ReSBE 2026 ReShaping the Built Environment through Sustainability and Circularity
20-23 of October, 2026
Thessaloniki, Greece

SNUG

What stakeholders expect from innovative construction solutions

Spyridon Karytsas, Dimitrios Mendrinos, **Theoni I. Oikonomou**, Constantine Karytsas – CRES
Carlos L. Rodríguez López , Miriam Hernández Pérez – CTCON
Irene Beleña Pozo - AIDIMME

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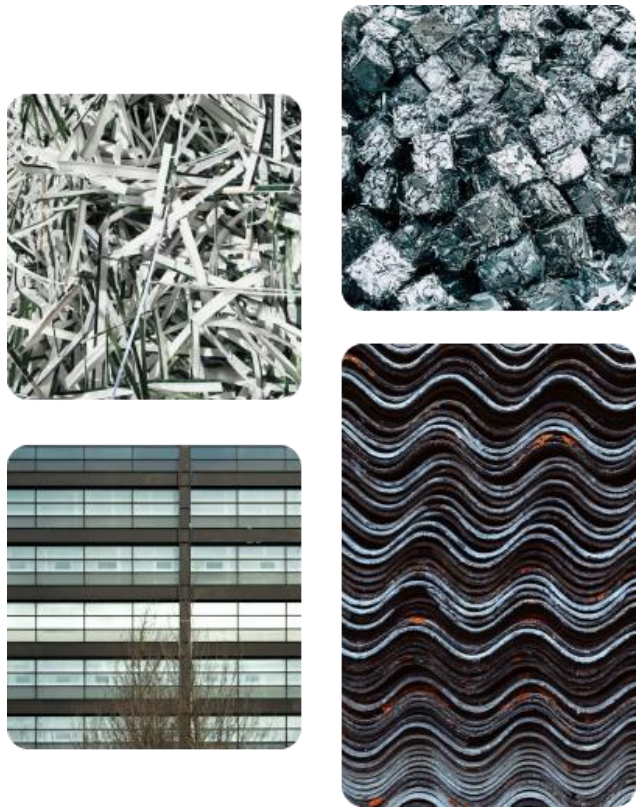
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Innovative circular economy & AI methodology for sustainable buildings

SNUG project is pioneering sustainable construction solutions, addressing the significant environmental impact of buildings. Through a groundbreaking methodology rooted in **circular economy principles and artificial intelligence,** we support architects and builders in selecting optimal thermal insulation materials for new construction or renovations according to building features and surroundings.



Project ID

Project Name	Innovative methodology based in circular economy and artificial intelligence to foster the transition to Sustainable and very high eNergy performance bUildinGs at a cost optimal level
Acronym	SNUG
Project Number	101123150
Call	HORIZON-CL5-2022-D4-02
Topic	HORIZON-CL5-2022-D4-02-05
Type of Action	HORIZON Innovation Actions
Project starting date	1 November 2023
Project end date	30 April 2027
Project Duration	42 months

Partners

Participant number	Participant organisation name	Short name	Country
1	INSTITUTO TECNOLOGICO METALMECANICO, MUEBLE, MADERA, EMBALAJE Y AFINES-AIDIMME	AID	ES
2	BECSA SOCIEDAD ANONIMA	BEC	ES
2.1	GLOBALCYCLUS SL	GLO	ES
3	ASOCIACION EMPRESARIAL DE INVESTIGACION CENTRO TECNOLOGICO DE LA CONSTRUCCION REGION DE MURCIA		ES
4	UNIVERSITY OF STUTTGART	CTC	DE
5	CHIMAR (HELLAS) AE - ANONYMI VIOMICHANIKI KAI EMPORIKI ETAIREIA CHIMIKON PROIONTON	CHI	EL
6	CRH NEDERLAND BV	CRH	NL
7	F6S NETWORK LIMITED	F6S	IE
8	CENTRE FOR RENEWABLE ENERGY SOURCES AND SAVING FONDATION	CRES	EL
9	BRIMATECH RESEARCH GGMBH	BRI	AT
10	KEEY AEROGEL	KEEY	FR
11	AUSTRIAN STANDARDS INTERNATIONAL - STANDARDISIERUNG UND INNOVATION	ASI	AT
12	HOGSKOLEN I OSTFOLD	HIO	NO
13	KASTAMONU ENTEGRE AGAC SANAYI VE TICARET ANONIM SIRKETI	KEAS	TR
14	TAKKENKAMP GROEP B.V.	TAK	NL
15	AGITEC AG	AGI	CH
16	LURTIS LTD	LUR	UK

Project scope



Develop sustainable and cost-effective building materials for optimized thermal insulation based on circular economy



Empower architects and builders to make eco-friendly choices by leveraging the power of artificial intelligence



Alleviate energy poverty through enhanced building energy efficiency



Reduce emissions from the construction industry while advancing the decarbonization of EU's building stock

