energy literacy for youth

Energy Literacy for Inclusion

A Research report on Learning with Marginalised Communities

Funded by the European Union

Title: Energy Literacy for Inclusion. A Research Report on Learning with Marginalised Communities

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ISBN: 978-83-968170-1-3

Publisher: Open Plan Foundation/Fundacja Otwarty Plan

Published in Kraków, 2025

Acknowledgments: We thank all participants, community partners, and facilitators who contributed to this research.

The Energy Literacy for Youth (ELY) project seeks to empower marginalised youth by equipping them with the knowledge and skills necessary to understand the links between energy literacy and climate action. The project has four core objectives: to research and identify the specific needs and barriers faced by marginalised youth in becoming energy literate; to create an inclusive and accessible curriculum that connects energy literacy with active citizenship and the climate crisis; to enhance access to online resources about the climate crisis and sustainable energy; and to ensure the widespread dissemination and effective implementation of the curriculum through targeted training initiatives.

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Executive Summary

This report presents the key findings from the Energy Literacy for Youth (ELY) project, with a focus on the participatory research conducted through the Energy Adventure Room (EAR) methodology across five European countries—Germany, Poland, the Czech Republic, Denmark, and Cyprus. The initiative engaged marginalised youth in structured, experiential learning activities designed to explore their knowledge, perceptions, and access to energy education. It also examined systemic, social, and cultural barriers affecting their engagement in the energy transition.

Key Findings

Low levels of energy literacy: More than half of the participants displayed low foundational knowledge of energy systems, climate change, and civic participation. Particular gaps were evident in understanding how energy systems function, their social implications, and how youth can influence decision-making.

Barriers to access: Youth from marginalised backgrounds face multiple, overlapping barriers:

- economic obstacles (cost of workshops, transport),
- geographical limitations (few local opportunities),
- linguistic and cultural exclusion (lack of relatable materials),
- disability-related inaccessibility,
- low visibility of existing energy education programmes.

Motivators for engagement: Despite existing knowledge gaps, the participating youth expressed a strong desire to act. They were most motivated by:

- hands-on learning and field experiences,
- opportunities to apply knowledge in real-life contexts,
- access to mentors or role models,
- a sense of contribution to climate action and national energy security.

Preferred learning formats: In-person workshops and community-based programmes were the most favoured; however, digital and gamified platforms were also appreciated by those with mobility or time constraints.

1. Introduction

Energy literacy has emerged as a crucial competence in addressing the dual challenges of the climate crisis and the pursuit of a just transition. The ability to understand, critically assess, and act upon energy-related information is fundamental for enabling citizens to participate meaningfully in energy decisions that affect their lives and communities (DeWaters & Powers, 2011). As global efforts to reduce greenhouse gas emissions and phase out fossil fuels intensify, individuals and communities are increasingly expected to navigate complex information related to renewable energy, efficiency measures, and policy frameworks (UNESCO, 2022).

Moreover, in the context of a just transition—defined as a process that aims to secure environmental sustainability while ensuring social equity and protection for affected workers and communities—energy literacy becomes a democratic and ethical imperative (Heffron & McCauley, 2018). It supports not only informed individual choices but also collective engagement in participatory processes, particularly among marginalised groups who are often excluded from formal decision-making structures (Sovacool et al., 2020).

In this regard, fostering energy literacy among young people and across generations contributes to building resilient, informed societies capable of co-shaping sustainable energy futures. More than merely an educational goal, it constitutes a cornerstone of energy democracy and environmental justice.

The Energy Literacy for Youth (ELY) project aims to empower marginalised youth across Europe by building their knowledge, agency, and civic engagement in relation to the climate crisis and sustainable energy. The project takes a participatory, inclusive approach and is grounded in equity, accessibility, and education.

Its specific objectives are:

1. Identifying needs and barriers: to research and understand the specific needs of marginalised youth and the existing barriers—educational, digital, social, or economic—that prevent them from becoming energy literate and active participants in the climate discourse.
2. Developing a participatory curriculum: to design and implement an inclusive and accessible curriculum that enables young people to explore the climate crisis and its relationship to energy systems, encouraging their critical thinking and active citizenship.
3. Enhancing access to digital resources: to create, curate, and distribute online resources that are engaging, multilingual, and tailored to the needs of diverse youth audiences, thereby improving their access to information on climate action and sustainable energy.
4. Training for maximum outreach: to enable educators, youth workers, and other stakeholders to effectively use and promote the curriculum, with a focus on reaching underrepresented communities.

Drawing from the overall goals of the project, the following research questions were formulated to specifically address the first two objectives:

➔ **Needs and barriers**

RQ1: What are the main social, economic, and cultural barriers that hinder marginalised youth from acquiring energy literacy?
RQ2: How do different groups of marginalised youth perceive energy, climate change, and their roles in sustainable futures?

➔ **Curriculum creation and learning**

RQ3: What are the key areas in which youth demonstrate the greatest gaps in energy literacy?
RQ4: What pedagogical models and participatory strategies are most effective for engaging marginalised youth in energy and climate education?
RQ5: How can curricula promote energy literacy while also encouraging critical thinking, civic participation, and systemic awareness?

To answer these questions, the ELY research team decided to use participatory action research (PAR), which is not only a methodological choice but also a political and ethical commitment to inclusivity, empowerment, and co-creation of knowledge. In the context of the Energy Literacy for Youth project, PAR is essential to ensure that marginalised youth and communities—often excluded from traditional educational and policy-making activities—are treated as active collaborators and co-researchers in the process of understanding, designing, and transforming energy literacy education. PAR shifts the power dynamic by giving these groups ownership over the knowledge-production, allowing them to define problems, co-design solutions, and evaluate outcomes based on their lived experiences.

Furthermore, energy literacy cannot be effectively taught or promoted through top-down models alone. PAR ensures that interventions are grounded in the local realities, languages, and socio-cultural frameworks of the communities involved. This is especially crucial when working with youth who may hold diverse or non-dominant worldviews regarding climate, technology, and civic agency. Additionally, marginalised communities often carry a justified distrust of institutions due to historical exclusion or discrimination. PAR fosters mutual trust and long-term collaboration, as it requires researchers and facilitators to engage participants with humility and respect, recognising local knowledge as equally valuable.

For participating youth, PAR is also a form of experiential and democratic education. It aligns with the goals of active citizenship, critical pedagogy, and energy justice by inviting young people to question dominant systems, explore their role in climate protection and just transition, and become agents of change in their own communities. In contrast to extractive research models, PAR integrates ethics of care, transparency, and reciprocity. It perceives participants as rights-holders, not data sources, and ensures that the benefits of research are shared equitably. At the same time, insights from PAR tend to be more actionable and grounded in reality. Therefore, when marginalised youth co-produce data and

recommendations, the outcomes are more policy-relevant, more legitimate, and more likely to be adopted by schools, NGOs, and local governments.

2. Theoretical and Conceptual Framework

Energy literacy—the knowledge, attitudes, and behaviours that enable individuals to make informed energy-related decisions—is a cornerstone of contemporary sustainability discourse (van den Broek, 2019). It encompasses not only technical and scientific understanding but also awareness of the economic, social, and environmental impacts of energy use. As the world transitions to more sustainable energy systems, fostering energy literacy among the general public, students, and policymakers has become a strategic imperative.

Recently, energy literacy has evolved into a multi-dimensional educational and policy goal, intersecting with global efforts to promote sustainable development, environmental awareness, and energy equity. It can be broadly defined as a set of knowledge and skills necessary for making informed energy-related decisions and taking responsible action. Another common conceptualisation encompasses three interrelated dimensions: knowledge, attitude and behaviour (Martins et al., 2019). These definitions emphasise both cognitive understanding and practical application.

Education and Curriculum Integration

Educational institutions are central to cultivating energy literacy. In primary and secondary education, innovative teaching models have emerged in this regard. For example, the I-DECOBEST module, designed for primary school settings, leverages visual tools and inquiry-based activities to enhance students' understanding of electrical energy and promote responsible energy behaviour (Jusoh et al., 2025). Similarly, middle school teachers have integrated energy concepts into curricula through real-world engineering challenges that support cross-disciplinary learning (Wright et al., 2025). A comprehensive literature review by Sriatun et al. (2025) identified several effective strategies for embedding energy literacy in physics education, including context-based learning, student-centred experimentation, and linking classroom content with global energy issues.

