Final Report on the #Solar4Future+ Solar Challenges

Local and International Online Solar Energy Challenge

1. Introduction

The #Solar4Future+ project, co-funded under the Erasmus+ programme, aims to promote solar energy awareness, STEAM education, environmental responsibility, and student-led innovation across partner schools in Europe. As part of the project activities, partner schools implemented online and local Solar Challenges, where students worked in teams to identify real-life energy-related problems and propose practical, creative, and sustainable solar-based solutions.

The Solar Challenge was designed as a Project-Based Learning activity using the STEAM approach: Science, Technology, Engineering, Arts, and Mathematics. Through this methodology, students were encouraged to move beyond theoretical knowledge and apply scientific and technical concepts to real problems in their schools and communities.

The challenge was implemented in two main stages:

1. Local Solar Challenges organized by each partner school in Italy, Croatia, Romania, and Spain.
2. The Final International Online Solar Challenge, held on 13 May 2026, where one finalist team from each country presented its project to an international jury.

The final online challenge jury included representatives from the Turkish partner, Innovation and Digital Development Association, and the Latvian partner, Riga Technical University. The final results were officially announced during the Final Project Meeting in Türkiye by the Riga Technical University team. Based on the jury voting, the Romanian team was selected as the best project of the #Solar4Future+ International Solar Challenge.

2. Objectives of the Solar Challenge

The Solar Challenge was organized to support the educational and sustainability goals of the #Solar4Future+ project. Its main objectives were:

- To increase students' knowledge of solar energy and renewable energy technologies.
- To help students understand how photovoltaic systems can be used in real-life contexts.
- To develop students' STEAM competences through practical teamwork.
- To encourage creativity, innovation, and critical thinking.
- To promote environmental awareness and climate responsibility.
- To connect schools, students, teachers, and project partners around a shared European sustainability challenge.

- To identify the most promising student-led solar energy solution at the international level.

The challenge also supported students in developing communication, presentation, and public speaking skills, as each team had to explain and defend its project in front of a jury.

3. Methodology and Challenge Structure

The methodology of the challenge followed a common project-based learning structure across the partner countries. Students worked in teams, usually with five members, and each team member had a role connected to the STEAM disciplines, such as scientist, technologist, engineer, artist, and mathematician.

The local challenges generally included the following steps:

3.1 Launch Phase

Students were introduced to the Solar Challenge, the project objectives, the competition rules, and the expected outputs. Teachers explained the importance of solar energy, sustainability, and the STEAM approach.

3.2 Research Phase

Students investigated energy-related problems in their schools, cities, or communities. They explored issues such as energy consumption, inefficient lighting, the need for renewable energy infrastructure, sustainable school spaces, and the role of solar technologies in reducing environmental impact.

3.3 Development Phase

Teams developed their project ideas by combining scientific research, technical calculations, design thinking, environmental analysis, and creative presentation methods. In some cases, students prepared physical models, posters, prototypes, or digital presentations.

3.4 Local Challenge Day

Each partner school organized a local competition where student teams presented their projects to a local jury. Presentations were usually limited to five minutes, followed by discussion and evaluation. The jury assessed the projects based on innovation, feasibility, STEAM integration, sustainability impact, teamwork, and presentation quality.

3.5 International Final

Following the local challenges, one finalist team from each partner country was selected to participate in the Final International Online Solar Challenge on 13 May 2026. The international jury evaluated the finalist projects and selected the Romanian team as the best project.

4. Overview of Local Challenges by Country

4.1 Spain – CEIP San Isidro Labrador

The Spanish local challenge was implemented at CEIP San Isidro Labrador. The school emphasized the pedagogical value of the activity, describing it as a learning journey where students became proactive "Agents of Change."

A total of 55 students participated in the Spanish challenge. Students came from different academic levels, ranging from 5th grade of Primary Education to 2nd grade of Secondary Education. This diversity supported peer-to-peer learning and collaboration between younger and older students.

Students were organized into teams of five members, following the STEAM role structure. Each student took responsibility for a specific role, such as scientist, technologist, engineer, artist, or mathematician.

The Spanish local challenge followed a structured methodology, including the launch phase, research phase, development phase, and local challenge day. Students investigated real energy inefficiencies within the school, applied energy consumption formulas, estimated cost savings, and calculated possible reductions in CO_2 emissions.