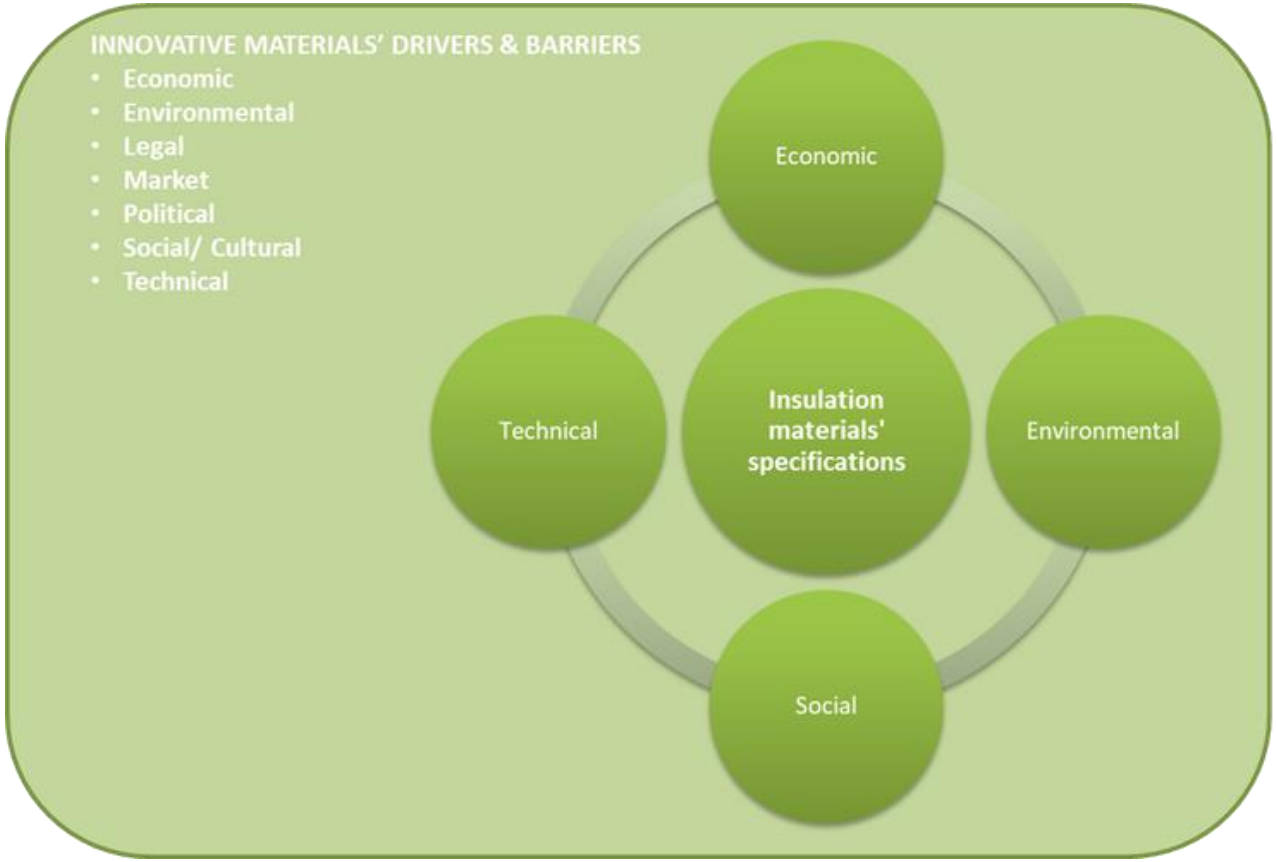
T2.1 – Establishment of requirements of innovative construction solutions

Analysis of the attitudes, behaviour and needs of end-users in terms of the requirements of innovative construction solutions.

Theoretical framework

Literature analysis:

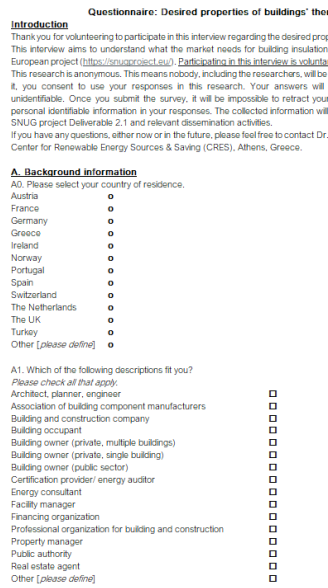
- Specifications & requirements
- Market barriers and drivers



CONCEPTUAL MODEL BASED ON LITERATURE REVIEW FINDINGS

Materials & methods

- Planning, organization and implementation of survey.
- Aim: examine perceptions and attitudes of end-users of diverse types and knowledge levels regarding innovative insulation materials.
- Identification of relevant end-user categories.
- Creation of questionnaire.
- Collection: March 2024.



Questionnaire: Desired properties of buildings' thermal insulation

Introduction

Thank you for volunteering to participate in this interview regarding the desired properties of buildings' thermal insulation. This interview aims to understand what the market needs for building insulation are. This study is part of the SNUG European project (https://snugproject.eu/). Participating in this interview is voluntary and you can withdraw at any time. This research is anonymous. This means nobody, including the researchers, will be aware of your identity. By answering it, you consent to use your responses in this research. Your answers will remain completely anonymous and unidentifiable. Once you submit the survey, it will be impossible to retract your answer. Please do not include any personal identifiable information in your responses. The collected information will be aggregated and presented in the SNUG project Deliverable 2.1 and relevant dissemination activities.
If you have any questions, either now or in the future, please feel free to contact Dr. Spyridon Karytsas, spkary@cres.gr, Center for Renewable Energy Sources & Saving (CRES), Athens, Greece.

