

# STEAM LEARNING ECOLOGIES

## Deliverable 5.3 Policy recommendations for STE(A)M education and connection to EU Research & Innovation



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## Table of contents

1. Introduction.....	5
2. Methodology .....	5
3. Links with D5.1 and D5.2 .....	6
4. Recommendations .....	7
THEME 1: Policy development and Systemic Alignment.....	7
THEME 2: Curriculum flexibility and Assessment reform .....	8
THEME 3: Teacher PD (Professional Development), recognition and empowerment.....	10
THEME 4: Multi-Stakeholder collaboration.....	12
THEME 5: Inclusion, gender equality, and diversity.....	13
THEME 6: Digital and Green Transition integration .....	14
THEME 7: Funding, Infrastructure, and Institutional support .....	15
THEME 8: Evaluation, Impact, and Sustainability .....	16
Leadership and Governance as cross-cutting enablers .....	18
5. Align SLEs recommendations with EU Research and Innovation	
18	
Map recommendations to Horizon Europe Missions and Clusters.....	18
Contribute to the European Research Area (ERA) and European Education Area (EEA) .....	19
Position Open Schooling and Living Labs as an R&I enabler.....	21
6. Conclusions and reflections.....	22
References .....	23





# 1. Introduction

The main aim of this deliverable is to provide a consolidated set of **policy recommendations for the systemic uptake of Open Schooling and STE(A)M Learning Ecologies (SLEs)** across Europe. Building on the evidence produced throughout the project, these recommendations translate the lessons learned from research, pilot/mature phase implementation, and stakeholder dialogues into concrete actions for policymakers at European, national, and regional levels. The deliverable aims to bridge the gap between practice and policy by identifying **the enabling conditions**, such as governance, teacher support, funding mechanisms, and evaluation framework, **that can sustain and scale up STE(A)M Open Schooling** beyond project boundaries. Ultimately, it aims to contribute to the broader European Education Area agenda of making education more open, inclusive, and connected to real-world challenges.

At the same time, the deliverable aims to demonstrate how the policy recommendations produced by the SLEs project connect to and bring added value to major EU research and innovation strategies and initiatives while offering solutions and ways forward to key issues and priorities.

# 2. Methodology

The policy recommendations presented in this report build on the collective learning and policy reflection that took place throughout the STE(A)M Learning Ecologies (SLEs) project. They are the result of a cumulative process that occurred across the project's timeline through research, policy analysis, stakeholder engagement, and validation with practitioners and policymakers.

At the heart of this process were the three SLEs Policy Briefs, which gradually shaped the project's understanding of what is needed to embed Open Schooling and STE(A)M Learning Ecologies into European and national education systems. The first Policy Brief<sup>1</sup> explored the policy landscape and identified the lack of systemic alignment between education, research, and innovation as a major obstacle to scaling up Open Schooling. The second Policy Brief<sup>2</sup> focused on teachers and schools, revealing that professional development, recognition, and institutional support are decisive factors for sustainability. The third Policy Brief turned attention to evaluation and impact, showing how evidence and monitoring can drive policy continuity beyond individual projects.

Taken together, these three briefs provided both the analytical foundation and the conceptual scaffolding for the recommendations that follow. Each drew on multiple forms of evidence i.e. literature reviews, policy mapping, and discussions with ministries, teacher educators, and school leaders, as well as lessons from the SLEs pilot and mature implementation phases. This combination of research and empirical insights ensured that the policy messages were grounded in both evidence and experience.

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<sup>1</sup> [https://www.steamecologies.eu/wp-content/uploads/2024/08/SLEs\\_1st-Policy-Brief\\_v.05\\_final-.pdf](https://www.steamecologies.eu/wp-content/uploads/2024/08/SLEs_1st-Policy-Brief_v.05_final-.pdf)

<sup>2</sup> [https://files.eun.org/scientix/SLEs\\_2nd-Policy-Brief\\_final.pdf](https://files.eun.org/scientix/SLEs_2nd-Policy-Brief_final.pdf)





To transform the findings from the policy briefs into coherent policy recommendations, the project partners focusing on policy aspects engaged in a process of synthesis and coherent consolidation. Across internal meetings, policy learning sessions, and various workshops, we analysed recurring policy issues and cross-cutting needs emerging from the briefs. The recommendations clearly stemmed from the analysis of both the good practices as well as the challenges as explained in D.5.1.

Similar ideas were grouped, compared, and refined until a set of interconnected themes began to emerge. These themes reflected both the structural levers of education policy such as governance, funding, curriculum, and teacher support and the transversal priorities shaping current European agendas, such as inclusion, the digital and green transitions, and evidence-informed policymaking.

