Horizon Europe

Action: EIC Pathfinder Open (Project No 101046909)
Reusable mask patterning (REMAP)

WP4: Task 4.1

Effective Societal Outreach

Dissemination level: PUBLIC

This report describes the work performed by UNIVERSITY OF LUXEMBOURG (UNILU) in the framework of the REMAP project pertaining to the communication activity at the *Science Festival* held in Luxembourg City from the 22nd to the 25th of November 2025.

Acknowledgement and disclaimer

REMAP is funded by the European Commission under the PathFinder Open programme (grant agreement No. 101046909).

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Innovation Council and SME Executive Agency (EISMEA). Neither the European Union nor the granting authority can be held responsible for them.

Funded by
the European Union

1. Overview

From November 22 to 25, 2025, the Science Festival (www.science-festival.lu) celebrates its 15th edition with a series of 68 workshops and performances focused on science and technology.

From 6 years old and with no upper age limit, visitors were invited to experience science hands-on, but also to marvel and be amazed by today's knowledge and research.
Admission is free, and participation in the workshops is not required for the general public. Science Festival to General Public ran from Saturday to Sunday (22&23 November), and these were the chosen dates to showcase micro-fabrication of solar cells through REMAP process among other research activities conducted at the University of Luxembourg.

The Science Festival was organized by the National Museum of Natural History and the National Research Fund of Luxembourg.

Solar Cell Research _ n°34

Curious about the future of solar energy? Than come to explore how solar panels can be layered, patterned, miniaturized, and even made in color - all to boost power and style! Discover how science shapes the solar solutions of tomorrow!

Org: University of Luxembourg

Age
> 6 years

Language
French, Luxembourgish, German, English

Type of activity
Workshop

Figure 1. Promotional banner of the Science Festival and booth theme showcased by the University of Luxembourg. *Source: https://www.science-festival.lu/en/.*

2. Description of the REMAP hands-on demonstrations

The workshop starts with the opening question “Can a window generate electricity?” setting the tone towards semi-transparent solar cells and how these could be fabricated using REMAP technology.

A brief explanation on micro-fabrication of solar cells is given to the public: microfabrication is a way of building tiny, detailed structures on solar cells to make them more efficient at capturing sunlight and converting it into electricity. Think of it like making a high-tech blueprint at a super small scale—almost like how a computer chip is made, but for solar panels! Two main methods are introduced: top-down and bottom-up approaches.

The top-down approach is like sculpting a statue from a big block of stone—you start with a solid material and remove parts to create the final structure. In the case of solar cells, this means starting with a large material (usually silicon) and cutting, shaping, or etching it down to form tiny, precise structures.

Hands-on activity 1. Demonstration of top-down approach: This hands-on session involves scratch sheets, where the audience is asked to scribe lines on the paper. This emulates the fabrication process of semi-transparent solar cells. From this activity, the generated wax leftovers is pointed out as material waste, which one of the main drawbacks of the top-down fabrication approach. Finally, real examples of semi-transparent solar cells is shown to the public.

Figure 2. Hands-on activity 1 illustration.

The bottom-up approach is like building something from scratch, piece by piece—just like stacking LEGO bricks to create a final structure. Instead of starting with a big material and cutting it down (like in the top-down approach), we build tiny structures from the ground up using either chemical and physical processes. The concept of templates is introduced as a way to generate different shapes/patterns on substrates.

Figure 3. Hands-on activity 2 illustration.

Hands-on activity 2. Demonstration of bottom-up approach: The audience is given blank paper sheets with double-side adhesive circle pads and glitter. The glitter is poured on the paper sheets and it is stuck to the glued circles pads, creating a patterned array of colorful circles (resembling a semiconductor which has been selectively deposited on a patterned substrate). This activity is conducted in plastic trays to avoid spilling of glitter everywhere and for its reuse. Aftewards, real examples of micro-patterned solar cells are shown to the public.

3. Photographic record

Figure 4. REMAP WP3 members (P. Dale & M. Gonzalez) from University of Luxembourg showcasing top-down and bottom-up approaches to micro-fabricate solar cells.