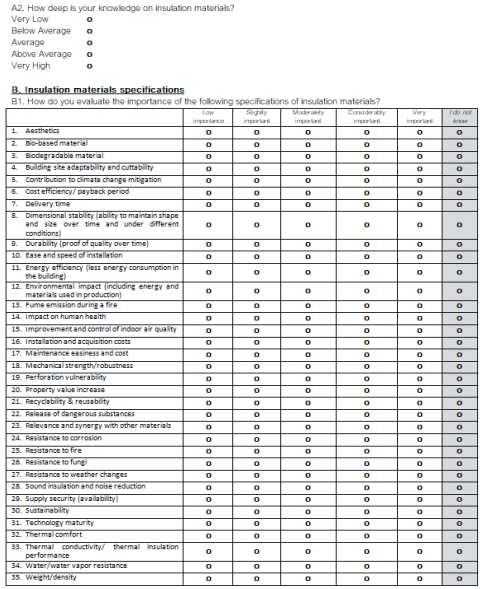
A. Background information

A0. Please select your country of residence.

Austria o
France o
Germany o
Greece o
Ireland o
Norway o
Portugal o
Spain o
Switzerland o
The Netherlands o
The UK o
Turkey o
Other [*please define*] o

A1. Which of the following descriptions fit you?
Please check all that apply.

Architect, planner, engineer ☐
Association of building component manufacturers ☐
Building and construction company ☐
Building occupant ☐
Building owner (private, multiple buildings) ☐
Building owner (private, single building) ☐
Building owner (public sector) ☐
Certification provider/ energy auditor ☐
Energy consultant ☐
Facility manager ☐
Financing organization ☐
Professional organization for building and construction ☐
Property manager ☐
Public authority ☐
Real estate agent ☐
Other [*please define*] ☐



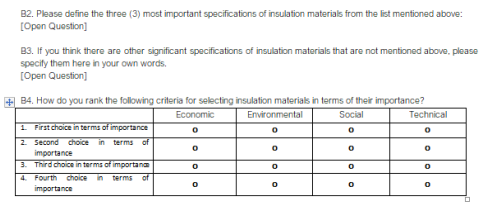
A2. How deep is your knowledge on insulation materials?

Very Low o
Below Average o
Average o
Above Average o
Very High o

B. Insulation materials specifications

B1. How do you evaluate the importance of the following specifications of insulation materials?

	Low importance	Slightly important	Moderately important	Considerably important	Very important	I do not know
1. Aesthetics	o	o	o	o	o	o
2. Bio-based material	o	o	o	o	o	o
3. Biodegradable material	o	o	o	o	o	o
4. Building site adaptability and cuttability	o	o	o	o	o	o
5. Contribution to climate change mitigation	o	o	o	o	o	o
6. Cost efficiency/ payback period	o	o	o	o	o	o
7. Delivery time	o	o	o	o	o	o
8. Dimensional stability (ability to maintain shape and size over time and under different conditions)	o	o	o	o	o	o
9. Durability (proof of quality over time)	o	o	o	o	o	o
10. Ease and speed of installation	o	o	o	o	o	o
11. Energy efficiency (less energy consumption in the building)	o	o	o	o	o	o
12. Environmental impact (including energy and materials used in production)	o	o	o	o	o	o
13. Fume emission during a fire	o	o	o	o	o	o
14. Impact on human health	o	o	o	o	o	o
15. Improvement and control of indoor air quality	o	o	o	o	o	o
16. Installation and acquisition costs	o	o	o	o	o	o
17. Maintenance easiness and cost	o	o	o	o	o	o
18. Mechanical strength/robustness	o	o	o	o	o	o
19. Perforation vulnerability	o	o	o	o	o	o
20. Property value increase	o	o	o	o	o	o
21. Recyclability & reusability	o	o	o	o	o	o
22. Release of dangerous substances	o	o	o	o	o	o
23. Relevance and synergy with other materials	o	o	o	o	o	o
24. Resistance to corrosion	o	o	o	o	o	o
25. Resistance to fire	o	o	o	o	o	o
26. Resistance to fungi	o	o	o	o	o	o
27. Resistance to weather changes	o	o	o	o	o	o
28. Sound insulation and noise reduction	o	o	o	o	o	o
29. Supply security (availability)	o	o	o	o	o	o
30. Sustainability	o	o	o	o	o	o
31. Technology maturity	o	o	o	o	o	o
32. Thermal comfort	o	o	o	o	o	o
33. Thermal conductivity/ thermal insulation performance	o	o	o	o	o	o
34. Water/water vapor resistance	o	o	o	o	o	o
35. Weight/density	o	o	o	o	o	o



B2. Please define the three (3) most important specifications of insulation materials from the list mentioned above:
[Open Question]