Through this process, we identified eight core themes that together describe the key conditions for enabling Open Schooling and STE(A)M Learning Ecologies to flourish: policy development and systemic alignment; curriculum flexibility and assessment reform; teacher professional development and empowerment; multi-stakeholder collaboration; inclusion and diversity; digital and green transition integration; funding and institutional support; and evaluation and sustainability. Each theme was designed to represent a policy space where transformation can occur if coherent strategies and shared responsibilities are put in place.

The draft recommendations were then validated and refined through consultations with policy representatives and project partners. Inputs from these exchanges together with reflections from the SLEs consortium helped ensure that the final recommendations are realistic, relevant, and anchored in the policy contexts they aim to influence.

This methodological journey reflects the very spirit of Open Schooling: a process of co-creation, collaboration, and mutual learning. The recommendations presented here are therefore not a theoretical exercise, but a shared outcome of research, practice, and policy dialogue. They capture the project's collective understanding of what systemic change requires and how Europe's policy framework can move from isolated initiatives on education to a coherent framework supporting Open Schooling.

### 3. Links with D5.1 and D5.2

This deliverable (D5.3) builds directly on the evidence and insights generated through D5.1 and D5.2. While D5.1 mapped the policy context, emerging trends and strategic priorities relevant to STE(A)M Learning Ecologies, D5.2 captured the discussions, validation, and stakeholder perspectives gathered through the Policy Dialogue and Policy Learning Sessions. Together, these two deliverables form the analytical foundation for D5.3. The recommendations in D5.3 therefore synthesise:

- the policy developments and needs identified in D5.1, and
- the feedback, priorities, and real-world considerations emerging from stakeholders in D5.2.

In this way, D5.3 serves as the final step that translates both the contextual analysis and the participatory input into a coherent set of actionable policy recommendation for the mainstreaming of Open Schooling and the STE(A)M Learning Ecologies methodology.





## 4. Recommendations

The recommendations are structured around **eight interconnected themes** that reflect the main policy areas identified through the project's analytical and consultative work. Each theme captures an important dimension of systemic change, from governance and curriculum reform to inclusion, funding, and sustainability, and is accompanied by a set of targeted actions and an indicative mapping of the stakeholders responsible for driving them. Various stakeholders, operating at different levels are collectively or independently in a position to enable the implementation of these recommendations. The close collaboration of these actors is essential for fostering constructive exchanges among local-national-EU levels but also among different bodies and entities.

A selection of examples coming from the pilot countries accompanies each theme, showcasing SLEs' contributions to supporting the recommendations, and its potential as a Methodology to advance them further.

While these themes are presented separately, they are deeply interdependent. Progress in one area reinforces and enables progress in the others. The recommendations should therefore be understood not as isolated actions, but as part of an integrated strategy for transforming education into a more open, inclusive, and forward-looking ecosystem of learning.

Similarly, the examples provided aim to capture specific aspects and angles of complex projects.

### THEME 1: Policy development and Systemic Alignment

Open Schooling and STE(A)M Learning Ecologies can only thrive when supported by coherent policy frameworks connecting education, research, and innovation. Fragmented governance leads to temporary, project-based initiatives instead of long-term transformation.

#### Recommendations

1. **Develop national and regional Open Schooling strategies** aligning STE(A)M education with curriculum goals.
2. **Ensure cross-departmental coordination** between ministries (Education, Research, Environment, Labour, Digital, Culture) for policy coherence.
3. **Integrate Open Schooling and STE(A)M education** as formal elements in education reform roadmaps under the European Education Area (EEA) and European Research Area (ERA) frameworks.
4. **Promote joint EU–national working groups** (similar to existing Digital Education Hubs) for policy co-creation between Commission, ministries, and practitioner networks





5. **Adopt a shared European framework** or the “STE(A)M Learning Ecologies” methodology<sup>3</sup> defining main principles, stakeholder roles, and impact indicators that can serve as the starting point for actors interested in initiating Open Schooling activities.

#### Stakeholders involved

- **Strategic Lead:** European Commission (DG EAC, DG RTD), National Ministries of Education.
- **Support:** National science education agencies, regional authorities.
- **Enablers:** Research organisations, EU networks (Scientix, OStogether), NGOs.

#### Netherlands and Malta: promoting cross-departmental collaboration for STEM objectives

The Netherlands and Malta already demonstrate the value of cross-ministerial coordination. In the Netherlands, national STEM/STEAM strategies are shaped through collaboration between the Ministries of Education, Economic Affairs, and Social Affairs to meet the demand for technical skills in the labour market (Techniekpact<sup>4</sup>).

