?
    2. Battery endurance per cycle – indicates how many hours and minutes the battery lasts under standardized usage conditions.
        1. Is this information clear to you?
        2. How do you interpret this number?
        3. Do you usually pay attention to battery life when buying a phone?
        4. How important would this parameter be compared to others like camera or price? Why?
    3. Drop resistance (durability) – this rating shows how resistant the smartphone is to accidental drops.
        1. Did you know this type of rating existed?
        2. How relevant is drop resistance to you?
        3. Would it influence your decision if two phones were similar in price and performance?
        4. Do you associate durability with sustainability? Why or why not?
    4. Repairability index – indicates how easy it is to repair the smartphone, including access to spare parts and ease of disassembly.
        1. What does repairability mean to you?
        2. Before today, had you ever thought about how repairable a phone is?
        3. How important would this be in your purchase decision?
        4. Would knowing a phone is difficult to repair discourage you from buying it?

5. Battery lifespan (performance over time) – indicates how many charge cycles the battery can withstand before its performance significantly decreases.
    1. Do you find this parameter easy or difficult to understand?
    2. Do you usually think about how long the battery will last over the years?
    3. Would this make you willing to pay slightly more?
    4. Do you associate longer battery lifespan with environmental sustainability? Why?
6. Water and dust resistance – indicates the level of protection of the phone against water and dust (e.g., splash resistance or immersion).
    1. Are you familiar with IP ratings?
    2. How important is water/dust resistance in your daily life?
    3. Do you consider it a quality factor, a safety factor, or a sustainability factor?
    4. Would it influence your purchase decision in a real situation?

14. Now that we have analyzed the six parameters, please rank them from most to least important when buying a smartphone:
    1. Energy efficiency class
    2. Battery endurance
    3. Drop resistance
    4. Repairability
    5. Battery lifespan
    6. Water/dust resistance
        1. Which one has surprised you the most during the conversation?
15. Do you trust this type of information? Why or why not?
16. Imagine a friend of yours is choosing between two smartphones and sees this energy label. How do you think they would react?
17. When buying a smartphone online or in a physical store, how visible do you think this label actually is?
18. In what situation, if any, do you think this label could really influence your decision?

19. Compared to other factors such as price or brand, how relevant do you think this label is in a real purchase situation?
20. What could prevent you from using this information when buying a smartphone?
    1. Rephrasing if necessary: what makes you not take it into account in real situations?
    2. When you are buying a smartphone, what leads you to ignore or overlook this type of information?
21. What could make this label more useful or relevant for people your age?
22. If you had to summarize it briefly: how much does the energy label matter to you when buying a smartphone?
23. Is there anything else you would like to add about smartphones, sustainability, or energy labels?

10.2 Online questionnaire

1. Are you between 18 and 25 years old?
    a. Yes
    b. No → End of questionnaire

Section 1: Smartphone Usage Context

2. Which is the brand and model of your phone?
3. How often do you usually replace your smartphone?
    a. Less than 1 year
    b. Every 1-2 years
    c. Every 3-4 years
    d. More than 4 years
4. Approximately how much did you spend on your last smartphone?
    a. Less than €200
    b. €200-€400
    c. €400-€700
    d. More than €700

Section 2: Purchase Decision Factors

5. When buying a smartphone, how important are the following factors to you? (Likert scale: 1=Not important at all - 5=Very important)
    a. Price
    b. Brand
    c. Design
    d. Camera quality

    e. Battery life
    f. Performance
    g. Environmental impact/ Sustainability

Section 3: Sustainability Attitudes

6. I consider myself a person who is concerned about the environmental impact of my consumption decisions. (1=strongly disagree - 5=Strongly agree)
7. I am willing to pay a higher price for a smartphone that is more environmentally sustainable (1= Strongly disagree - 5=Strongly agree)

Section 4: Awareness of the EU Energy Label (add a pic of the label)

8. Before this survey, were you familiar with the Eu energy label applied to electronic devices (smartphones and tablets)?
    a. Yes
    b. No
9. Where have you seen this type of energy label? (Multiple answers possible)
    a. Physical retail stores
    b. Online stores
    c. Advertising
    d. Social media
    e. I had never seen it before

Section 5: Understanding of Energy Label

10. I find the EU energy label easy to understand (1=Strongly disagree - 5=Strongly agree)
11. The EU energy label helps me compare different smartphones (1=Strongly disagree - 5=Strongly agree)

Section 6: Understanding of Label Parameters

12. How well do you understand the following parameters shown on the label? (1=Do not understand at all – 5=Understand clearly)
    a. Energy efficiency class
    b. Battery endurance
    c. Durability rating
    d. Repairability score
    e. Resistance to drops
    f. Resistance to dust and water

Section 7: Importance of Label Parameters

13. Please rank the following label parameters from MOST important to LEAST important when choosing a smartphone.
    a. Energy efficiency scale
    b. Battery lifetime
    c. Durability
    d. Repairability

e. Resistance to drops
f. Resistance to dust and water

Section 8: Influence on Purchase Decisions

14. If two smartphones had similar price and technical features, I would choose the one with a better energy efficiency rating (1=Strongly disagree - 5=Strongly agree)
15. In my most recent smartphone purchase, sustainability considerations influenced my final decision. (1=Strongly disagree - 5=Strongly agree)

Section 9: Tradeoff between decision factors

16. Please rank the following factors according to their importance when buying a smartphone
    a. Price
    b. Brand
    c. Technical features
    d. Design
    e. Sustainability / energy efficiency label

Section 10: Behavioural Segmentation Variables

17. When buying a smartphone, which of the following best describes your behavior?
    a. I usually choose the cheapest option
    b. I compare several alternatives before deciding
    c. I prefer well-known brands
    d. I prioritize product quality and durability
    e. I prioritize environmentally sustainable products
18. How much information do you usually search before buying a smartphone?
    a. Very little
    b. Some
    c. A moderate amount
    d. A lot

Section 8: Sociodemographic information

19. Age
    a. 18-19
    b. 20-21
    c. 22-23
    d. 24-25
20. Gender
    a. Female
    b. Male
    c. Other / Prefer not to say
21. Highest level of education completed
    a. High school
    b. Undergraduate degree
    c. Master's degree or higher