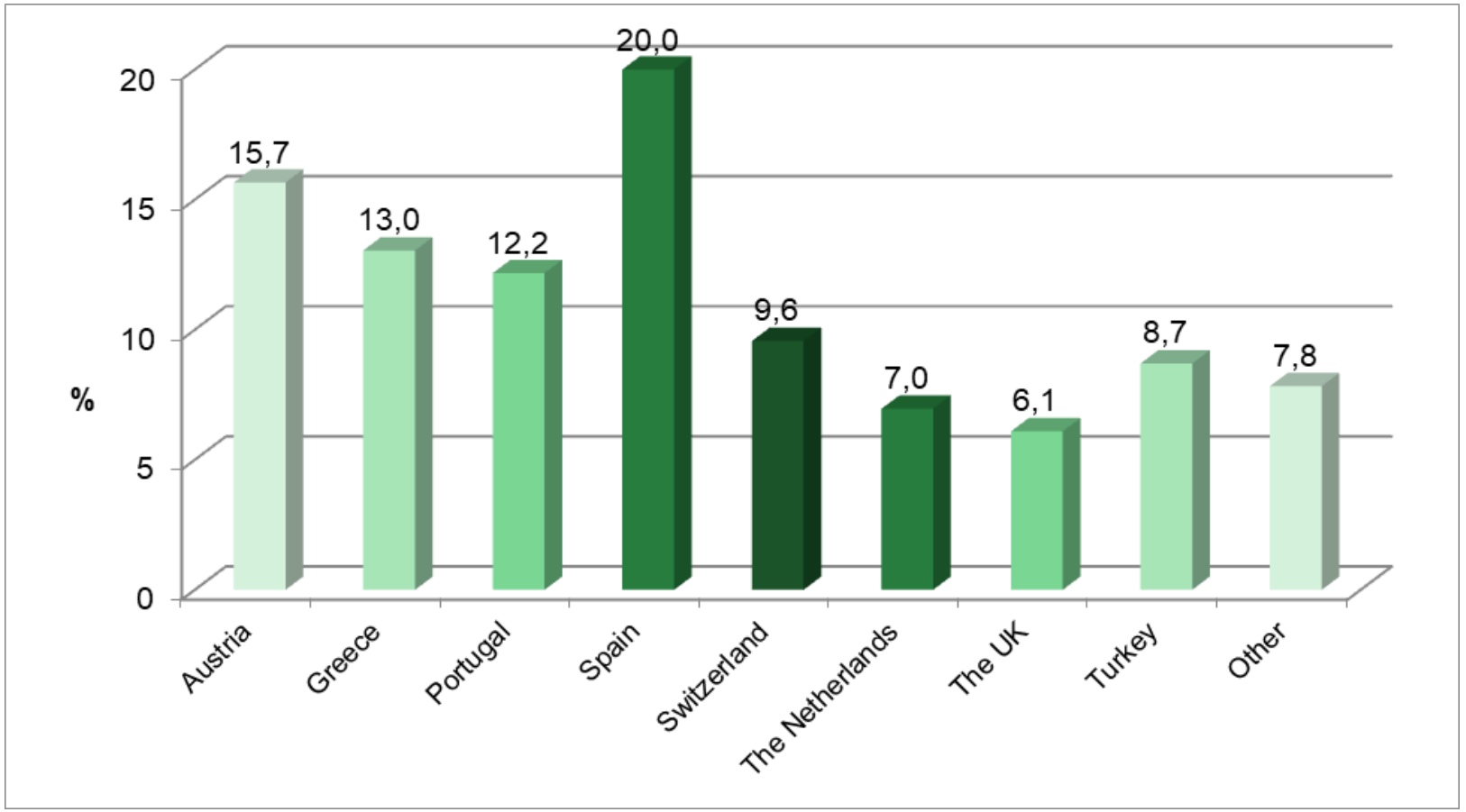
B3. If you think there are other significant specifications of insulation materials that are not mentioned above, please specify them here in your own words.
[Open Question]

B4. How do you rank the following criteria for selecting insulation materials in terms of their importance?

	Economic	Environmental	Social	Technical
1. First choice in terms of importance	o	o	o	o
2. Second choice in terms of importance	o	o	o	o
3. Third choice in terms of importance	o	o	o	o
4. Fourth choice in terms of importance	o	o	o	o