Malta’s education and innovation policies are co-developed by the Ministries for Education, Economy, Digital Affairs, and Environment. These models show how joint governance structures can ensure policy coherence and smoother implementation across sectors<sup>2</sup>.

<sup>1</sup> <https://www.cedefop.europa.eu/en/tools/matching-skills/all-instruments/pact-technical-sector>

<sup>2</sup> Government of Malta Ministry for Education, Sport, Youth, Research and Innovation. (2022). *Malta’s National Strategic Action Plan for Further and Higher Education*. [https://mfhea.mt/wp-content/uploads/2022/12/MFHEA-National-Strategic-Plan-2030\\_compressed-1.pdf](https://mfhea.mt/wp-content/uploads/2022/12/MFHEA-National-Strategic-Plan-2030_compressed-1.pdf)

## THEME 2: Curriculum flexibility and Assessment reform

The existing rigid curricula and standardised testing limit innovation and interdisciplinary collaboration. Allowing flexibility and alternative assessment forms makes Open Schooling part of the formal education system rather than an extracurricular activity.

#### Recommendations

1. **Introduce flexible curricula** that allow schools to allocate a part of learning time to interdisciplinary, project-based activities.
2. **Recognise Open Schooling projects formally**, as part of curriculum implementation and assessment.
3. **Recognise interdisciplinarity and support innovative /practical / experimental educational methods and pedagogical approaches** (e.g. living labs, design thinking, project-based learning) etc.

<sup>3</sup> [https://www.steamecologies.eu/wp-content/uploads/2025/11/D2.3\\_SLEs\\_Methodology\\_final\\_version.pdf](https://www.steamecologies.eu/wp-content/uploads/2025/11/D2.3_SLEs_Methodology_final_version.pdf)





3. **Promote learning products and student projects** (e.g. prototypes, exhibitions, campaigns) as valid outcomes demonstrating knowledge and competence development.
4. **Encourage thematic cross-curricular modules** addressing sustainability, digital literacy, or civic responsibility.
5. **Support curriculum experimentation** through pilot programs that can later be scaled up on national level.

**Support civic-oriented STE(A)M projects** linked to real-world societal issues. **Reform national assessment systems** to include collaborative, inquiry-based and creative activities.

#### Stakeholders involved

- **Strategic Lead:** Ministries of Education, national curriculum authorities.
- **Support:** School leaders, inspectorates, curriculum developers.
- **Enablers:** Teacher associations, researchers in education and assessment.

#### **Romania: encouraging cross-curricular modules and civic-oriented projects through school flexibility and dedicated week events.**

Romania's "curriculum la decizia scolii" (CDS, curriculum at the school's decision) gives each school the freedom to determine part of the curriculum, offering flexibility beyond mandatory subjects. Schools allocate certain hours to design their own curricular offerings, which may include additional subjects, modules, or projects tailored to the specific interests and needs of their students and local community.

The "Green Week" and "Școala Altfel" ("A Different Kind of School") are another example of national school programs enabling experiential and cross-curricular learning. Both last five consecutive days a year, replacing regular classes with special, flexible schedules. The Green Week is dedicated to environmental education, climate awareness, and sustainability through interdisciplinary and hands-on activities. Școala Altfel encourages activities aimed at developing life skills, creativity, social and civic responsibility, and teamwork, often through partnerships with NGOs, museums, and local organizations. Schools independently select when to hold each program.

All teachers implementing SLEs in Romania took advantage of either the CDS or the thematic weeks to develop their projects.





### Italy: introducing curriculum flexibility and contextualized learning through school-industry programs.

In Italy, curriculum experimentation was made possible by leveraging the PCTO (Pathways for Transversal Competences and Orientation), a mandatory **work-based learning program** for Italian high school students, which aims to **bridge academic knowledge and real-world employment skills** by integrating classroom education with practical experience in companies, organizations, or public bodies. The program is structured in phases, which allowed the development of several Italian SLEs: **orientation activities** to help students identify strengths, **integration with professional workshops** and company visits, and **specialization through internships or project work**. PCTO is devised to promote the development of transversal skills, introducing students to possible career paths, all core objectives of the SLEs Methodology.

## THEME 3: Teacher PD (Professional Development), recognition and empowerment

Teachers are the driving force of Open Schooling. However, lack of training, recognition, and time prevents them from engaging and using it systematically.