The local proposals included:

- Sustainable Inclusive Park for common areas.
- Solar Streetlights for school facilities.
- School Solar Garden for environmental education.
- Mobile and Laptop Solar Chargers.

The challenge ended with a very close competition. Two teams achieved the same first-place score of 16.5 points: "Sustainable Classrooms" and "School Playground." To solve the tie fairly, both teams presented their projects again in a special tie-breaker round before the school community.

The teaching staff assessed the activity as excellent. The Spanish report emphasized that the students improved their mathematical and scientific competencies, learned to work under pressure, respected deadlines, and developed a deeper understanding of renewable energy.

4.2 Croatia – Srednja škola Metković

The Croatian local challenge took place on 29 April 2026 at Srednja škola Metković, in the Scientific Laboratory, Room 21. The event brought together students to develop innovative solutions related to sustainability, renewable energy, and solar technologies.

A total of 25 students participated in the Croatian challenge, divided into five teams. Each team presented a project proposal focused on renewable energy, sustainability, and local development through the STEAM approach.

The jury was composed of teachers and experts from different fields, including geography, IT, mathematics, and science. The jury evaluated the projects according to innovation, applicability, STEAM integration, teamwork, and presentation quality.

Each team was given five minutes to present its project using a laptop and smart TV. After the presentations and discussion, the jury selected Team 1 as the winning team.

The winning Croatian team proposed a set of innovative solutions to increase the use of solar energy in Metković. Their proposal included:

- Public solar energy projects.
- Educational workshops.
- Subsidies for solar energy use.
- Rooftop solar installations.
- Solar-powered roundabouts.
- Wider local awareness about sustainability.

The Croatian winning project successfully connected solar energy with local environmental needs and community development. It also demonstrated the integration of science, technology, engineering, arts, and mathematics.

After the local challenge, the Croatian winning team also disseminated its project within the school community. The project was presented during a workshop organized in connection with the European Parliament Ambassador School programme. This helped reach a wider audience of students and teachers, while linking environmental responsibility with European values and active citizenship.

4.3 Romania – “Ștefan cel Mare” National Pedagogical College, Bacău

The Romanian local challenge was organized by “Ștefan cel Mare” National Pedagogical College in Bacău. The activity, titled “STEAM Energy Challenge” Local Competition, took place on Wednesday, 29 April 2026, at 14:00 in the “Spiru Haret” Amphitheater.

The main objective of the Romanian challenge was to stimulate students' critical thinking, creativity, and collaboration skills. Students were challenged to transform theoretical energy-related problems into real and sustainable solutions for the future.

A total of 9 teams registered for the competition. The teams included students from both lower secondary and upper secondary levels. Following the STEAM methodology, each team member took on a role connected to science, technology, engineering, arts, or mathematics.

The Romanian jury combined technical expertise and pedagogical experience. It included representatives from the energy sector, such as SIMTEL and Grünman Energy, as well as teachers from the school. This combination strengthened the evaluation process by connecting educational and industry perspectives.

The results of the Romanian local challenge were organized by category. In the high school category and general ranking:

- 1st Prize: 10th Grade A Team.
- 2nd Prize: 10th Grade C Team.
- 3rd Prize: 10th Grade F-2 Team.
- Honorable Mention: 10th Grade F Team.

The jury also recognized lower secondary teams with special awards for "Future Researchers," showing that the challenge encouraged participation across different age groups.

Although the 10th Grade A Team initially won the local competition, they later withdrew before the online international stage. According to the competition rules, the right to participate in the international phase was transferred to the runner-up team. Therefore, the Romanian school was represented internationally by the 2nd place team, 10th Grade C.

The Romanian finalist team consisted of:

- Budău Roșu Rita.
- Grigore Diana.
- Cobzaru Emanuela.
- Semeș Ilaria.
- Negrii Sara.

The Romanian local challenge was considered a major success. It demonstrated students' capacity to develop innovative ecological solutions using the STEAM methodology. It also strengthened the dissemination of the #Solar4Future+ project values within the school community.

At the international final stage, the Romanian team was selected as the best project based on the jury voting.

4.4 Italy – I.I.S.S. “Federico II Stupor Mundi”, Corato

The Italian local challenge was organized at I.I.S.S. “Federico II Stupor Mundi” in Corato, Italy. It took place on 29 April 2026 at 10:45 in the Scientific Laboratory, Room 21.