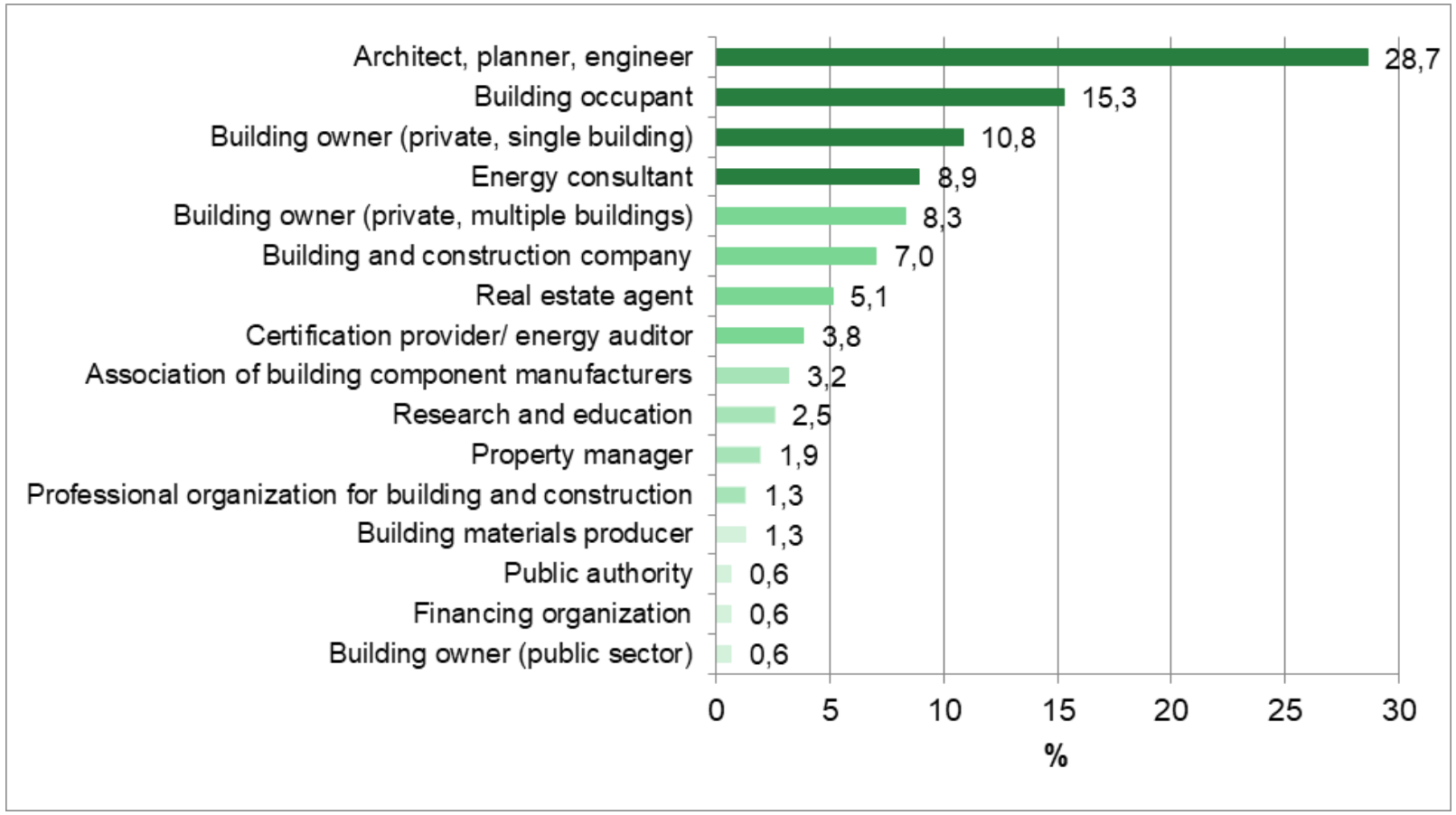
T2.1 – Survey results

- 115 responses from 12 European countries.