### Recommendations

1. **Create national/regional Continuous Professional Development (CPD) options** specifically addressing STE(A)M and Open Schooling pedagogies (co-creation, design-based learning, gender inclusion).
2. **Link teacher participation in Open Schooling to professional credits or promotion criteria**, making Open Schooling part of their career progression.
3. **Provide formal teacher recognition** for interdisciplinary, project-based initiatives.
4. **Encourage “learning by doing” models**, where teachers acquire competences by co-creating and testing SLEs with their students.
5. **Allocate dedicated time** within teaching hours for coordination and stakeholder engagement.
6. **Promote collaborative professional learning communities** and peer mentoring between schools and countries.
7. **Ensure leadership support within schools**, recognising teachers’ innovative practices and giving them autonomy for experimentation.

### Stakeholders involved

- **Strategic Lead:** Ministries of Education, national teacher training institutes.
- **Support:** School leadership teams, inspectorates.
- **Enablers:** Universities, pedagogical networks, EU platforms (eTwinning, Scientix).





### **Portugal: learning by doing through tailored CPD**

The Portuguese Science Centre “Ciencia Viva Algarve” translated the SLEs methodology into a 25-hour accredited Professional Development programme. In this model, teachers were first introduced to SLE’s Open Schooling, STE(A)M and Living Labs’ principles by the Science Centre’s experts, then spent a full week in the centre with their students. Working side by side with researchers, they co-designed and facilitated activities integrating inquiry, co-creation and experiential learning. Each teacher concluded the programme by implementing a final project activity that would demonstrate their mastery of active and project-based learning approaches.

This model showcased the potential of science centres to promote local, experiential teacher professional development, where learning happens together with students, and acquired practices can be experimented with and applied directly, under the supervision of subject and pedagogical experts who provide instant feedback.

### **Türkiye: professional learning communities by teachers for teachers**

The Turkish SLE “Innovation Bridge – future technologies on the trail of the past” provides a relevant example of fostering collaborative professional learning communities with the support of local authorities. Supported by the regional education authority, the SLE brought together 17 schools within the same district, engaging local industries and the municipality to co-design STE(A)M activities connecting historical heritage with emerging technologies. In doing so, the SLEs methodology was experimented with- and applied by several teachers in the region through one strategic pilot project.

Following the project’s success, the lead teacher developed a 20-hour professional development programme to share the SLE methodology with colleagues from other districts, extending its impact nationwide, and multiplying the possibility the project will be replicated in the future.





## THEME 4: Multi-Stakeholder collaboration

Open Schooling thrives on collaboration between formal and non-formal education, research, and industry. Yet most partnerships remain ad hoc and fragile.

### Recommendations

1. **Establish local or regional Open Schooling hubs** connecting schools, science centres, research organisations, and civic actors.
2. **Provide clear cooperation templates** (MoUs, partnership agreements) defining roles, expectations, and data management protocols.
3. **Fund coordination or the allocation of key roles** (e.g. “Open Schooling facilitators”) to maintain stakeholder engagement over time.
4. **Develop mechanisms for sustained collaboration** such as annual community science events or school–industry challenges.
5. **Encourage universities and companies** to integrate Open Schooling in their outreach and engagement strategies.
6. **Leverage EU networks, city alliances,** and local stakeholder networks to connect local ecosystems across borders.

### Stakeholders involved

- **Strategic Lead:** Ministries of Education (policy and funding), regional/municipal authorities.
- **Support:** Schools, science centres, research institutions, private sector.
- **Enablers:** NGOs, local community organisations, museums.

#### Malta: Sustaining collaboration through Community and Industry partnerships

In Malta, the Ministry of Education’s Directorate for STEM and VET Programmes (DSVP) leveraged its national collaboration networks to connect schools with local companies, universities, municipalities, NGOs, other directorates such as Gozo’s Environmental Directorate, and informal education providers. Thanks to its coordinating role, 10 SLEs were developed, each rooted in the local context, and often showcasing the latest innovations developed in research centres or by industries.

Beyond coordination, the Directorate ensured these partnerships outlived the pilots’ duration, many SLEs now being in their second or third iteration. To strengthen this ecosystem, the DSVP organised an annual national conference in November, gathering SLEs participants and new members of its network. The event served both as a celebration of students’ achievements in the projects, and as a means to catalyse interest in new collaborations.





## THEME 5: Inclusion, gender equality, and diversity

STE(A)M Learning Ecologies have shown strong potential for breaking gender stereotypes and promoting inclusive learning. However, policies and monitoring systems are still fragmented. For more information, you can refer to section 4.1 of Deliverable 5.1.