The Italian challenge brought together several student teams, each of which presented a STEAM-based solar energy project. The examining jury included internal school experts and external technical experts. Internal jury members included teachers of English and Erasmus+ coordination, science, ceramic design, and mathematics. External experts included engineers Marco Jurilli and Antonio Diaferia.

Five teams participated in the Italian challenge. Each team was given five minutes to present its project using a laptop and smart TV. After the presentations, the jury evaluated the works and selected the best project.

Team 1 was selected as the winner. The team members and their STEAM roles were:

- Mattia Bonasia – Engineer.
- Giorgia Grieco – Artist.
- Valeria Sophia Gaia Cantatore – Technician.
- Ilaria Fucci – Mathematician.
- Francesco Pio Cassano – Scientist.

The winning Italian project was called “The Piezopottery.” It proposed a hybrid flooring system capable of recovering mechanical energy normally lost during walking. The system combined piezoelectric materials, which generate electricity when compressed by footsteps, with transparent silicon cell tiles that capture solar energy.

The jury highlighted several strengths of the Italian winning project:

- A multidisciplinary approach combining scientific rigor and contemporary design.
- A strong sustainability focus, including zero CO_2 emissions and recycled materials.
- Effective communication skills, supported by clear slides and confident presentation.

The Italian challenge demonstrated a strong connection between renewable energy, design, engineering, and sustainable innovation.

5. Final International Online Solar Challenge

The Final International Online Solar Challenge was held on 13 May 2026. One finalist team from each partner country participated after being selected through the local challenge process.

The participating countries included:

- Italy.
- Croatia.
- Romania.
- Spain.

The international final provided an opportunity for students to present their local winning projects at the European level. It also allowed students to compare different approaches to solar energy, sustainability, and STEAM-based problem solving.

The international jury included representatives from:

- Türkiye: Innovation and Digital Development Association.
- Latvia: Riga Technical University.

The jury evaluated the finalist teams based on the quality of their solutions, innovation, STEAM integration, feasibility, environmental impact, presentation quality, and overall potential.

The final results were announced during the Final Project Meeting in Türkiye by the Riga Technical University team. Based on the jury voting, the Romanian team was selected as the best project of the #Solar4Future+ International Solar Challenge.

6. Comparative Analysis of the Local Finalist Projects

The local reports show that each country approached the Solar Challenge from a different but complementary perspective.

Spain

The Spanish challenge placed strong emphasis on school-based transformation, inclusion, and environmental education. The proposals focused on improving school spaces, such as playgrounds, gardens, classrooms, and charging stations. The projects were practical, community-oriented, and directly connected to the everyday needs of the school.

Croatia

The Croatian winning project focused on the wider local community. Instead of limiting the solution to the school environment, the Croatian team proposed solar energy applications for the city of Metković. Their ideas included solar-powered infrastructure, public awareness, workshops, and policy-related measures such as subsidies.

Romania

The Romanian challenge involved the largest number of teams among the uploaded local reports. It also included strong external technical input from energy sector representatives. The Romanian team demonstrated the ability to adapt after the original winning team withdrew, and the runner-up team successfully represented the school internationally. The Romanian project was ultimately selected as the best project in the international final.

Italy

The Italian winning project stood out for its technical creativity and hybrid energy approach. “The Piezopottery” combined piezoelectric energy generation with solar technology, showing a high level of multidisciplinary innovation. The project also integrated sustainability, design, and material reuse.

7. Educational Impact

The Solar Challenge created strong educational value across all participating schools. The uploaded local reports show that students developed both technical and transversal skills.

The main educational impacts included:

- Improved understanding of solar energy and renewable technologies.
- Practical application of mathematics, science, and engineering concepts.
- Development of teamwork and collaboration skills.
- Increased confidence in public speaking and project presentation.
- Stronger environmental awareness and climate responsibility.
- Better understanding of how local problems can be solved through innovation.
- Experience in working under deadlines and presenting to a jury.
- Increased motivation to participate in European and sustainability-related activities.

The challenge also helped teachers apply project-based learning in a practical and engaging way. It supported interdisciplinary teaching and encouraged cooperation between different subject areas.

8. Dissemination and Visibility

The Solar Challenges also contributed to the visibility of the #Solar4Future+ project at local, national, and European levels.

Examples of dissemination included:

- Local school competitions with students, teachers, and jury members.