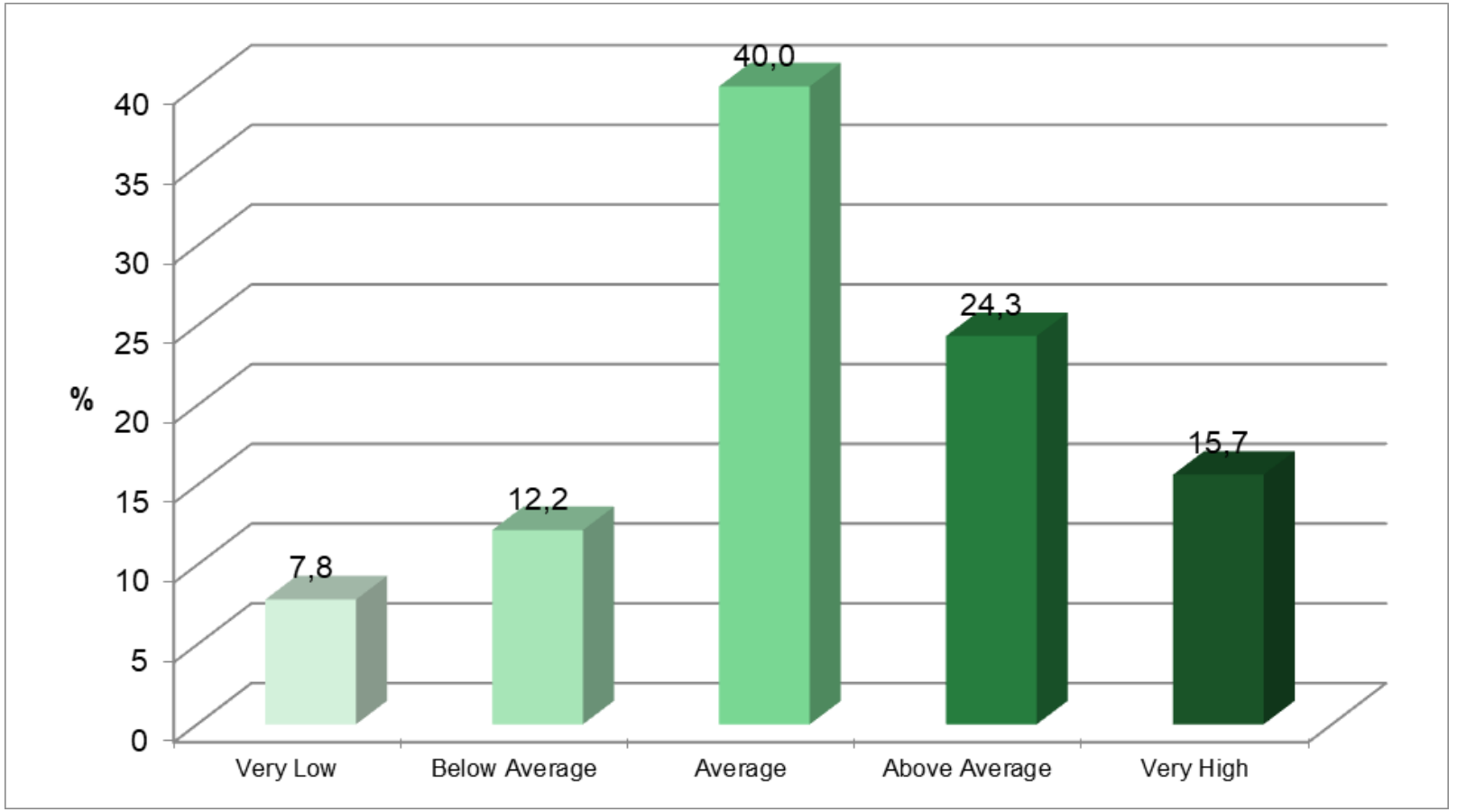
COUNTRY OF RESIDENCE

Survey results



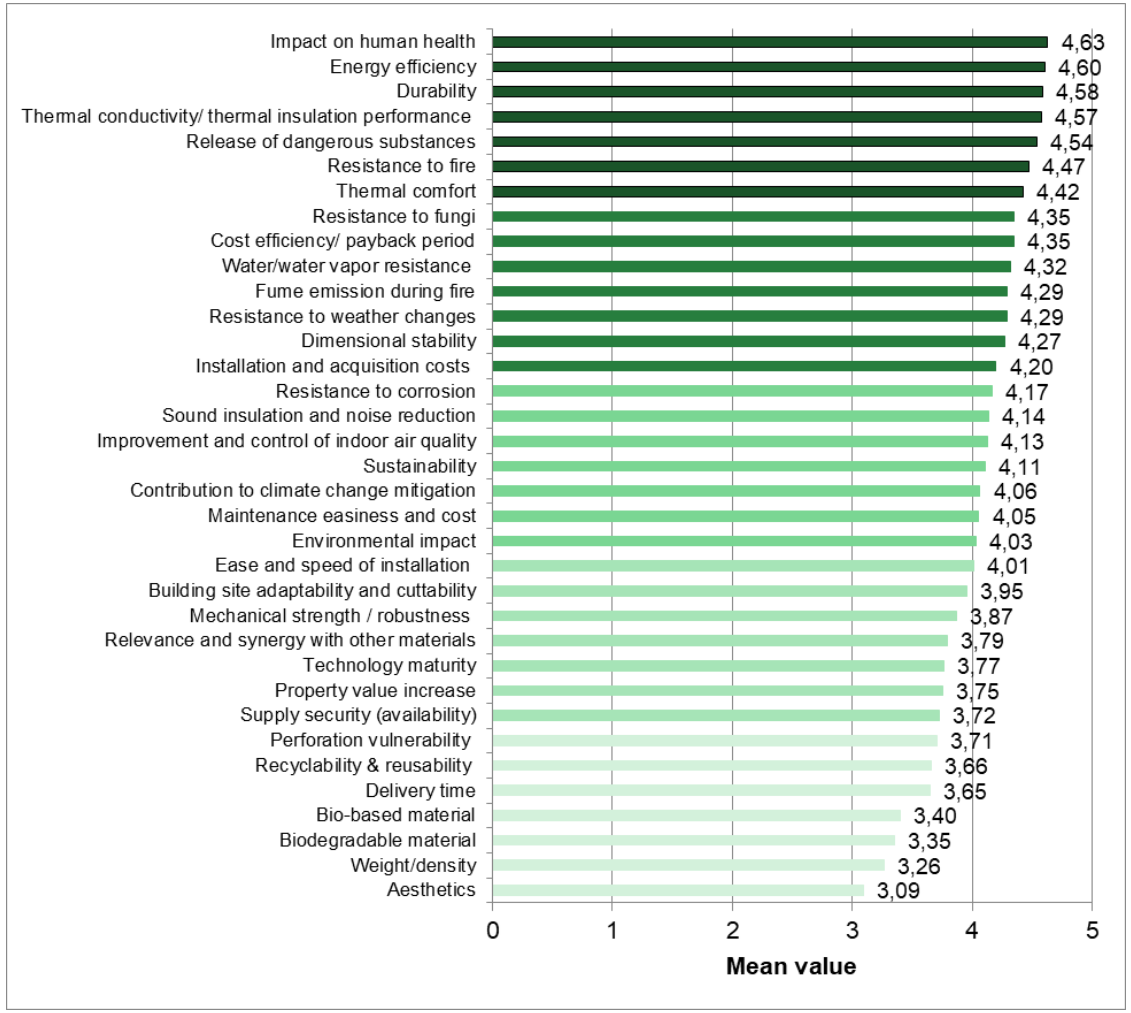