4. Wooclap quiz

A QR code generated through the Wooclap platform was displayed on a computer screen for the public to scan it and access to the quiz via mobile phone. The quiz contained 10 multiple-choice questions, where Q1-Q3 assessed the knowledge of the public on sustainability, Q4-Q6 solar energy, and Q7-Q10 micro-fabrication of solar cell and the scope of REMAP.

Figure 5. Advert shown to the public to participate in the questionnaire after the hands-on demonstration.

The multiple-choice questions given to the public via Wooclap are shown below with the correct answer highlighted in yellow.

Section 1: Sustainability (4 Questions)
Q1. What does sustainability mainly aim to achieve?
a) Unlimited use of resources
b) Meeting present needs without compromising future generations
c) Using only renewable energy sources
d) Reducing all industrial activities

Q2. Which of the following is a renewable energy source?
a) Coal
b) Natural gas
c) Solar energy
d) Nuclear energy

Q3. Why is reducing material waste important for sustainability?
a) It makes products cheaper
b) It helps conserve resources and reduce environmental impact
c) It speeds up production
d) It improves product color

Q4. Which everyday action supports sustainability?
a) Leaving lights on all day
b) Recycling paper and plastics
c) Using single-use plastic bags
d) Driving everywhere alone

Section 2: Solar Energy (3 Questions)
Q5. What is the main function of a solar cell?
a) Store electricity
b) Heat water
c) Reflect sunlight
d) Convert sunlight into electricity

Q6. Can a window generate electricity?
a) No, never
b) Yes, if it has semi-transparent solar cells
c) Only if it is made of metal
d) Only in very hot climates

Q7. Why are semi-transparent solar cells interesting?
a) They block all sunlight
b) They work only at night
c) They allow light through while generating electricity
d) They are cheaper than all other solar cells

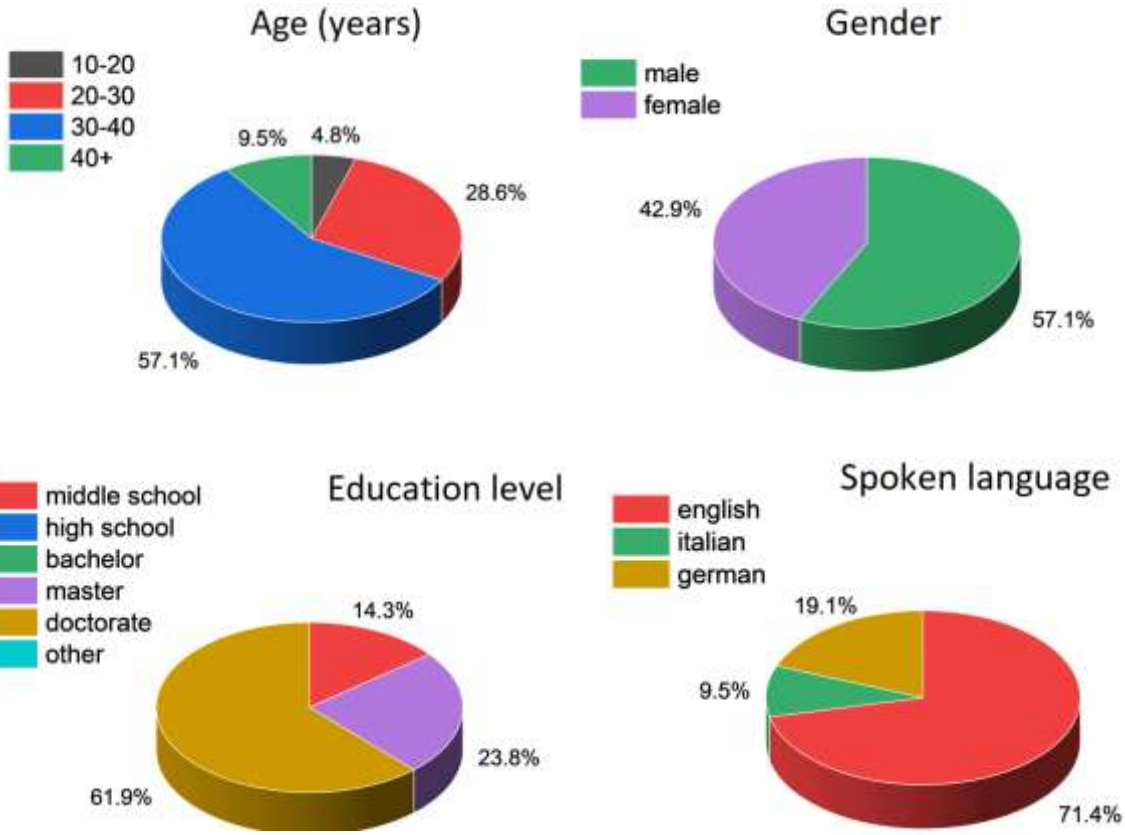
Section 3: Micro-Fabrication of Solar Cells (3 Questions)
Q8. What is micro-fabrication in solar cells?
a) Making solar cells very large
b) Building tiny structures to improve efficiency
c) Painting solar panels
d) Adding glitter for decoration