### Recommendations

1. **Integrate gender and inclusion goals** explicitly in national STE(A)M and digital strategies.
2. **Incorporate inclusive design and gender awareness** in teacher education and CPD.
3. **Support national mentorship and role model campaigns** highlighting women and diverse professionals in STE(A)M careers.
4. **Use Open Schooling projects to address local inequalities**, engaging disadvantaged schools and communities.
5. **Monitor participation data aggregated by gender, background, and ability**, ensuring equitable access to resources.
6. **Promote universal design principles** in educational materials and infrastructure to support learners with special needs.

### Stakeholders involved

- **Strategic Lead:** Ministries of Education and Equality, national gender equality bodies.
- **Support:** Teacher training institutions, women-in-STEM networks.
- **Enablers:** NGOs, EU equality agencies (EIGE), civil society groups.

#### Ireland: promoting gender equality and inclusion

SLEs adopted various strategies to promote women and girls' interest in STEM subjects and careers. These varied from the promotion of female role models to the design of hands-on activities connected to real-world challenges, to develop girls' motivation, confidence and sense of belonging in STEM disciplines. Gender-balanced teams and female leadership workshops were also adopted. Among the various examples, Irish SLE 'Neurons Behaving Badly', and Malta's 'Tween4STEAM' stood out for the attention reserved to inclusion.

The Irish SLE took place in a school serving English as a Second Language (ESL) students. With support from a scientist, the teacher adapted learning materials to the needs of ESL students across different school levels, and designed hands-on activities to raise awareness on Multiple Sclerosis, a condition with a higher incidence on Irish women. The topic's relevance, its alignment with curricular modules on the nervous system, and the accessibility of resources contributed to the project's success, drawing the interest of the entire school.





## THEME 6: Digital and Green Transition integration

SLEs link the green and digital transitions through experiential learning. When learners tackle local environmental or societal challenges, they gain transversal competences while actively contributing to Europe's future.

### Recommendations

1. **Embed GreenComp, DigComp and LifeComp\_frameworks** into national curricula and teacher training.
2. **Promote real-life sustainability projects** (biodiversity monitoring, food waste reduction, clean energy).
3. **Ensure equitable access to digital infrastructure and open tools** for schools in all regions.
4. **Encourage the responsible and ethical use of AI and data** within STE(A)M teaching and learning.
5. **Support partnerships with local authorities and green enterprises** to translate classroom projects into civic actions.
6. **Link SLEs outcomes to national sustainability and digital literacy targets.**

### Stakeholders involved

- **Strategic Lead:** Ministries of Education, Environment, and Digital Transformation.
- **Support:** Local authorities, innovation agencies, schools.
- **Enablers:** Private sector (tech and green companies), universities, NGOs.

### Serbia: Sustainable innovation

Serbia's SLE "Smart Recycling from plastic bottle to 3D printing" leveraged local partnerships to promote green innovation. With the help of the local landfill and an environmental NGO, students engineered a prototype turning plastic bottles into 3D printing filament, which was then used to produce recycled products. They then developed ideas to commercialize their products, as well as teaching materials on plastic recycling. This learning experience provides a valuable example on how to combine GreenComp, DigComp and LifeComp competences through engineering, coding, communication and entrepreneurship activities.





### Spain: Employing AI ethically to raise awareness for the UN's SDGs

In Spain, students learned the fundamentals of AI through a comparative use of available tools (ChatGPT, Gemini, Grok, LeonardoAI) to create public awareness videos around the UN's SDGs.

Stakeholders introduced learners – and teachers- to the importance of AI ethics and data protection, empowering them to use AI responsibly.

## THEME 7: Funding, Infrastructure, and Institutional support

Open Schooling initiatives often depend on temporary funding and voluntary commitment. Sustainable policy impact requires dedicated financial mechanisms and structural support.

### Recommendations

1. **Create dedicated Open Schooling funding schemes** within national budgets or recovery/resilience plans.
2. **Enable hybrid funding models**, combining public and private contributions.
3. **Integrate Open Schooling as an eligible cost category** in Erasmus+, Horizon Europe, and ESF+.
4. **Provide small grants for schools** to co-develop SLEs with community partners.
5. **Support infrastructure upgrades** (maker spaces, labs, green classrooms) linked to local SLE networks.
6. **Establish award or recognition systems** for innovative schools and educators implementing SLEs.

### Stakeholders involved

- **Strategic Lead:** European Commission (DG EAC, DG RTD, DG REGIO), National Ministries of Education and Finance.
- **Support:** Regional authorities, agencies managing structural funds.
- **Enablers:** Private sector, foundations, municipalities, schools.

### Serbia: leveraging maker labs to solve local challenges

In Serbia, schools that had a maker space at disposition, could use the resources available and combine them to external expertise from local research centres to conduct more complex laboratory analyses related to their challenge. In “The River is Not Just Water” SLE, learners investigated physical-chemical and microbiological characteristics of the water.