END-USER CATEGORIES

Survey results



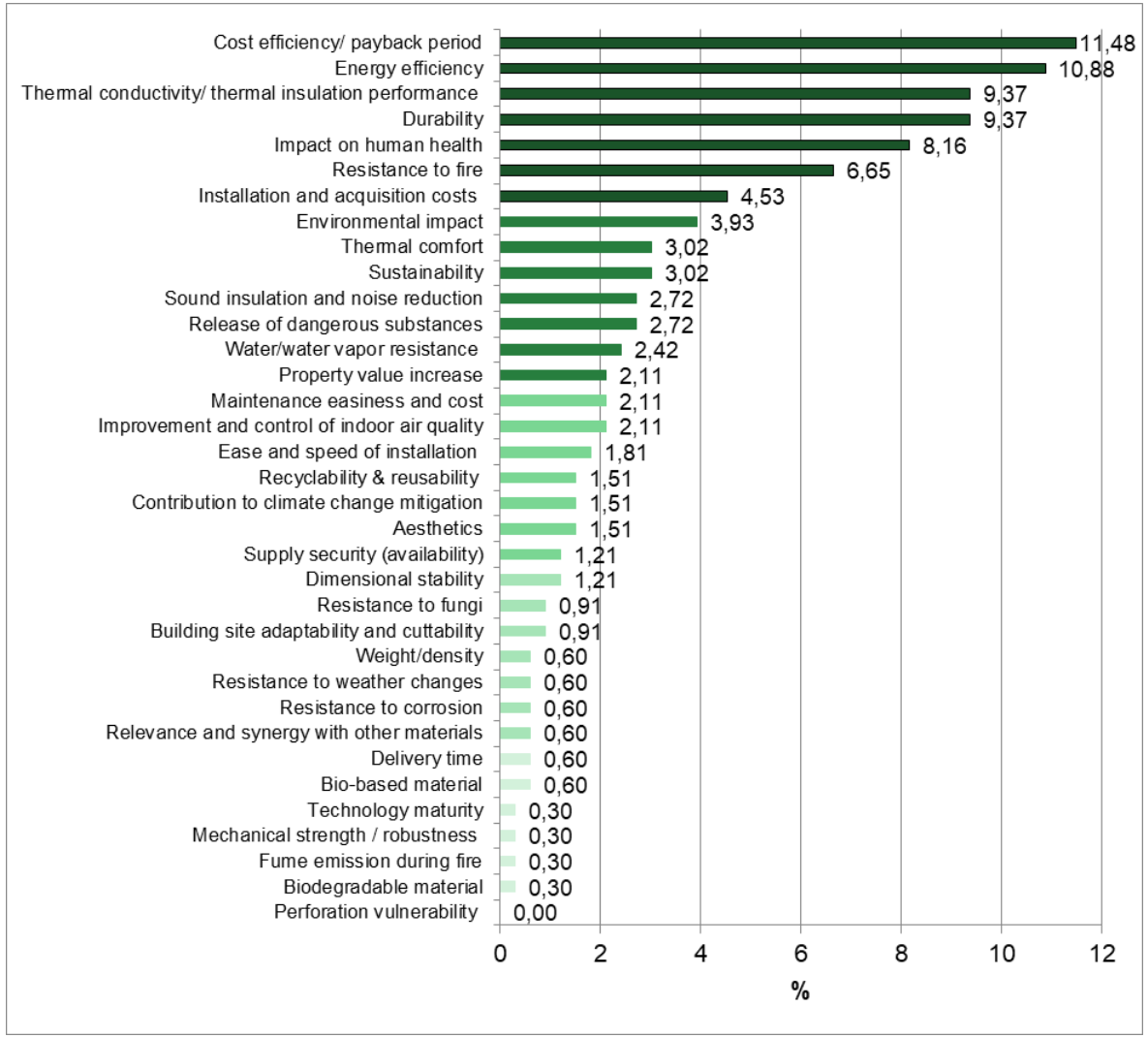
LEVEL OF KNOWLEDGE OF INSULATION MATERIALS