Q9. Which statement describes technically the top-down approach?
a) Building structures layer by layer
b) Using templates to deposit materials
c) Adding adhesive pads and glitter
d) Removing material from a larger block to create small structures

Q10. How can we fabricate micro-solar cells with REMAP technology?
a) By adding glitter to improve sunlight reflection.
b) By scribing material.
c) Using magnetic particles to mask surfaces and create patterns.
d) Through robust tools.

Wooclap Quiz performance metrics and participants demographics

For outreach statistics of this booth, information such as age, gender, and level of education of the participants and how they found out the hands-on activities was collected.



This year's science festival recorded a significantly lower number of visitors from the general public, with attendance decreasing by almost a factor of three compared to previous editions. The primary reason for this reduction appears to be the unusually poor weather conditions during the event. Conversations with other exhibitors confirmed that the entire venue saw fewer visitors overall, reinforcing the conclusion that the drop in attendance was environmental rather than related to programme content, outreach, or public interest. Those who did visit REMAP booth showed a clear interest in the scientific content presented and demonstrated curiosity about the project's aims and applications. Visitors stayed for discussions, asked relevant questions, and interacted positively with the demonstrations and materials provided. This suggests that although the audience was smaller, it was composed largely of motivated and genuinely interested individuals. Feedback gathered informally indicates that visitors were able to grasp the main scientific principles and understand the broader relevance of the work. The reduced attendance therefore did not impede our ability to deliver clear, accessible, and meaningful outreach. Instead, it offered an opportunity for more focused, personalized exchanges that may have strengthened individual understanding.

Although the quiz did not include questions regarding participant's ownership of electronic equipment, their interest in STEM disciplines, their motivation to engage with REMAP or their perception of gender-related impacts, some reasonable inferences can be made from the educational background of the participants. The majority of the respondents were actively engaged in research-intensive environments (PhD education level). Their education profile suggests a strong familiarity with electronic devices such as smartphones and computers and regular interaction in their professional activities. The advanced training observed in this category of participants also implies a natural high level of interest in STEM disciplines. Lastly, although no direct data was collected, given the academic background of the majority of participants it is reasonable to assume that the audience would not perceive REMAP's work as disproportionality benefiting a particular gender and would instead view the research impact as broadly applicable.

Appendix I.

Wooclap quiz interactive platform as perceived by the participants.
(pdf file)

UniLu REMAP quiz

Number of participants: 24

1.

Il est temps de tester vos connaissances sur le développement durable et les cellules solaires ! Veuillez sélectionner la bonne réponse.

Time to test your knowledge on sustainability and solar cells! Please, select the correct answer.