### Cyprus: Open Schooling and Blue Lights funding

In Cyprus, SLE “Microplastic Detection using Fluorescence” was awarded funding by the Horizon project ‘Blue Lights’ for its contribution to raising awareness on sea pollution through scientific analysis of samples (sea water, sand and ethically farmed shrimps) and the creation of a campaign to showcase results. The project demonstrated Open Schooling’s potential to support and enhance wider EU research projects and citizen science approaches supported by local networks of stakeholders, through smaller school funding.

## THEME 8: Evaluation, Impact, and Sustainability

Scaling up Open Schooling requires evidence of educational and social impact. Evaluation systems should go beyond traditional metrics to capture innovation, community value, and student agency.

### Recommendations

1. **Develop common European indicators** for assessing STE(A)M and Open Schooling impact.
2. **Support research** on the effects of Open Schooling on student skills, inclusion, and community engagement.
3. Promote peer networks at both EU and national level to support the sharing of good practices and upscaling of projects
4. Formalise coordination mechanisms to ensure consistency, reliability and transparency across educational systems and standards.
3. **Integrate evaluation frameworks** into national monitoring systems and inspection processes.
4. **Encourage schools to document and share their learning artefacts** as evidence of student outcomes.
5. **Create national or EU observatories** of Open Schooling practices, building on existing networks.
6. **Use impact evidence to inform policy cycles**, ensuring continuous learning and adaptation.

### Stakeholders involved

- **Strategic Lead:** European Commission (JRC, DG EAC), national evaluation and quality assurance agencies.
- **Support:** Ministries of Education, universities, research centres.
- **Enable:** Schools, teachers, students, and communities providing data and stories.





### **The European Higher Education Sector Observatory and lessons learned for an Open Schooling Observatory**

The European Higher Education Sector Observatory (EHESO) is a comprehensive EU data and information platform designed to provide policymakers with tools and resources to support evidence-based decision making on National Higher Education policies, and on the European Education Area agenda. It also contains useful tools for higher education institutions' leaders, students, and practitioners looking to exchange good practices and understand university profiles.

The Observatory's comprehensive nature, its variety of resources, catering to the needs of multiple stakeholders, and its potential for implementation in national strategic planning processes provide a valuable example to construct an Open Schooling Observatory.

### **SELFIE and lessons learned for the upcoming STEM/STE(A)M Competence Framework**

As the STEM/STE(A)M Competence Framework takes shape under the EU STEM Education Strategic Plan, valuable lessons can be learned from the SELFIE tool on scaling evaluation frameworks within education monitoring systems to inform systemic change.

By helping schools self-assess their digital capacity, the tool can provide valuable insights into the policy needs of educational institutions to build digital capacity at national and regional levels. Supported by several country ministries, such as Italy, Spain, Malta and Belgium, the tool's participatory design, its adaptability to local contexts and potential for integration into national strategies could inspire the development of evaluation frameworks to supplement and enrich the upcoming STEM/STE(A)M Competence Framework. Additionally, SLEs findings can inform the tool's focus on assessing not only STEM competences acquisition, but also learners' transversal skills, their interest in STEM, and the wider community engagement and its long-term impact on the local fabric of school-research-industry partnerships.





## Leadership and Governance as cross-cutting enablers

Across all previously mentioned themes, distributed leadership and collaborative governance are key elements.

- School leaders should be empowered and given the autonomy to create enabling conditions (time, space, partnerships).
- National policymakers should recognise and reward innovation leadership within education systems. Offer official recognition to leaders within external stakeholders e.g. initiators which are not within schools (e.g. non formal educators, researchers etc.)
- EU bodies can coordinate policy dialogue platforms to maintain coherence and momentum.

## 5. Align SLEs recommendations with EU Research and Innovation

Throughout this section we will explore how the policy recommendations presented in Section 4 can support and be supported by current EU Research & Innovation strategies.

### Map recommendations to Horizon Europe Missions and Clusters

The interdisciplinary, real-life based nature of STE(A)M education is directly aligned with the ambitions of Horizon Europe, particularly the five **Missions** (Climate adaptation, Cancer, Climate-neutral and smart cities, soil health, and healthy oceans). These Missions require strong societal engagement and collaboration across different sectors, which can evolve and advance through educational initiatives such as **Open Schooling** and project-based learning.