Digital Tools and Higher Education

At the higher education level, energy literacy intersects with digital literacy, fostering a new generation of energy-aware citizens. Akinsemolu (2025) emphasises the role of artificial intelligence (AI) in promoting sustainable learning, noting that educational AI platforms can enhance students' understanding of energy systems, climate impacts, and sustainable practices. Gupta and Saranya (2025) complement this view by showing how digital infrastructure, when integrated with energy awareness, can lead to more sustainable industry practices—particularly in emerging economies where digitalisation and energy equity need to evolve in tandem.

Citizen Science and Societal Engagement

Outside of formal institutions, citizen science initiatives have played a key role in fostering grassroots energy and environmental literacy. As demonstrated by Morillas et al. (2025) in the context of soil and ecological monitoring, participatory projects can enhance both scientific understanding and community awareness of resource and energy interdependencies. More broadly, societal engagement in energy transitions encompasses community-led initiatives, mobilising local knowledge, participatory governance, and advocacy for energy justice—particularly when marginalised groups are involved (Jenkins et al., 2016).

Interdisciplinary Perspectives

Energy literacy is no longer viewed as a purely scientific competency. Recent scholarship places it at the intersection of financial, digital, and civic literacies—particularly when addressing challenges such as energy poverty, misinformation, and environmental injustice. These interdisciplinary connections expand the scope of energy literacy into a broader civic and ethical domain. As we approach the midpoint of the 21st century, the imperative is clear: to embed energy literacy at all levels of education, align it with technological innovation, and empower both individuals and communities to engage actively in energy transitions. This endeavour not only supports the achievement of the UN Sustainable Development Goals (SDGs) but also builds societal resilience against energy insecurity and climate threats.

Analytical levels

To critically understand and evaluate the dynamics of youth energy literacy and participation, this project employs three interrelated analytical lenses: energy justice, climate education, and youth agency. Each lens offers a different perspective on how power, knowledge, identity, and aspiration shape youth engagement with energy and sustainability in the context of education. At each level, guiding questions are intended to enhance analytical depth and highlight qualitative insights.

Energy justice examines how the benefits and burdens of energy systems are distributed across different social groups, with attention to issues of equity, access, participation, and recognition.

Application: This lens helps analyse how marginalised youth experience unequal access to energy resources (e.g. digital access, fuel poverty), and whether they are recognised as legitimate participants in energy decision-making processes.

Guiding questions:

- ➔ Who has access to affordable, sustainable energy?
- ➔ Whose voices are included or excluded in energy planning and education?
- ➔ How does energy policy reproduce or challenge existing social inequities?

Climate education is not limited to the transmission of environmental facts—it is a transformative process aimed at fostering critical awareness, systemic thinking, and civic action.

Application: This lens allows us to explore how energy literacy is embedded within broader climate education, and assess whether pedagogical strategies empower youth to understand the interconnectedness of energy, environment, and society.

Guiding questions:

- ➔ What concepts and narratives about climate and energy are being taught?
- ➔ Do curricula engage students critically and contextually?
- ➔ Are marginalised youth given appropriate tools to understand and act on the climate crisis?

Youth agency refers to the capacity of young people to act intentionally and make choices that affect their lives and communities.

Application: Through this lens, we examine how participatory processes enable or constrain young people's ability to influence energy-related decisions and educational practices. It also helps us assess whether youth are treated as passive recipients or co-creators of knowledge and change.

Guiding questions:

- ➔ Are youth empowered to lead or shape climate and energy initiatives?
- ➔ How do various structures (educational, social, political) support or limit youth action?
- ➔ Do youth perceive themselves as capable of making a difference?

Together, these three lenses ensure that the analysis goes beyond knowledge measurement to include equity, empowerment, pedagogy, and imagination. They support a holistic interpretation of the research findings that integrates justice, inclusion, and youth voice—the core principles in participatory action research and the ELY project.

3. Methodology

Participatory action research (PAR) is a democratic and collaborative approach to research that seeks not only to understand the world but to transform it through direct involvement of the people most affected by the issues being studied. Rooted in the work of Paulo Freire (1970) and later expanded by other scholars such as Orlando Fals-Borda (1987), PAR bridges knowledge production and social action by prioritising the voices, needs, and expertise of marginalised or underrepresented communities.*)*

The key characteristics of PAR include the following:

1. Participation and co-creation
   Participants are actively involved in every stage of the research process—from defining the questions and collecting data, to analysing results and determining actions. This fosters a horizontal power structure between researchers and participants (Kemmis & McTaggart, 2000).

2. Action-oriented
   PAR aims to generate practical solutions to real-world problems. It is closely tied to social transformation, not just theory-building (McIntyre, 2008).

3. Reflexivity and iteration
   PAR is cyclical, involving ongoing reflection and adjustment. Participants and facilitators learn together through repeating cycles of inquiry, planning, action, and reflection (Reason & Bradbury, 2001).

4. Context-sensitivity
   Emphasis is placed on local knowledge and lived experience. The methodology is adapted to cultural, social, and political realities of the participants, rather than applying one-size-fits-all frameworks (Kindon, Pain & Kesby, 2007).

In the ELY project, the PAR process was implemented through multiple interactive phases that enabled youth to explore, express, and influence their learning environment related to climate and energy. The research included two key components:

I. Barriers and Needs in Energy Literacy for Youth Survey

The survey was used as an initial diagnostic tool to explore the experiences, knowledge levels, challenges, and motivations of young people—particularly those from migrant backgrounds and with disabilities—in the areas of energy, climate change, and sustainability. Its aims were as follows:

- ➔ To collect qualitative and quantitative data on current levels of awareness, behavioural habits, and key access barriers experienced by the participating youth with regard to energy literacy.
- ➔ To help identify localised challenges and to inform development of inclusive, accessible, participatory curricula and outreach programmes that promote energy literacy and civic engagement.
- ➔ To assess young people's interests and preferences for learning environments, content, and formats, and to give marginalised youth a platform to express their needs and propose solutions.

While the survey provides valuable insights into the experiences and perspectives of marginalised youth, the sample size (N=60) is relatively small and does not meet the thresholds typically required for statistically robust quantitative analysis. As such, the data will be approached through a qualitative analytical lens, focusing on thematic exploration and contextual interpretation rather than numerical generalisation.

II. Energy Adventure Room

The Energy Adventure Room (EAR) is a flagship activity of the Energy Literacy for Youth (ELY) project and embodies the principles of participatory action research. Designed as an interactive and inclusive learning environment, the EAR aims to increase energy literacy, foster critical thinking, and activate youth engagement in climate and energy issues—particularly among marginalised young people, including those with migrant backgrounds and disabilities. The EAR is structured around the following core goals:

- ➔ To enhance youth understanding of the interconnections between energy systems, climate change, and social justice.
- ➔ To promote active citizenship and democratic participation in shaping a sustainable energy future.
- ➔ To support the development of the ELY Modular Curriculum and Training Guide, which combines scientific literacy, technical understanding, and civic engagement.

Description of the participants

Survey

The survey collected responses from a total of 60 participants across five countries.

Table 1. Number of the survey respondents

Country	Number of Participants	Youth Profile
Germany	23	Youth with migrant background
Czech Republic	10	Youth with migrant background
Denmark	5	Youth with migrant background
Cyprus	11	Youth with disabilities
Poland	11	Youth with disabilities