2. Quel est l'objectif principal du développement durable ?/ What does sustainability mainly aim to achieve?

17 correct answers
out of 24 respondents

	Utilisation illimitée des ressources/Unlimited use of resources	0%	0 votes
✓	Satisfaire les besoins actuels sans compromettre les générations futures/Meeting present needs without compromising future generations	71%	17 votes
	Utiliser uniquement des sources d'énergie renouvelables/Using only renewable energy sources	29%	7 votes

Réduire toutes les activités industrielles/Reducing all industrial activities	0%	0 votes

3. Laquelle des sources d'énergie suivantes est renouvelable ?/Which of the following is a renewable energy source

23 correct answers
out of 23 respondents

Charbon/Coal	0%	0 votes
Gaz naturel/Natural gas	0%	0 votes
✓ Énergie solaire/Solar energy	100%	23 votes
Énergie nucléaire/Nuclear energy	0%	0 votes

4. Pourquoi la réduction du gaspillage de matières premières est-elle importante pour le développement durable ? / Why is reducing material waste important for sustainability

21 correct answers
out of 23 respondents

	Elle permet de réduire le coût des produits/ It makes products cheaper	4%	1 vote
✓	Elle contribue à préserver les ressources et à réduire l'impact environnemental/It helps conserve resources and reduce environmental impact	91%	21 votes
	Elle accélère la production/ It speeds up production	0%	0 votes

Elle améliore la couleur des produits/It improves product color — 4% — 1 vote

5. Quelle action quotidienne favorise le développement durable ?/Which everyday action supports sustainability?

21 correct answers out of 22 respondents

Laisser les lumières allumées toute la journée/Leaving lights on all day — 5% — 1 vote

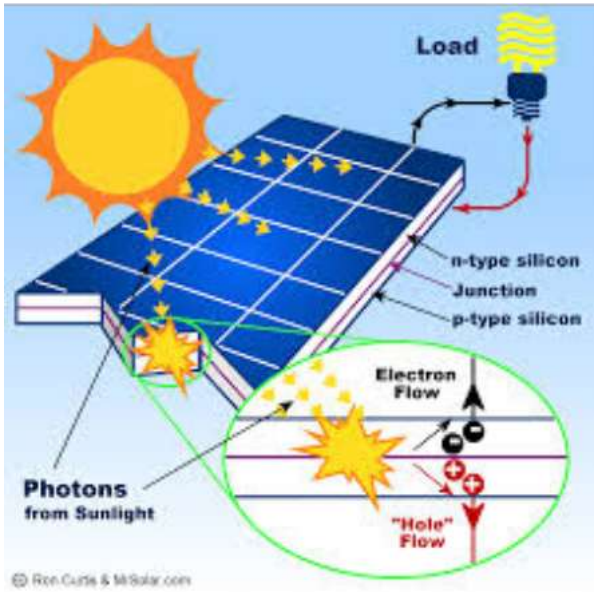
Recycler le papier et le plastique/Recycling paper and plastics — 95% — 21 votes

Utiliser des sacs en plastique à usage unique/Using single-use plastic bags — 0% — 0 votes

Se déplacer seul(e) en voiture/Driving everywhere alone — 0% — 0 votes

6. Quelle est la fonction principale d'une cellule solaire ?/What is the main function of a solar cell?

21 correct answers
out of 22 respondents



	Stocker l'électricité/Store electricity	5%	1 vote
	Chauffer l'eau/Heat water	0%	0 votes
	Réfléchir la lumière du soleil/Reflect sunlight	0%	0 votes
✓	Convertir la lumière du soleil en électricité/Convert sunlight into electricity	95%	21 votes

7. Une fenêtre peut-elle produire de l'électricité ?/Can a window generate electricity?

21 correct answers
out of 22 respondents

	Non, jamais./No, never	5%	1 vote
✓	Oui, si elle est équipée de cellules solaires semi-transparentes./Yes, if it has semi-transparent solar cells	95%	21 votes
	Uniquement si elle est en métal/Only if it is made of metal	0%	0 votes
	Uniquement dans les climats très chauds/Only in very hot climates	0%	0 votes

8. Pourquoi les cellules solaires semi-transparentes sont-elles intéressantes ?/Why are semi-transparent solar cells interesting?