Relevant Horizon Europe **Clusters** that connect with STE(A)M policy goals include:

- Health
- Culture, Creativity and Inclusive Society
- Civil Security for Society
- Digital, Industry and Space
- Climate, Energy and Mobility
- Food, Bioeconomy, Natural Resources, Agriculture and Environment

Figure 1 below showcases the strong potential of Open Schooling and of the STE(A)M Learning Ecology Methodology to enable schools at all levels to contribute to Horizon Europe clusters. Indeed, the 109 SLEs implemented across Europe collectively addressed every cluster mentioned, ranging from healthy nutrition, physical activity, and Multiple Sclerosis studies (Health; Food and Environment), to STEM-Based theatre, local cultural heritage exploration, women's inclusion in STEM Careers, and students' civic engagement on societal challenges (Culture, Creativity and Inclusive Society).





Additional SLEs focussed on developing digital solutions for public administrations, designing space missions, and building AI competences (Digital, Industry, and Space), as well as creating green city innovations such as solar-powered model vehicles and recycled-material model cities (Climate, Energy and Mobility). The map below provides an overview of topics tackled by SLEs across Europe, clearly showcasing the connection with the Horizon Clusters above. Each pilot often covered multiple themes and should be explored individually to identify further connections. A comprehensive analysis of the themes of the 109 SLEs can be found in D4.2.

Overall, this diversity in themes showcases the capacity of SLEs, with its focus on Open Schooling and STE(A)M, to foster a co-creation environment that strengthens local partnerships, provides promising community dissemination channels, and contributes to creating a pipeline for the development of the future workforce needed to tackle these complex challenges. For Horizon projects in these Clusters, connecting with- and fostering Open Schooling initiatives represents therefore a strategic opportunity to design and test research and innovation within communities with real needs, enhancing their societal relevance and increasing the visibility of project outcomes. These connections would also address Europe’s challenge of cultivating a STEM skilled workforce in strategic economic fields.



Figure 1 SLEs in numbers

## Contribute to the European Research Area (ERA) and European Education Area (EEA)

The policy recommendations presented in this deliverable are closely aligned with the European Union’s long-term vision for a **European Education Area (EEA)** and a **European Research Area (ERA)**, two complementary frameworks driving Europe’s transition towards a knowledge-based, inclusive, and innovative society. Both policy visions emphasise collaboration, openness, and the creation of synergies between education, research, and innovation.

Within the **European Education Area**, the SLEs project directly supports the vision of high-quality, inclusive, and forward-looking education systems. By promoting Open Schooling and STE(A)M Learning Ecologies, the project contributes to building bridges between schools, communities, and research institutions, thereby strengthening the EEA’s core priorities.





Key areas of alignment include:

- **Quality and innovation in education:** SLEs promotes innovative, learner-centred pedagogies such as inquiry-based and project-based learning, fully in line with EEA objectives to modernise education systems and improve teaching quality.
- **Teacher professional development and recognition:** The project's focus on targeted CPD, peer learning, and professional recognition responds to EEA actions supporting teachers as key enablers of transformation.
- **Equity, inclusion, and gender equality:** SLEs actively engages diverse learners and promotes inclusive practices, supporting EEA efforts to make education fair, accessible, and reflective of Europe's social diversity.
- **Digital and green competences:** By connecting Open Schooling to the green and digital transitions, SLEs reinforces EEA initiatives such as the *Digital Education Action Plan* and *Education for Environmental Sustainability*.
- **Cross-sector and cross-border cooperation:** The project's partnerships between schools, research institutions, enterprises, and local actors advance the EEA priority of building stronger European and international cooperation in education.
- **Recognition of non-formal and informal learning:** SLEs contributes to EEA goals of validating learning beyond the classroom by recognising community-based and experiential learning as meaningful educational outcomes.

These alignments demonstrate how Open Schooling can become a concrete mechanism for achieving the EEA's strategic goal of making learning more connected, inclusive, and relevant to real-world challenges.

In parallel, the **European Research Area (ERA)** provides a complementary policy framework for building a unified and open European research and innovation ecosystem. The SLEs approach directly contributes to several key ERA objectives.

In February 2025, the European Commission adopted the *ERA Policy Agenda 2025–2027*<sup>4</sup>, introducing a series of structural policies and thematic actions highly relevant to STE(A)M education. Among them:

- **Open science:** Encouraging the adoption of open and collaborative research practices. Embedding open science principles into STE(A)M learning helps cultivate transparency, critical inquiry, and shared knowledge creation among students and teachers.
- **Research infrastructures:** Expanding access to scientific infrastructures and laboratories enriches STE(A)M learning experiences, linking classrooms to cutting-edge research and innovation environments.
- **Knowledge valorisation:** Boosting the process of converting research outcomes into real-world innovations and solutions.