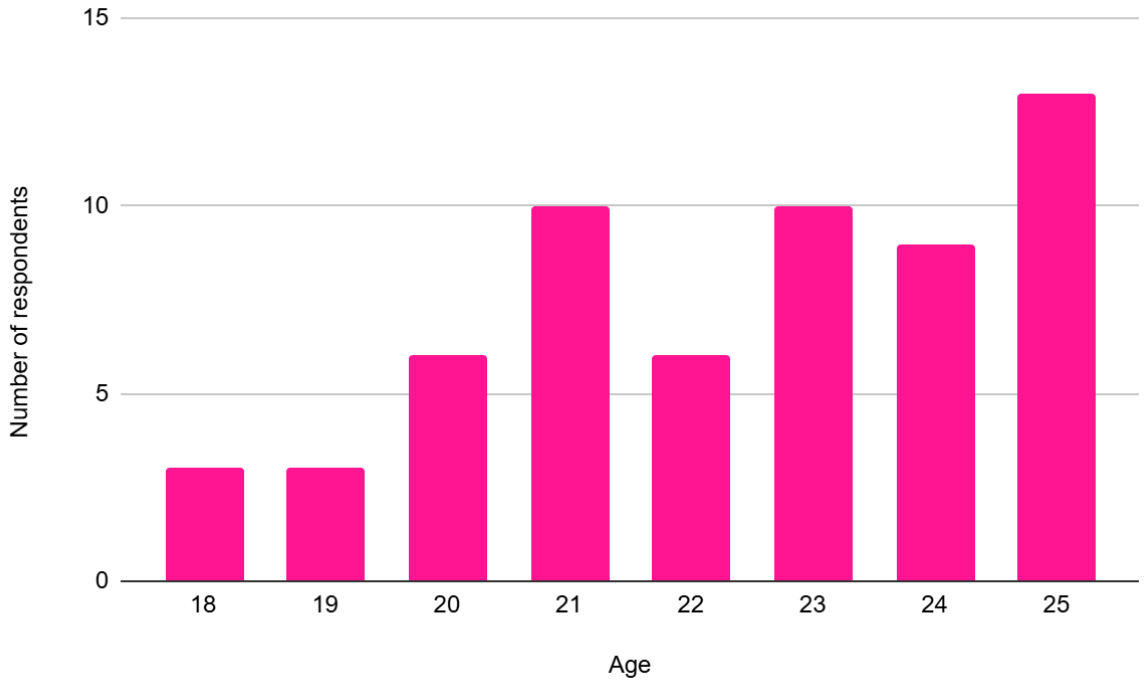
To ensure meaningful analysis and relevance to the project's objectives, the dataset has been divided into two key groups based on the profiles of the participants:

- ➔ youth with migrant backgrounds (from Germany, the Czech Republic, and Denmark);
- ➔ youth with disabilities (from Cyprus and Poland).

This grouping allows for comparative, context-sensitive analysis that recognises the distinct experiences, needs, and barriers faced by each group in relation to energy literacy, access to sustainability education, and active participation in climate-related issues.

Key demographic information about the respondents comprises their age, gender, educational or employment status, and the population size of their place of residence.

Chart 1. Age of the survey respondents



The bar chart above illustrates the age distribution of respondents. The most common age was 25, followed by 23 and 21, indicating that the majority of participants were in their early to mid-twenties. The least represented ages were 18 and 19, suggesting lower participation from the youngest individuals in the sample.

Chart 2. Gender of the survey respondents

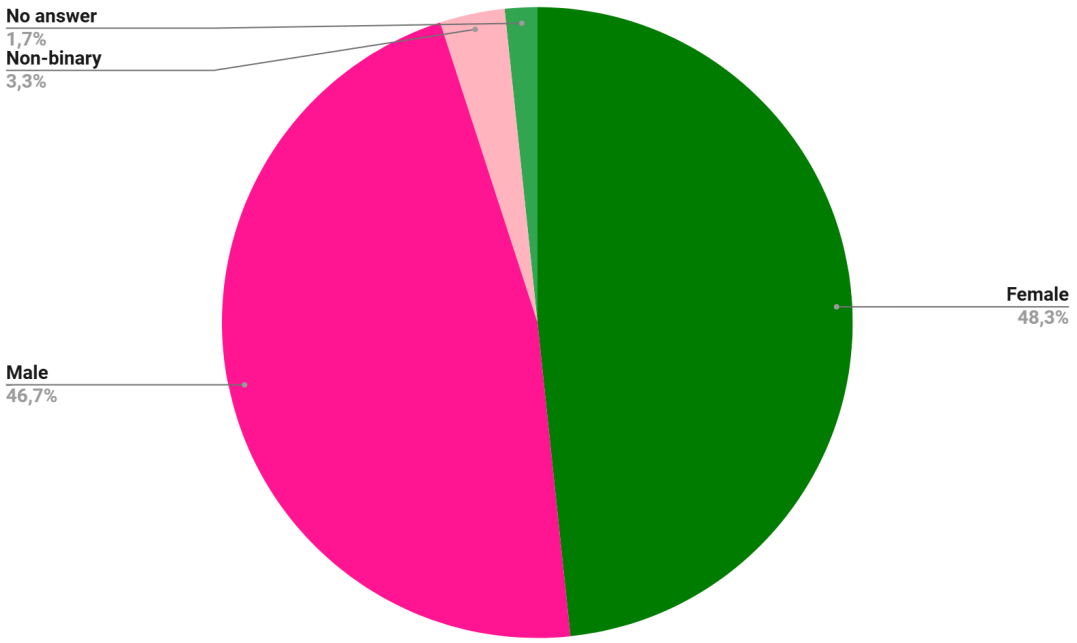


Chart 2 presents the composition of the sample based on self-identified gender. The majority of respondents identified as female (29 individuals), closely followed by those who identified as male (28 individuals). Two participants identified as non-binary, while one person chose not to disclose their gender. The overall distribution reflects a relatively balanced representation of male and female respondents, with limited but present gender diversity beyond the binary categories.

The majority of respondents (27 individuals) were students at a university or college, indicating a strong representation of youth in higher education. A significant group (17 respondents) reported that they worked, suggesting active engagement in the labour market. Four respondents stated that they both studied and worked, reflecting a dual commitment to education and employment, which is common among young adults balancing academic goals with financial or career needs. Eleven individuals were affiliated with a day centre, which may include youth engaged in social, rehabilitation, or support programmes—highlighting the presence of structurally marginalised youth in the sample. Only one respondent reported being not in education or employment, a notable data point considering the challenges often faced by NEET (Not in Education, Employment, or Training) youth. These results show a diverse snapshot of youth engagement, emphasising the predominance of education and work among participants, while also underscoring the need for inclusive outreach to those in support services or outside formal systems.

Energy Adventure Room

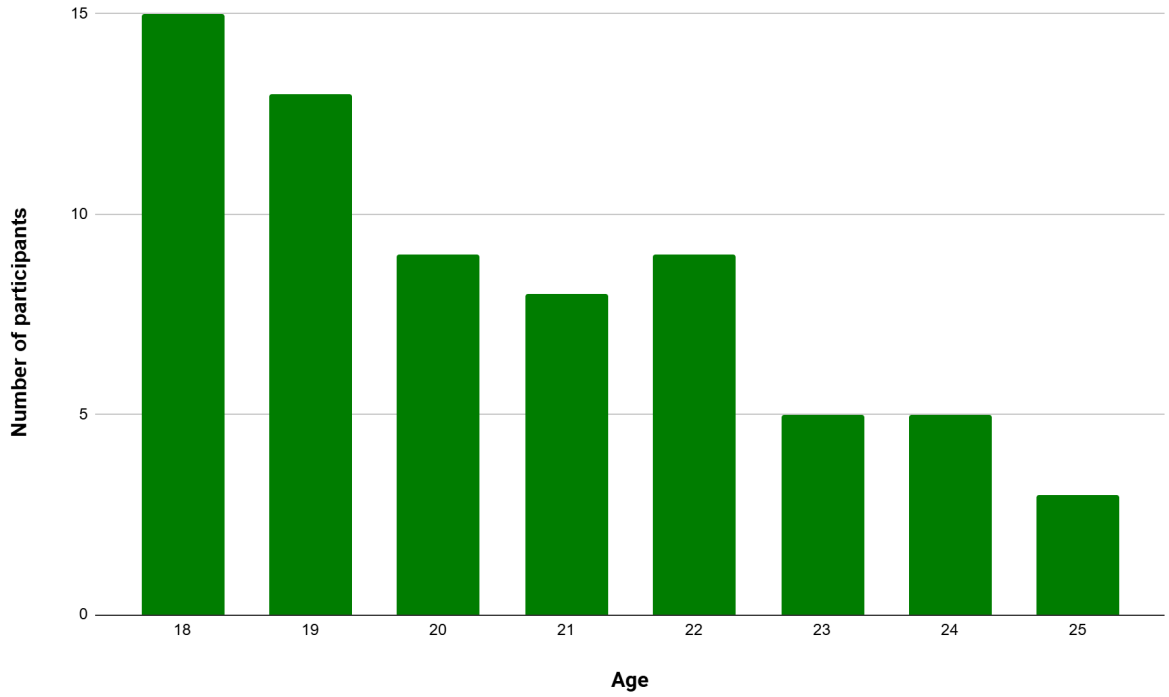
Energy Adventure Room (EAR) formed a key part of the participatory action research phase of the Energy Literacy for Youth project. It engaged a total of 67 young participants across five European countries. Their involvement was crucial to ensuring that the research was grounded in lived experiences, local contexts, and diverse forms of marginalisation.