21 correct answers
out of 22 respondents

	Elles bloquent toute la lumière du soleil./They block all sunlight	5%	1 vote
	Elles ne fonctionnent que la nuit./	0%	0 votes
✓	Elles laissent passer la lumière tout en produisant de l'électricité./They allow light through while generating electricity	95%	21 votes
	Elles sont moins chères que toutes les autres cellules solaires./They are	0%	0 votes

cheaper than all other solar cells

9. Qu'est-ce que la microfabrication dans le domaine des cellules solaires ?/What is micro-fabrication in solar cells?

20 correct answers
out of 22 respondents

Fabriquer des cellules solaires de très grande taille/Making solar cells very large		5%	1 vote
Construire des structures minuscules pour améliorer l'efficacité/Building tiny structures to improve efficiency	✓	91%	20 votes
Peindre les panneaux solaires/Painting solar panels		0%	0 votes
Ajouter des paillettes			

à des fins décoratives/Adding glitter for decoration

10. Quelle aft'rmation décrit techniquement l'approche descendante ?/Which statement describes technically the top-down approach?

12 correct answers
out of 22 respondents

Construire des structures couche par couche/Building structures layer by layer	27%	6 votes
Utiliser des gabarits pour déposer des matériaux/Using templates to deposit materials	14%	3 votes
Ajouter des pastilles adhésives et des paillettes/Adding adhesive pads and glitter	5%	1 vote
Retirer de la matière d'un bloc plus grand		

pour créer de petites structures/Removing material from a larger block to create small structures

12 votes

11. Comment peut-on fabriquer des microcellules solaires avec la technologie REMAP ?/How can we fabricate micro-solar cells with REMAP technology?

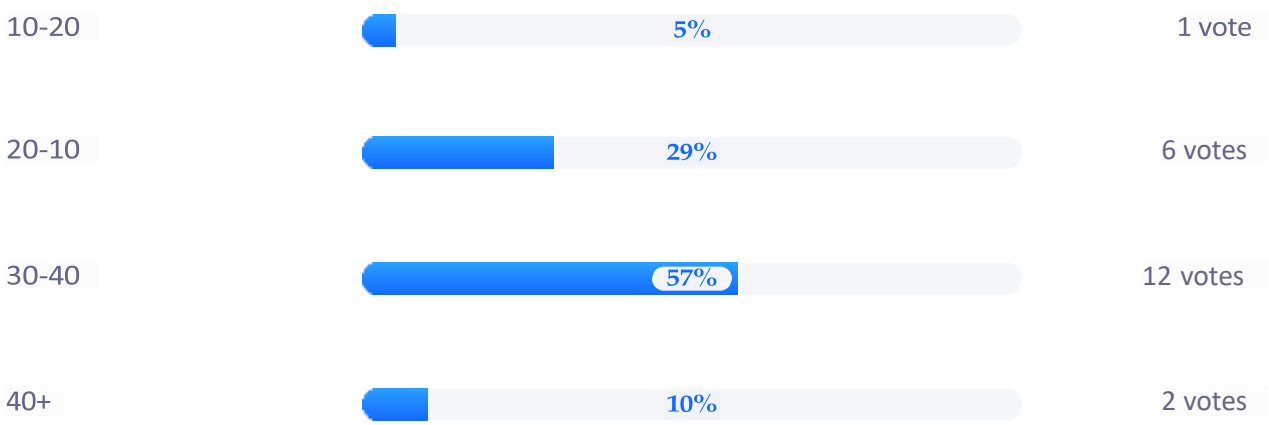
18 correct answers
out of 21 respondents

En ajoutant des paillettes pour améliorer la réflexion de la lumière solaire./By adding glitter to improve sunlight reflection.	10%	2 votes
En gravant le matériau./By scribing material.	5%	1 vote
✓ En utilisant des particules magnétiques pour masquer les surfaces et créer des motifs./Using magnetic particles	86%	18 votes

to mask surfaces and create patterns. Grâce à des outils robustes/Through robust tools.	0%	0 votes