- Presentations in front of school communities.
- Use of visual materials, posters, prototypes, and digital presentations.
- Dissemination of the Croatian winning project through the European Parliament Ambassador School programme.
- Sharing of Romanian project activities through school and social media channels.
- International presentation of finalist projects during the online final challenge.
- Announcement of final results during the Final Project Meeting in Türkiye.

These activities helped communicate the project's key messages about solar energy, youth innovation, and sustainability to a wider audience.

9. Key Achievements

The #Solar4Future+ Solar Challenge achieved several important results:

- Four partner schools successfully organized local Solar Challenges.
- Students from different age groups participated actively.
- The STEAM methodology was applied in real educational settings.
- Local juries evaluated projects using criteria related to innovation, sustainability, feasibility, teamwork, and presentation.
- Finalist teams were selected from Italy, Croatia, Romania, and Spain.
- The international online final was successfully held on 13 May 2026.
- The final jury included partners from Türkiye and Latvia.
- The Romanian team was selected as the best project based on jury voting.
- Students gained practical experience in sustainability, renewable energy, and public presentation.
- The activity strengthened the European dimension of the #Solar4Future+ project.

10. Challenges and Lessons Learned

The implementation of the Solar Challenge also provided several lessons for future activities.

10.1 Time Management

Some schools implemented the challenge within an intensive timeline. Despite this, students were able to follow the required steps and prepare strong projects. Future editions could benefit from a longer preparation period to allow deeper technical development and prototype testing.

10.2 Continuity and Substitution

The Romanian case showed the importance of having clear rules for finalist replacement. When the original winning team withdrew, the runner-up team was able to represent the school fairly and successfully. This demonstrated flexibility and good competition management.

10.3 Jury Diversity

The involvement of teachers, technical experts, engineers, and energy sector representatives strengthened the quality of evaluation. Future challenges should continue to include both pedagogical and technical expertise.

10.4 Prototype Development

Many teams created physical models, posters, or visual presentations. Future activities could further support students in developing functional prototypes, testing small solar devices, or using simple data measurement tools.

10.5 Dissemination

The Croatian example showed how local challenge results can be connected with other educational initiatives, such as the European Parliament Ambassador School programme. Future challenges should include a dissemination plan for each school.

11. Recommendations for Future Solar Challenges

Based on the uploaded local reports and the final international experience, the following recommendations are proposed:

1. Provide students with more preparation time before the local challenge.
2. Use a common evaluation rubric across all partner schools to ensure consistency.
3. Encourage teams to include basic technical calculations, such as estimated energy production, cost savings, and CO_2 reduction.
4. Support students in preparing simple but functional prototypes.
5. Include local energy experts, engineers, and sustainability professionals in the jury.
6. Organize a preparatory online session before the international final to help students improve their presentations.
7. Record the final international presentations for dissemination and reporting purposes.
8. Prepare a short booklet or digital gallery of all finalist projects.
9. Encourage schools to implement at least one small solar-related idea after the challenge.
10. Continue using the STEAM role structure, as it supports teamwork and balanced participation.

12. Conclusion

The #Solar4Future+ Solar Challenges successfully demonstrated how students can become active contributors to the energy transition when they are given the opportunity to explore real problems through creativity, science, technology, and teamwork.

Across Italy, Croatia, Romania, and Spain, students developed innovative ideas ranging from solar school gardens and inclusive solar playgrounds to city-level solar infrastructure, hybrid energy flooring, photovoltaic panels, and sustainable school solutions. The local challenges showed strong engagement from students and teachers, while the international final created a European platform for sharing ideas and recognizing excellence.

The Final International Online Solar Challenge, held on 13 May 2026, brought together the best finalist teams from each participating country. With jury members from Innovation and Digital Development Association in Türkiye and Riga Technical University in Latvia, the final stage ensured an international and professional evaluation process.

The announcement of the results during the Final Project Meeting in Türkiye marked an important milestone for the project. Based on jury voting, the Romanian team was selected as the best project of the #Solar4Future+ International Solar Challenge.

Overall, the Solar Challenge was a highly successful educational and dissemination activity. It strengthened students' STEAM skills, increased awareness of solar energy, promoted European cooperation, and empowered young people to think creatively about sustainable solutions for the future.

#Solar4Future+ showed that when students are encouraged to become innovators, they can generate meaningful ideas for cleaner, smarter, and more sustainable communities.