Table 2. Number of the EAR participants

Country	Number of Participants	Youth Profile
Czech Republic	25	Youth with migrant background
Cyprus	14	Youth with disabilities
Denmark	12	Youth with migrant background
Poland	10	Youth with disabilities
Germany	6	Youth with migrant background

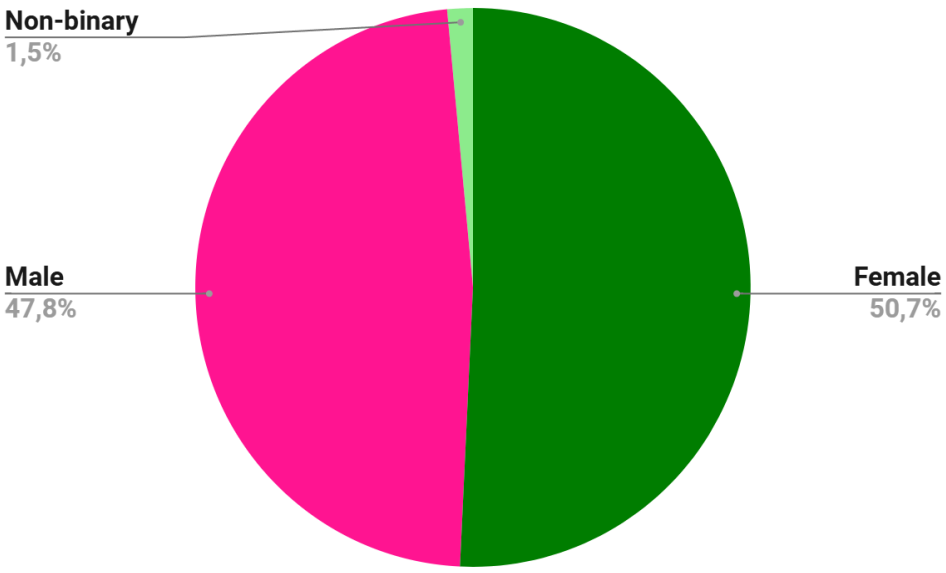
In terms of age, the majority of the participants fell within the younger segment of the overall range. As presented on the chart below, the most represented ages were 18 and 19, together accounting for nearly half of all the youth involved. The number of participants declined progressively in the older groups, especially beyond 22.

Chart 3. Age of the EAR participants



The gender distribution was relatively balanced—with 34 male and 32 female participants—indicating inclusive outreach. One person identified as non-binary.

Chart 4. Gender of the EAR participants



34 participants completed secondary education or less, indicating a strong representation of young people still in or just out of basic education. 18 participants held or pursued a bachelor's degree, reflecting a significant presence of higher education students.

Post-secondary non-tertiary education pathways (such as technical gymnasium, design, police, or library schools) accounted for seven participants. Only five individuals reported being engaged in or having completed master's studies. One participant indicated they were not studying.

The largest group of participants originated from Ukraine (21), followed by Cyprus (13) and Poland (10). Other countries represented were: Turkey (4), Pakistan (3), Syria (2), India (2), Palestine (1), Kurdistan (1), Central Asia—Kazakhstan, Iraq, and Turkmenistan (1), North Macedonia (1), Bangladesh (1), and Croatia (1).

The characteristics most frequently identified among participants related to migration and displacement, with 23 individuals describing themselves as migrants and 15 as refugees.These figures indicate that the project effectively reached its intended demographic of marginalised and structurally excluded youth—those who often face compounded barriers to accessing formal education, stable living conditions, and civic participation, and whose experiences are frequently overlooked in traditional energy education efforts. In addition, a significant number of participants reported experiencing health-related challenges, including mental health conditions, sensory impairments, and neurodivergent conditions such as ADHD, dyslexia, and psychological distress. These were either listed explicitly or referenced under broader categories such as "person having health challenges, including mental health disabilities." Many of these young people likely face multiple barriers to learning and participation, including stigma, accessibility limitations, and a lack of tailored educational support.

What is particularly noteworthy is the prevalence of intersectional identities among the participants. Many responses reflected multiple dimensions of marginalisation, such as:

- ➔ gender,
- ➔ LGBTQIA+ identity,
- ➔ migration and refugee status,
- ➔ economic hardship,
- ➔ ethnic minority background,
- ➔ disabilities and mental health conditions.

For example, one participant identified as a "person in a difficult social or economic situation, person having health challenges, ethnic minority, LGBTQIA+, male, migrant, refugee." This complex identity highlights how multiple forms of disadvantage can intersect, compounding vulnerability and deepening exclusion. Such findings validate the use of a participatory and flexible methodology, as employed in the ELY project, which enabled youth to express their lived realities without being constrained by predefined categories. It also reinforces the need for an energy literacy curriculum that is inclusive by design, addressing diverse learning needs, social positions, and lived experiences.

Together, the survey and EAR activities engaged 127 young people across five countries, with deliberate inclusion of those from marginalised groups. The participant profiles reflect:

- diverse, youth-centred demographic;
- balanced gender representation;
- varied educational and employment status;
- strong engagement from youth still in the early stages of adult life.

This comprehensive demographic snapshot provided the ELY project with the valuable insight needed to develop inclusive educational tools, targeted interventions, and youth-driven policy recommendations focused on energy literacy and climate justice.

4. The Research Process

The Energy Literacy for Youth (ELY) project implemented the participatory action research (PAR) methodology across five European countries—Poland, Germany, the Czech Republic, Denmark, and Cyprus. Research activities were designed to be inclusive, participatory, and context-sensitive, tailored to the specific needs of marginalised youth, including those with disabilities and migrant backgrounds. Each country used a dual strategy:

- the diagnostic online/offline survey to assess energy literacy levels, identify knowledge gaps, and explore barriers and motivations related to energy education;
- the Energy Adventure Room (EAR)—an interactive, exploratory activity that enabled deeper engagement and feedback through experiential learning.

Description of the participatory tools

Survey

The survey consisted of 38 questions and included various formats such as single choice, multiple choice, Likert scale, checkboxes, and open-ended text. It was structured into seven thematic sections, each addressing a different aspect of the respondent's background, knowledge, and preferences:

- ➔ Background information: age, gender, education/work status, living situation, place of residence, country of origin, and disability (if applicable).
- ➔ Knowledge about energy: basic energy concepts, familiarity with terms like renewable energy and energy efficiency, and main sources of information.
- ➔ Attitudes, beliefs, and energy-related behaviours: opinions on energy education, renewable energy, and personal energy-saving practices.
- ➔ Barriers to energy education: challenges in accessing or understanding energy-related content and perceptions of accessibility in current programmes.
- ➔ Needs and preferences: topics of interest, preferred learning formats (e.g. workshops, online courses), and motivations for learning about energy.

- ➔ Engagement and participation: willingness to participate in energy/environmental programmes and types of support needed (e.g. financial, transportation, flexible timing).
- ➔ Open-ended questions: qualitative input on how to make energy literacy programmes more inclusive and relevant to marginalised youth.

All participants were informed that the survey was conducted anonymously and that all collected data would remain strictly confidential. The information gathered was used solely for research and educational development within the framework of the ELY project.

To ensure full accessibility and inclusivity, the survey was translated into the official languages of each participating country as well as the languages of migrant communities: Polish, German, Greek, Czech, and Ukrainian—for migrant youth, particularly displaced individuals from Ukraine. These translations guaranteed that language was not a barrier to participation, enabling all youth—regardless of background—to fully understand and respond to the questions. In some settings, facilitators also provided verbal support or simplified formats to accommodate individuals with additional learning or cognitive needs. This multilingual approach was critical to upholding the project's core PAR principle of equitable access and representation, especially for youth often excluded from mainstream research and policy discussions due to language limitations.

The survey was distributed by project partners from February until the beginning of May 2025. It was promoted through multiple channels, including partner websites, social media platforms, and the official ELY project website. In addition, the survey was directly shared with relevant organisations and target groups via email and outreach networks to ensure broad and inclusive participation among marginalised youth. Although the initial objective was to collect at least 100 responses per country, achieving this target proved difficult due to limited access to the identified target groups—namely, youth with disabilities and youth with migrant backgrounds. These groups are often underrepresented in public spaces, rarely involved in mainstream consultations, and typically require the involvement of intermediaries, such as support organisations, special education institutions, day centres, or educational assistants. Despite the wide dissemination of the survey, and direct outreach to relevant organisations and youth groups, the total number of responses remained below the target. As a result, the collected data is treated predominantly as qualitative material, focusing on contextual, experiential, and thematic insights rather than on statistical representativeness.