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<sup>4</sup> <https://european-research-area.ec.europa.eu/era-policy-agenda-2025-2027>





- **Research careers and talent development:** Promoting attractive research careers and mobility across Europe aligns with SLEs' objective to inspire young people to pursue scientific and research-oriented pathways.
- **Artificial Intelligence in Science:** The ERA's focus on AI and data literacy is mirrored in SLEs' call for responsible and ethical use of digital tools in education, preparing students for the technological landscape of the future.
- **Research security and ethics:** ERA's emphasis on ethical research practices is reflected in SLEs' promotion of responsible science education that integrates societal, ethical, and environmental considerations.
- **Science for policy:** ERA's goal of bridging science and policymaking resonates with the SLEs approach of engaging learners in community-based projects that connect scientific inquiry to societal decision-making.

Aligning STE(A)M education with these ERA priorities enables:

- **Enhanced synergy:** Stronger collaboration between education, research, and innovation sectors, creating a seamless continuum from schools to research institutions.
- **Promotion of inclusivity:** Reinforcing gender equality and diverse participation in research and innovation careers.
- **Strengthened innovation ecosystems:** Positioning schools as active contributors within local and regional innovation ecosystems that address Europe's social and environmental challenges.

The SLEs project demonstrates how Open Schooling can act as a bridge between these two European policy visions, turning schools into dynamic hubs of innovation, participation, and societal engagement. This alignment reinforces Europe's collective capacity to cultivate creative, critical, and responsible citizens ready to shape the future of science, technology, and society.

## Position Open Schooling and Living Labs as an R&I enabler

Following the alignment with the European Education Area (EEA) and the European Research Area (ERA), Open Schooling also plays a strategic role in advancing the broader **European Research and Innovation (R&I) agenda**. It acts as a powerful enabler for innovation ecosystems by connecting schools, research institutions, businesses, and communities in shared experimentation spaces, the so-called living labs (see D2.3).

Through these ecosystems, learning becomes a collaborative and participatory process where multiple actors co-design, test, and adapt solutions to real-world challenges. Schools evolve into **local innovation hubs**, while learners, teachers, researchers, and community stakeholders all engage in learning. This approach embodies the principles of open innovation, co-creation, and citizen science promoted across EU R&I policies.

Projects such as **STE(A)M Learning Ecologies (SLEs)**, **The SEER (STEAM Education European Roadmap)**, **RoadSTEAMer**, and **Make it Open** have demonstrated the transformative potential of this model. Together, they show that Open Schooling and living lab approaches contribute to:





- **Real-life problem solving aligned with regional, national, and European R&I priorities**, enabling schools to work on authentic societal and environmental challenges.
- **Local and regional impact through school–community partnerships**, enhancing citizens' engagement in science and reinforcing the social relevance of research.
- **Increased interest in science and research careers**, as students experience science not as abstract theory but as a tool for improving their communities.

Recognising Open Schooling as an integral part of **regional innovation ecosystems** can open new funding and policy synergies across education, research, and development programmes. It can, for instance, connect **education reforms** with **Smart Specialisation Strategies (S3)**, **European Regional Development Funds (ERDF)**, or **Horizon Europe Missions** that focus on local innovation and sustainability.

Positioning schools as living laboratories for innovation thus supports Europe's transition goals, green and digital, while reinforcing the cultural and civic dimensions of science education. Open Schooling can therefore be seen not only as a pedagogical innovation, but as an **R&I enabler** that strengthens Europe's capacity for inclusive, responsible, and place-based innovation.

## 6. Conclusions and reflections

The policy recommendations presented in this deliverable present the key conditions for embedding Open Schooling and STE(A)M Learning Ecologies into education systems in a sustainable way. The eight themes and the transversal role of leadership and governance show that change cannot be materialised by isolated projects or individual actors alone. It requires coherent and multilevel strategies that connect curriculum, assessment, teacher professional development, funding, infrastructure, evaluation, and multi-stakeholder collaboration within a shared vision for more open, inclusive, and future-oriented education.

At the same time, the alignment with the European Education Area, the European Research Area and Horizon Europe confirm that SLEs is not operating in isolation but strongly contributes to wider EU ambitions for a knowledge-based and innovation-driven society.

Finally, these recommendations should be seen as a starting point for ongoing dialogue. Their implementation will depend on their adaptation of different national contexts, continued investment in capacity building, and systematic monitoring of impact. Future work should deepen the evidence base on the long-term effects of Open Schooling, explore how to integrate SLEs into mainstream policy instruments, and keep strengthening the research–policy–practice interface. In this way, the legacy of SLEs can support European and national actors in moving from promising pilots to a more coherent, systemic approach to open STE(A)M education.





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