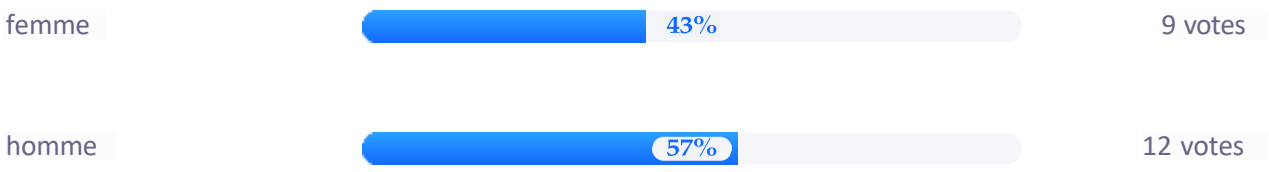
12. quel âge avez-vous?/ whats your age?

21 respondents



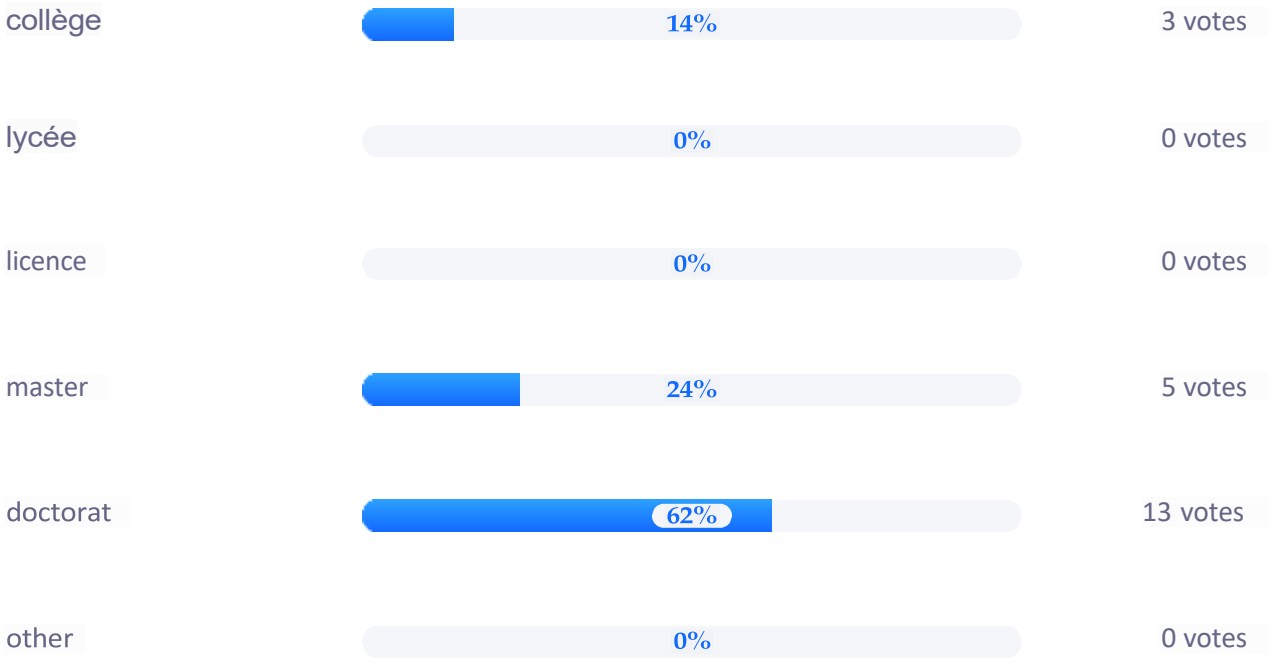
13. sexe/gender

21 respondents



14. niveau d'études/level of education

21 respondents



15. langues parlées/spoken language

21 respondents