In addition to conducting the survey and participatory activities, the research team decided to broaden the dataset by gathering relevant literature and background materials from each project partner in order to deepen the understanding of the barriers and challenges faced by marginalised youth in accessing energy literacy. Each partner contributed a brief national report summarising key findings from existing academic literature, national studies, policy documents, and recent research. These reports focused on the period from 2015 onwards, providing contextual insights into the structural, educational, linguistic, social, and economic obstacles that influence youth engagement with climate and energy topics in each country.

Energy Adventure Room

The development of the Energy Adventure Room (EAR) began during the first ELY consortium meeting in Kraków in 2024, which included a joint staff training session. This training was designed to strengthen the consortium's capacity in participatory action research (PAR) and to foster collaborative, youth-centred approaches to promoting energy literacy, particularly among marginalised communities. The training combined theoretical foundations with practical exercises and group dialogue, emphasising inclusivity, community-driven solutions, and the ethical dimensions of PAR.

As a result of these collaborative efforts, the project partners jointly conceptualised the EAR as a core participatory learning tool of the ELY project. The idea emerged from shared reflections on the need for interactive, inclusive, and youth-led educational formats. Building on the experience from the training in Kraków, it was agreed to proceed with the development of a complete EAR scenario—designed to be adaptable to different national contexts and accessible to diverse youth groups. In the following months, the consortium held an online working session focused on deepening knowledge and skills related to PAR facilitation. The detailed design of the EAR scenario was led by MigLab (Germany), in close collaboration with INFORSE Europe (Denmark).

Facilitators' Guide
To support consistent and inclusive implementation across all partner countries, a comprehensive Facilitators' Guide was developed and distributed. This practical tool provided clear instructions and adaptable templates for organising EAR activities in diverse settings.

The guide comprised the following elements:

- A step-by-step outline for setting up the EAR, including recommended timelines, room layout suggestions, and required materials for each station;
- Guidance on facilitating interactive tasks, encouraging discussion, and supporting critical reflection;
- Ready-to-use templates for instruction sheets, feedback forms, and reflection exercises.

EAR Structure and Learning Themes
The final EAR consisted of 10 interactive stations, labelled symbolically (A, B, C...) rather than numerically, to encourage free movement and exploration. Each station represented a key theme from the ELY curriculum:

- The Science of Climate Change – visual analysis and collaborative interpretation;
- Climate Justice and Global Inequalities – understanding North–South dynamics and social responsibility;
- Renewable Energy and Energy Efficiency – hands-on interaction with solar models and low-tech solutions;
- Energy Democracy – role-playing different institutional and community actors in decision-making processes;

- Personal and Collective Climate Action – reflection on habits, values, and potential for real-life change.

EAR Box
To facilitate implementation, all materials were compiled and distributed by MigLab in the form of a ready-to-use "EAR Box". Each partner organisation received a standardised set containing:

- printed visual prompts and instructional sheets,
- station markers using symbols (not numbers),
- props such as solar-powered devices and illustrative visuals,
- role-play and scenario cards tailored to the station content.

All partners used the EAR Box alongside the Facilitators' Guide to implement the activity locally, ensuring consistency while allowing for cultural and contextual adaptations.

Implementation
The EAR was typically delivered in three phases described below:

Introduction phase – Facilitators welcomed participants, introduced the goals of the ELY project, and explained the structure of the EAR. The Erasmus+ Programme and partner organisations were acknowledged.

Exploration phase (approx. 2 hours) – Participants worked in small groups, rotating freely between stations. At each one, they engaged with interactive materials, completed instruction sheets, and discussed insights related to energy, equity, and local realities.

Conclusion phase – Participants completed an anonymous feedback survey, reflecting on their learning experience and offering input for improving future EAR activities and the broader ELY curriculum.

5. Key Findings

The core findings derive from the Energy Adventure Room (EAR), a series of participatory research activities conducted across five European countries—Germany, Poland, Denmark, the Czech Republic, and Cyprus. The EAR methodology provided a hands-on, interactive, and inclusive environment for engaging marginalised youth in meaningful dialogue and reflection around the key energy and climate-related issues.

Energy knowledge level

The information gathered from the EAR activities provided structured insight into the current state of participants' knowledge and understanding of various topics related to climate and energy. Using a participatory framework, responses were collected across 10 interactive stations, each designed to explore a distinct thematic area—from energy production and

saving to climate justice and civic participation. The results clearly illustrate significant gaps in the foundational knowledge and systemic understanding among the participating youth. Over 55% of all responses were classified as Category A (low knowledge), indicating that more than half of the participants were unfamiliar with the basic concepts essential for engaging with the energy transition. Only 13% demonstrated advanced understanding (Category C), suggesting that the existing education systems and outreach mechanisms have not equipped most youth—especially those from marginalised backgrounds—with the competencies required for informed engagement.

Table 3. Main findings from the EAR

Theme (Station)	A (Low)	B (Basic)	C (Good)	Total	Main Finding
A. What is Climate Change	4	13	3	20/B	Basic knowledge on the topic -> Could be beneficial for curriculum
B. What is Climate Justice	8	10	0	18/B	Basic knowledge on the topic --> Could be beneficial for curriculum
C. Social Effects	16	3	1	20/A	Low knowledge on the topic -> Needs to be in curriculum
D. Global South Relations	7	6	7	20/C	Good to very good knowledge and reflection on the topic --> No need to include in curriculum
E. Energy Production	16	2	2	20/A	Low knowledge on the topic -> Needs to be in curriculum
F. Solar/Wind Devices	5	7	5	17/C	Good to very good knowledge and reflection on the topic --> No need to include in curriculum
G. Energy Saving & Efficiency	13	6	1	20/A	Low knowledge on the topic -> Needs to be in curriculum
H. Civic Participation & Organisations	18	2	0	20/A	Low knowledge on the topic -> Needs to be in curriculum
I. Role Play / Democracy	0	0	0	—	No data
J. Engagement for Planet	11	6	4	21/A	Low knowledge on the topic -> Needs to be in curriculum

Category A: Low Knowledge (98 responses; 55.7%)

These responses highlight the areas where the participants exhibited minimal or no prior knowledge. The most pronounced knowledge gaps were observed in the following stations: H – Civic Participation and Organisations, C – Social Effects of Energy Systems, E – Energy Production. These insights underscore the urgent need to include such topics in youth-targeted energy literacy curricula, with a focus on real-world relevance and accessibility.

Category B: Basic Knowledge (55 responses; 31.2%)

The participants in this category showed some familiarity with energy and climate issues but lacked depth and contextual understanding. Stations such as B – Climate Justice, F – Solar and Wind Devices, G – Energy Saving & Efficiency showed a relatively even distribution between low and basic knowledge. This suggests that, while the themes may be recognisable, they are not meaningfully internalised or connected to the participants' everyday lives.

Category C: Good Knowledge (23 responses; 13.1%)

A minority of the participants demonstrated higher-level knowledge and comprehension of the issues. For instance, Station D – Global South Relations showed a more balanced distribution, with 7 responses indicating good reflection and understanding. This suggests that certain youth—possibly those with prior engagement or exposure—are able to critically analyse the global dimensions of energy inequality and transition. However, the limited number of high-knowledge responses across all stations confirms that comprehensive energy literacy remains rare.

The EAR process revealed a clear need for curricula and programming that move beyond technical facts to embrace systemic, civic, and justice-oriented learning. The gaps in the participants' knowledge were especially visible in the following areas:

- ➔ understanding of how energy decisions affect marginalised communities;
- ➔ awareness of how to engage with democratic structures or civic actors;
- ➔ grasp of the basic functioning of energy systems and sustainable technologies.

Barriers in access to energy literacy

Based on the partner countries' reports, a comparative analysis was developed for Germany, Poland, the Czech Republic, Denmark, and Cyprus, highlighting context-specific obstacles and identifying shared challenges in accessing energy literacy.

Germany, a global leader in the *Energiewende* (energy transition), exhibits considerable regional and demographic disparities in energy education. Although public awareness of climate change is generally high, systemic understanding of energy justice, civic participation, and socio-technical systems remains underdeveloped (Umweltbundesamt, 2023). The decentralised educational system results in the fragmented curricular integration of energy topics. While initiatives such as *Bildung für nachhaltige Entwicklung* (Education for Sustainable Development - ESD) exist, their implementation is uneven and often limited to urban, affluent contexts. Non-formal efforts—though innovative—face sustainability challenges due to short-term funding and lack of institutional support.