Survey results



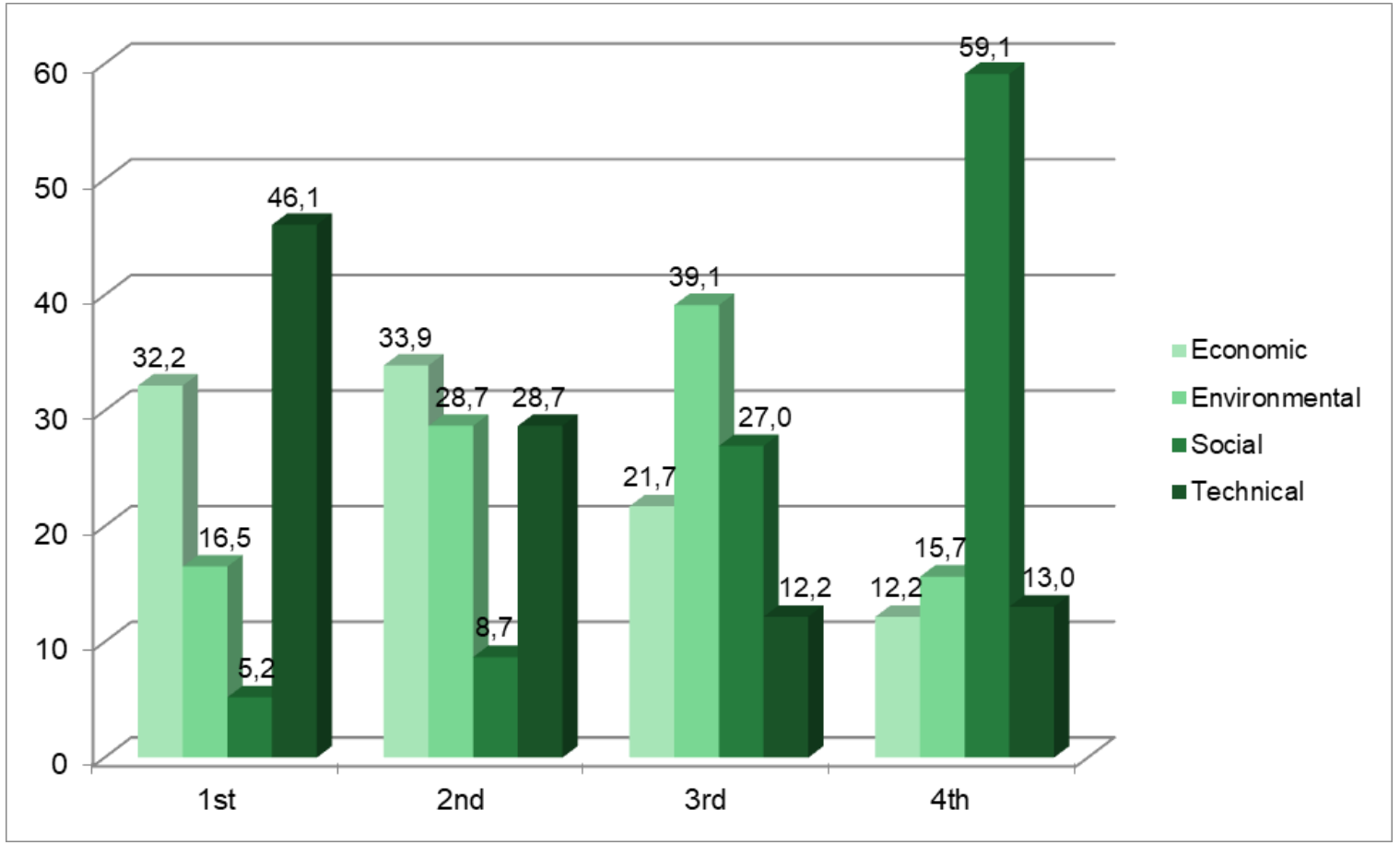
MEAN VALUES OF THE PERCEIVED IMPORTANCE OF INSULATION MATERIALS' SPECIFICATIONS

Survey results



SPECIFICATIONS PERCEIVED AS OF TOP-3 IN TERMS OF IMPORTANCE (% EXPRESSES THE SHARE OF EACH SPECIFICATION IN RELATION TO THE TOTAL ANSWERS PROVIDED)

Survey results

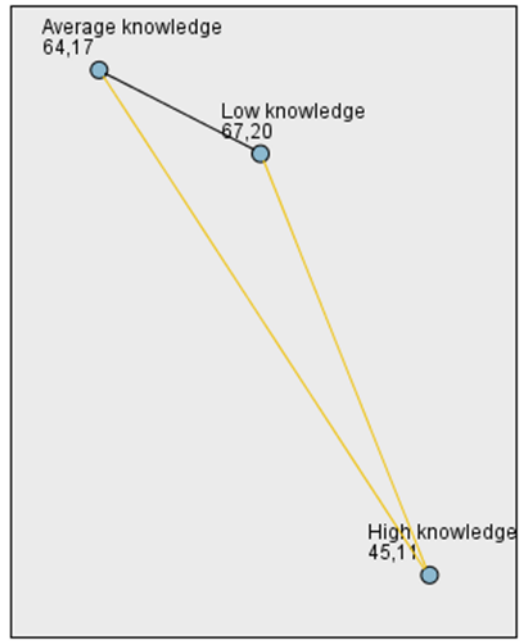


RANK OF CRITERIA IN TERMS OF THEIR IMPORTANCE FOR SELECTING INSULATION MATERIAL

Survey results

COMPARISONS OF RESPONSES BETWEEN KNOWLEDGE GROUPS: RESULTS OF Kruskal-Wallis tests

Specification	Sig.
Aesthetics	0,004
Bio-based material	0,179
Biodegradable material	0,026
Building site adaptability and cuttability	0,063
Contribution to climate change mitigation	0,500
Cost efficiency/ payback period	0,919
Delivery time	0,307
Dimensional stability	0,290
Durability	0,766
Ease and speed of installation	0,148
Energy efficiency	0,460
Environmental impact	0,334
Fume emission during a fire	0,282
Impact on human health	0,281
Improvement and control of indoor air quality	0,293
Installation and acquisition costs	0,862
Maintenance easiness and cost	0,230
Mechanical strength/robustness	0,927
Perforation vulnerability	0,779
Property value increase	0,418
Recyclability & reusability	0,000
Release of dangerous substances	0,605
Relevance and synergy with other materials	0,473
Resistance to corrosion	0,321
Resistance to fire	0,808
Resistance to fungi	0,703
Resistance to weather changes	0,814
Sound insulation and noise reduction	0,258
Supply security (availability)	0,031
Sustainability	0,028
Technology maturity	0,267
Thermal comfort	0,817
Thermal conductivity/ thermal insulation performance	0,031
Water/water vapor resistance	0,966
Weight/density	0,061



RESULTS OF THE PAIRWISE COMPARISON OF THE IMPORTANCE OF AESTHETICS AS A SPECIFICATION OF INSULATION MATERIALS BETWEEN THE DIFFERENT KNOWLEDGE LEVELS OF END-USERS

Conclusions & Further Activities

- Technical performance, health and safety, and cost-effectiveness are key priorities for end-users.
- Technical and economic criteria generally outweigh environmental and social considerations.
- Knowledge levels influence perceptions of certain insulation material specifications.
- **Manufacturer validation:** Findings have also been validated with manufacturers.
- **Next steps:** Survey findings will inform subsequent citizen survey and interviews with demonstration-site occupants and construction stakeholders.

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