In Poland, energy literacy is still nascent and heavily influenced by the country's historical reliance on coal. Although awareness of climate change is growing, energy-related topics are often politicised and framed through economic narratives. Energy education in schools is marginal and tends to focus on technical rather than systemic or participatory dimensions. Although the youth climate movement initiated the push for climate education, it has only recently become one of the objectives of the Ministry of Climate and Environment. Rural and low-income youth are particularly underserved. Civil society plays a crucial role in promoting energy education, but its outreach remains underfunded and structurally unsupported.

In the Czech Republic, the concept of energy literacy has not been widely institutionalised. Most public and academic efforts focus on defining the term rather than measuring or developing it. Surveys reveal that a significant portion of the population lacks basic knowledge about energy providers and tariffs (SIMAR, 2018). Energy education remains largely cognitive, lacking behavioural and contextual integration (Institut 2050, 2023). While younger populations tend to exhibit more sustainable behaviours, their knowledge is fragmented, and connections to broader socio-technical systems are often missing (Richterová, 2017).

Denmark's global leadership in sustainability is not fully reflected in its education system. Although climate and energy topics are embedded in the *Fælles Mål* curriculum, their implementation is inconsistent across municipalities due to decentralised governance (Danmarks Evalueringsinstitut, 2025). Teachers often lack adequate training, and reforms emphasising standardised testing have limited interdisciplinary engagement. The education system rarely covers unsustainable technologies such as nuclear power or geoengineering, leaving critical knowledge gaps (Energistyrelsen, 2024; DUF, 2024). Moreover, the valuable contributions of NGOs and community organisations are underutilised due to policy fluctuations and reduced visibility of their resources.

Cyprus faces unique structural and pedagogical challenges in fostering energy literacy. While sustainability themes are present in formal education, they are delivered largely through theoretical instruction, limiting real-world engagement. Teacher preparedness on energy transition topics remains insufficient, and the curriculum does not adequately address contentious energy technologies such as nuclear power or carbon capture. Students have few opportunities for experiential learning, and there is limited institutional support for energy education in rural or underserved areas. Furthermore, the infrastructure for practical, participatory approaches—such as energy labs or fieldwork—is severely lacking,

compounding accessibility issues for youth with disabilities or from disadvantaged backgrounds.

Table 4. Energy literacy country comparison

Country	General Understanding and Context	Education System Integration	Key Barriers	Opportunities
Germany	Central to *Energiewende* (energy transition). High awareness but uneven literacy.	Energy topics are integrated in science and ESD, but vary by state.	Fragmentation, weak systemic understanding, low inclusion.	Energy Labs, participatory projects, ESD expansion.
Poland	Coal legacy shapes perceptions. Low systemic thinking.	Marginally covered in formal education. NGOs active.	Technical framing only, access inequality, limited civic link.	Link with democracy and justice, target marginalised groups.
Czech Republic	Energy literacy is still understudied. Some surveys exist.	Focus mainly cognitive, lacking behavioural context.	Rural gaps, fragmented knowledge, low institutional effort.	Detailed national research needed, integrate energy justice.
Denmark	Green leader globally. Youth seen as key actors.	SDGs in curricula since 2017, integrated through Fælles Mål (national curriculum).	Inconsistent implementation, insufficient teacher training, lack of practical context.	New reforms (2025), NGO materials, hope-focused learning.
Cyprus	Active policy for EE/RES. Public awareness rising.	Integrated via Education for Environmental Citizenship (EEC).	Low exposure to non-renewables, teacher training gaps, curriculum limitations.	NGO engagement (Cyprus Energy Agency), gamification and practical learning.
Europe (general)	Growing interest, tied to climate policy. The EU promotes National Energy and Climate Plans.	Often embedded in ESD frameworks or science classes.	Varies significantly across states, rural and socio-economic gaps persist.	EU funds (Green Deal, Erasmus+), joint frameworks.

Information regarding barriers was also gathered through the survey (Q 4.1). “Difficulty in understanding technical concepts” was chosen as by far the most significant obstacle (42 mentions), highlighting the need to simplify or scaffold energy-related content in curricula. A substantial number of participants also cited “lack of access to reliable information” (33) and “lack of interest in the topic” (22), pointing to both content and outreach challenges. Financial barriers and limited opportunities to participate in relevant programmes were also common, indicating structural limitations in access to non-formal learning.

Energy programmes accessibility

The participants’ responses from the survey (Q 4.2) reveal that 23 respondents explicitly stated they were unsure or unaware whether energy education programmes are accessible to them. This group represents over one-third of the sample, highlighting a critical area of uncertainty and ambiguity in the current outreach and visibility of such programmes. These responses are not simply neutral but point to a lack of clarity, communication, or exposure to the available energy-related educational initiatives. In practice, this means that even if programmes exist, their presence is neither perceived nor understood by a significant portion of young people. Furthermore, only seven participants confirmed that such programmes were accessible to them. This very low number—just over 10% of all respondents—underscores the limited reach of energy education among youth, particularly those from marginalised or underserved groups.

Additionally, comprehensibility was the most frequently cited challenge (Q 4.4)—“Programmes are difficult to understand” was mentioned 23 times, showing that technical complexity or inaccessible delivery remains a widespread barrier in becoming energy literate. Educators’ preparedness is also a major issue—combined mentions of teacher-related knowledge gaps (under various phrasings) totalled 28, indicating that young people feel that teachers are not equipped to deliver meaningful education on energy topics. Moreover, cultural and linguistic barriers are highly relevant, such as lack of culturally relevant content (19 mentions), lack of materials in native languages (12 mentions), or lack of adaptation for disabilities (8 mentions).

Structural barriers, e.g. programmes not being offered locally (18 mentions) and lack of outreach to communities (15), highlight inequities in access based on geography and social inclusion. Participation is also impacted by cost-related issues—high cost was cited 8 times, pointing to the importance of free, publicly accessible education and training.

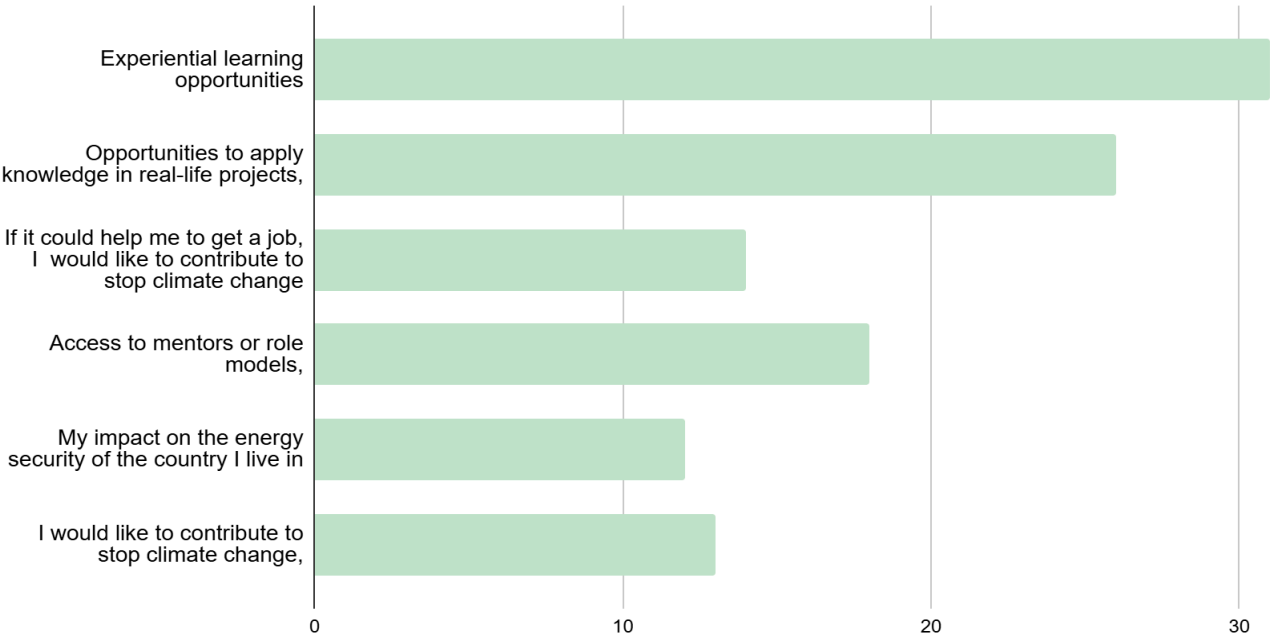
Opportunities

Key motivations

The responses from the survey (Q 5.1) offer valuable insights into what motivates young people—particularly those from marginalised communities—to engage with energy literacy and environmental topics. The results indicate a strong preference for learning experiences that are active, practical, and personally meaningful. The most frequently cited motivator (41 mentions) was the desire for experiential learning, such as hands-on activities, site visits, and field-based education. This suggests that young people are more likely to engage when

learning is connected to real-world contexts and presented in an interactive way, rather than through traditional, theory-heavy approaches. These formats allow participants to physically observe and interact with energy systems and environmental solutions, thereby enhancing both understanding and retention. The second most common motivator was the opportunity to apply knowledge in real-life projects (26 mentions). Respondents valued the chance to put their learning into action—whether through community initiatives, technical solutions, or advocacy—demonstrating a preference for education that is impactful and results-oriented.

Chart 5. Key motivators



Other key motivators included:

- ➔ Access to mentors or role models (18 mentions), indicating the importance of guidance and relatable leadership in shaping youth interest;
- ➔ A desire to contribute to stopping climate change (13 mentions), reflecting the ethical and environmental commitment of many participants;
- ➔ Interest in supporting national energy security (12 mentions), highlighting a growing awareness of the political and civic dimensions of energy issues.

Additionally, a large majority (44 respondents) showed clear interest in participating in educational programmes on energy and the environment (Q 6.1). Only two respondents explicitly declined interest, while five expressed uncertainty or lack of clarity. Ambivalent responses (“Maybe” and “I’m not sure”) highlight the importance of thoughtful programme design. Making energy education accessible, engaging, and relevant could turn uncertainty into active participation.

Key energy topics

Among the energy-related topics that respondents would like to know more about (Q 5.2), the most frequently selected was: “how energy affects my daily life” (41 mentions). This highlights a strong demand for content that directly connects energy concepts to young people’s everyday experiences, such as transport, home energy use, and consumer behaviour. With 40 mentions, “how to save energy and reduce costs” was the second most chosen theme. This suggests that youth are not only concerned with environmental outcomes but also with practical, economic implications—especially relevant for those from low-income or precarious living situations. Topics like “renewable energy sources” and “climate change and its impact” each received 33 mentions, showing consistent interest in environmental sustainability. Respondents want to understand the technical and systemic dimensions of clean energy and how it relates to the climate crisis, reflecting both curiosity and concern for global issues. Although selected by fewer respondents (22 mentions), “careers in the energy sector” still represents a significant portion of the group. This reflects interest in exploring employment opportunities within the energy transition and the need to better connect educational programmes to future job markets.

Learning environment

In-person workshops were the most preferred learning environment (Q 5.3), chosen by 42 respondents. This reflects a strong desire for face-to-face, structured engagement, which may foster deeper interaction, trust-building, and improved learning outcomes. Community-based programmes came in second (37 mentions), highlighting the importance of local context and relevance. Participants favour initiatives that are embedded in their communities, especially those addressing specific social or cultural needs. Online courses were selected by 29 respondents, indicating the value of flexibility and accessibility, particularly for those with logistical or time constraints. Interactive mobile or computer apps were mentioned 24 times, showing a preference among youth for digital and gamified learning formats, which can be personalised and accessed on demand. A small number of participants gave unspecified or unique responses, reflecting diverse or unclear preferences.

Support

Flexible timing was the most commonly cited support need (Q 7.1), showing that young people—particularly from marginalised groups—require adaptable schedules to accommodate school, work, or caregiving responsibilities. Another important issue is financial support, especially in communities facing economic hardship. This aligns with broader equity concerns in climate and energy education. A notable number of youth (13 mentions) emphasised the importance of having mentors or role models, underlining the motivational and guidance role played by such figures. Transportation remains a logistical barrier for many, indicating a need for either local delivery of programmes or support for commuting. Childcare was mentioned only once but reflects an often-overlooked need, especially among young parents or caregivers.

6. Conclusions and Recommendations

This chapter synthesises the key findings from the Energy Literacy for Youth (ELY) project, focusing on the Energy Adventure Room (EAR) participatory research and complementary survey-based inquiry. The analysis addresses the main research questions:

- ➔ What do young people from marginalised groups know—and not know—about energy systems, transition, and climate change?
- ➔ What barriers prevent their access to meaningful energy education and participation?
- ➔ What conditions and formats support more inclusive and empowering energy literacy?

Conclusions

1. **Main social, economic, and cultural barriers that hinder marginalised youth from acquiring energy literacy**

Marginalised youth face a range of interconnected barriers that significantly hinder their access to energy literacy education and meaningful engagement in the energy transition. These barriers are structural, systemic, and deeply rooted in socio-economic inequalities across the five countries studied. One of the most prominent challenges is economic limitations. Many young people—particularly those from low-income households—simply cannot afford to participate in paid workshops, travel to centralised programmes, or access necessary digital tools. This was consistently reflected in the survey data, where financial constraints emerged as one of the most frequently cited obstacles to participation. Geographical inaccessibility further compounds this exclusion. Youth living in rural or peri-urban regions in countries such as Poland, the Czech Republic, and Cyprus often lack access to local programmes altogether. This reinforces territorial inequality, as energy education and engagement opportunities tend to be concentrated in urban centres, leaving out large segments of the population. The issue is exacerbated by fragmentation in educational systems, particularly in Germany and Denmark, where decentralised governance leads to the inconsistent integration of energy topics across school curricula. In many cases, whether a young person receives meaningful energy education depends more on their postcode than on a national standard.

Cultural and linguistic exclusion is another major barrier. Migrant youth and ethnic minorities often encounter materials that are neither culturally relevant nor available in their native languages. The survey responses from Cyprus, Germany, and Poland revealed that this lack of inclusion directly affects participants' ability to engage with the content and see themselves as part of the energy transition narrative. Barriers are also sharply felt by youth with disabilities, who reported that materials and programmes are not adapted to their sensory, cognitive, or physical needs. This lack of accessibility prevents full participation and reinforces educational disparities. Finally, digital and informational invisibility emerged as a critical issue. Twenty-three respondents explicitly stated that they did not know whether energy education programmes existed. This highlights a fundamental gap in communication and outreach: even when such initiatives are available, they often fail to reach those who need them most.

2. Marginalised youth's perception on energy, climate change, and their roles in sustainable futures

The perceptions of marginalised youth regarding energy, climate change, and their role in shaping a sustainable future reveal both significant challenges and powerful potential. A key insight is the low baseline confidence among many participants. When asked about their ability to access or understand energy education, a substantial number responded with uncertainty or "I don't know." This pattern indicates not only gaps in formal instruction but also a lack of self-efficacy—young people do not feel equipped or empowered to navigate energy-related topics. Such low confidence is likely a product of broader systemic factors, including unequal access to educational resources, inaccessible language or content, and minimal exposure to practical, real-world examples. At the same time, the responses show that many young people approach energy from a practical and economic lens. The two most frequently chosen learning interests were "how energy affects my daily life" and "how to save energy and reduce costs". This reflects the immediate material realities faced by economically vulnerable youth, who prioritise knowledge that can directly improve their everyday conditions. For these participants, energy is not a distant environmental issue, but a matter of financial survival—relating to heating, transportation, housing, and consumption decisions. Yet, beneath these constraints, there is clear evidence of an emerging civic and environmental consciousness. A notable group of participants expressed strong motivation to engage in climate action and contribute to national energy security. These aspirations suggest that—when provided with accessible, inclusive learning environments—young people are not only willing but eager to play an active role in the green transition. Their responses show that they see value in collective responsibility and national resilience, even if their current educational environments do not yet support this.

Interestingly, distrust and scepticism also emerged in the data. Some participants questioned dominant narratives—for example, doubting the true environmental benefits of electric vehicles due to concerns about battery production and disposal. Such views highlight the importance of dialogue-based, critical education. Rather than seeking to persuade or indoctrinate, energy education should foster open discussion, provide balanced evidence, and encourage critical thinking. This approach builds trust and positions learners as partners in the energy conversation.

Finally, the findings point to a lack of role clarity. Many respondents do not view themselves as meaningful actors in the energy transition. This disconnect reflects the failure of current educational and societal structures to communicate that youth are not only future leaders but also current stakeholders. Without targeted support and visibility into participatory pathways, young people struggle to see how their actions—whether through voting, career choices, or daily habits—can influence systemic change.

In sum, the perceptions of marginalised youth reveal a mix of caution, pragmatism, latent agency, and critical inquiry. With responsive, inclusive, and empowering education, these young people can become both informed consumers and active drivers of a just energy transition.

3. Key areas in which youth demonstrate the greatest gaps in energy literacy

The Energy Adventure Room (EAR) findings highlight several key areas where marginalised youth exhibit the most significant gaps in energy literacy. These knowledge deficits reflect not only missing content in formal and informal education but also broader societal barriers that limit youth participation in shaping the energy transition. The most critical deficit emerged in the area of civic participation and organisations. 90% of responses in this theme were categorised as low knowledge, underscoring that most participants are unfamiliar with how to engage in energy-related decision-making. This includes a lack of awareness about relevant institutions, participatory mechanisms, or avenues for advocacy. As a result, young people—especially those from marginalised communities—are often excluded from democratic processes related to climate and energy policy, even when they are directly affected.

Equally pronounced were knowledge gaps in energy production and efficiency. Participants demonstrated limited understanding of where energy comes from, how it is distributed, and how it can be conserved. Many lacked familiarity with basic concepts such as grids, electricity sources, or the role of technology in energy-saving. These topics, although central to achieving sustainability, are often taught from a highly technical or abstract perspective, making them inaccessible to learners without specialised backgrounds.

The third area of concern involved the issues of social and global justice in relation to energy systems. While some participants showed awareness of global inequalities—such as the disproportionate energy burden borne by countries in the Global South—this knowledge was inconsistent and fragmented. Most youth did not fully grasp the systemic nature of energy injustice and how their local actions or broader policies connect to global dynamics. The EAR activities revealed a need for educational content that explicitly links energy to human rights, equity, and global solidarity.

Finally, the data pointed to a broader weakness in democratic engagement for climate protection and energy transition. Even among motivated youth who expressed interest in sustainability and activism, many lacked the tools, language, and frameworks needed to translate their values into action. This includes understanding how to communicate with policymakers, join or form youth-led initiatives, or navigate institutional structures that influence environmental decisions.

Together, these findings underscore the need for a more holistic and justice-oriented approach to energy literacy—one that not only imparts technical knowledge but also cultivates civic competencies, global awareness, and critical reflection. Empowering young people with the skills and confidence to act is essential for building a more inclusive and democratic energy transition.

4. Pedagogical models and participatory strategies for effectively engaging marginalised youth in energy and climate education

The findings from the Energy Adventure Room (EAR) and the accompanying survey underscore several key principles for designing effective energy and climate education for

marginalised youth. These insights should inform curriculum development, outreach strategies, and programme delivery formats to ensure both accessibility and engagement.

Experiential learning emerged as the strongest motivational factor, chosen by 31 respondents. Youth expressed a clear preference for hands-on educational experiences, such as field trips to energy facilities, guided workshops, or interactive site visits. These approaches not only enhance conceptual understanding but also allow learners to connect abstract information with tangible systems. For many participants, physically observing how energy is produced or managed helped bridge the gap between theory and everyday life.

Real-world application of knowledge is also critical. Twenty-six respondents highlighted the importance of being able to apply what they learn in concrete projects—whether technical, community-based, or activist in nature. Programmes that focus on implementation, rather than passive consumption of content, are particularly impactful for those with low prior exposure to environmental or civic education.

Mentorship and access to role models were identified by 18 participants as a core enabler of motivation and self-efficacy. This is especially important for youth who may feel disconnected from traditional educational spaces or civic institutions. Relatable mentors can help demystify pathways into energy-related fields and build confidence in young people's ability to contribute meaningfully to the energy transition.

Community-based programmes were the second-most preferred learning format, following in-person workshops. This preference underscores the importance of local relevance—youth want to learn in contexts that reflect their own environments and challenges. Community-rooted learning also enables collaboration, cultural tailoring, and peer-based exchange, which can foster a stronger sense of belonging and motivation.

Finally, gamified and digital learning tools—including mobile apps and online courses—were notably popular among respondents who face structural barriers such as transport or time constraints. These tools offer flexible, self-paced learning opportunities and can effectively complement in-person education, especially for reaching geographically dispersed or time-limited learners.

Together, these findings suggest that multi-modal, participatory, and context-sensitive education models are essential for advancing energy literacy in a just and inclusive way. Programmes must move beyond content delivery to emphasise engagement, relevance, and empowerment.

5. **Curriculum strategies to foster energy literacy, critical thinking, civic participation, and systemic awareness**

To effectively address the knowledge gaps and barriers identified among marginalised youth, the future energy literacy curriculum must move beyond conventional educational models and reflect the complex realities and aspirations of young people today. It should aim not only to inform but to empower. A crucial step is broadening the curriculum beyond technical instruction. While understanding how energy systems function remains important,

this alone is insufficient. The curriculum must also explore the social, political, and economic dimensions of energy—highlighting issues such as justice, inequality, policy-making, and global interdependence. By embedding these themes, students can begin to view energy not just as a technical matter, but as a human and civic issue that impacts communities in diverse and uneven ways.

Equally important is the adoption of participatory, dialogic formats that integrate reflection, storytelling, and collaborative learning. Activities inspired by the Energy Adventure Room (EAR) model provide an excellent foundation for this. Rather than simply absorbing information, young people engage with real-world scenarios, share perspectives, and build collective understanding. These experiences help transform passive learners into active participants in the energy transition.

Civic literacy should also be a core component of energy education. Many young people lack the knowledge or confidence to influence energy policy or engage with local decision-makers. The curriculum should provide them with tools and frameworks for advocacy, democratic engagement, and participation in grassroots initiatives. This builds a bridge between learning and action, positioning youth as agents of change.

To ensure inclusivity, the curriculum must be rooted in narratives that reflect the full diversity of youth experiences. This means deliberately including the perspectives of migrants, ethnic minorities, LGBTQ+ individuals, and youth with disabilities. When young people see their identities and communities represented, they are more likely to feel ownership over the material and motivation to act on what they learn.

Linking the personal with the planetary is another vital strategy. Lessons should illustrate how energy connects to everyday life—transportation, housing, digital consumption—while also clarifying its ties to global challenges such as climate change and resource inequality. This helps make abstract concepts tangible and situates young people within a larger web of action and consequence.

Finally, the curriculum should not only diagnose problems but also foster hope. Climate anxiety is increasingly common among youth, and education that focuses solely on crisis can become overwhelming. By showcasing solutions, amplifying youth-led innovation, and encouraging imaginative thinking about the future, the curriculum can build emotional resilience and a sense of agency.

Recommendations

Based on these findings, the ELY project identifies the following multi-level recommendations to improve energy literacy among marginalised youth across Europe:

Curriculum Reform and Integration

- ➔ Adopt a systemic approach to energy literacy that includes technical, social, and political dimensions.

- ➔ Ensure that energy education is explicitly tied to climate justice, civic engagement, and daily life relevance.
- ➔ Integrate EAR-type participatory methods into national and local curricula to promote interaction, critical reflection, and youth agency.
- ➔ Establish core competencies for energy literacy aligned with both the EU Green Deal and national energy-climate strategies.

Support and Empower Educators

- ➔ Develop and fund teacher training programmes focused on interdisciplinary energy education and facilitation of participatory methods.
- ➔ Provide easy-to-use, multilingual teaching toolkits that include up-to-date, inclusive materials from NGOs and public agencies.
- ➔ Reinstate and support successful educational platforms that have been defunded or removed due to shifting policies (e.g. Climate Caravan in Denmark).

Address Structural and Accessibility Barriers

- ➔ Create locally accessible programmes in rural and underserved areas, with provisions for transport and digital alternatives.
- ➔ Make programmes free of charge and flexible in scheduling to accommodate youth responsibilities and constraints.
- ➔ Design for inclusion by ensuring that content is culturally relevant, available in multiple languages, and accessible to young people with disabilities.

Promote Youth Agency and Participation

- ➔ Support youth-led climate and energy projects that combine learning with real-world action and local engagement.
- ➔ Involve youth in co-designing education programmes and policies, especially through participatory formats like EAR.
- ➔ Recognise youth as present stakeholders and future decision-makers, and invest in long-term, multi-sectoral partnerships to embed their perspectives in energy transition planning.

Strengthen Policy and Institutional Frameworks

- ➔ Embed energy literacy in National Energy and Climate Plans (NECPs) and align with SDG 4.7 (Education for Sustainable Development).
- ➔ Provide dedicated funding streams for inclusive energy education, including long-term support for non-formal education actors.
- ➔ Establish national monitoring frameworks to assess progress in energy literacy across demographic groups.

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