D5.3
Report on the identified interventions and actions

Funding scheme	EU-H2020-Grean Deal, H2020-LC-GD-2020-3		
Project	ECF4CLIM, European Competence Framework for a Low Carbon Economy and Sustainability through Education		
Project number	101036505		
Project Coordinator	CIEMAT, Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas		
Start Date of the Project	01.10.2021	Duration of project	48 months
Contributing WP	WP5		
Tasks	5.1: Behavioural Interventions (individual /organisational) to modify practices, routines, habits, and social norms concerning climate change and sustainability in education 5.2: Structural/Environmental Interventions (energy, water, green procurement, green spaces, transport, indoor air quality, waste)		
Dissemination Level	Public		
Due date	2025 June 30th		
Submission date	2025 July 30th		
Responsible partner	University of Seville (USE)		
Contributing organisations	CIEMAT, IST, JYU, UAB, MedaResearch, QUE		
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Version	1.0		

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036505

WHO WE ARE

The ECF consortium consists of ten partners. The project is coordinated by Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas-CIEMAT.

Name	Country	Logo
Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas – CIEMAT	ES	
Instituto Superior Técnico. University of Lisbon. IST	PT	
Universidad de Sevilla USE	ES	
University of Jyväskylä JYU	FI	
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Entilia Entilia	PT	
Que Technologies Kefalaiouchiki Etaireia QUE	GR	

ABOUT THE PROJECT

Through a multidisciplinary, transdisciplinary and participatory process, ECF4CLIM develops, tests and validates a European Competence Framework (ECF) for transformational change, which will empower the educational community to take action against climate change and towards sustainable development.

Applying a novel hybrid participatory approach, rooted in participatory action research and citizen science, ECF4CLIM co-designs the ECF in selected schools and universities, by: 1) elaborating an initial ECF, supported by crowdsourcing of ideas and analysis of existing ECFs; 2) establishing the baseline of individual and collective competences, as well as environmental performance indicators; 3) implementing practical, replicable and context adapted technical, behavioural, and organisational interventions that foster the acquisition of competences; 4) evaluating the ability of the interventions to strengthen sustainability competences and environmental performance; and 5) validating the ECF.

The proposed ECF is unique in that it encompasses the interacting STEM-related, digital and social competences, and systematically explores individual, organisational and institutional factors that enable or constrain the desired change. The novel hybrid participatory approach provides the broad educational community with: an ECF adaptable to a range of settings; new ways of collaboration between public, private and third-sector bodies; and innovative organisational models of engagement and action for sustainability (Sustainability Competence Teams and Committees).

To encourage learning-by-doing, several novel tools will be co-designed with and made available to citizens, including a digital platform for crowdsourcing, IoT solutions for real-time monitoring of selected parameters, and a digital learning space. Participation of various SMEs in the consortium maximises the broad adoption and applicability of the ECF for the required transformational change towards sustainability.

LEGAL NOTICE

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1. EXECUTIVE SUMMARY

Deliverable 5.3 falls within Work Package 5 (WP5) of the project, which is dedicated to interventions. It directly addresses the tasks within WP5: Task 5.1, focusing on "Behavioural Interventions (individual/organisational) to modify practices, routines, habits, and social norms concerning climate change and sustainability in education," and Task 5.2, dealing with "Structural/Environmental Interventions (energy, water, green procurement, green spaces, transport, indoor air quality, waste)." The University of Seville (USE) is the responsible partner for this deliverable, with contributions from other project organizations including CIEMAT, IST, JYU, UAB, Meda Research and QUE.

It presents a selection of targeted interventions implemented at 13 schools and universities from four EU countries (our Demonstration Sites) to foster sustainability competences. These interventions were co-designed, co-implemented and co-evaluated through our innovative hybrid participatory process, involving Sustainability Competence Teams (SCTs) and Committees (SCCs) along three school terms. Each intervention is also linked to the various dimensions of the ECF4CLIM Roadmap, as detailed in D3.3.

More precisely, D5.3 presents the 22 interventions that were selected as showcases by our demonstration sites in close collaboration with the research team. The criteria for selecting the interventions are:

- Impact on the educational community
- Replicability
- Wide coverage of the 4 dimensions in the ECF4CLIM roadmap ngagement, Connections, Change, Action)
- Wide coverage of the 3 spheres in the ECF4CLIM Analytical Framework (individual, collective and technical-material competences)

CAll of them have already been implemented and evaluated at our demonstration sites with the support of a variety of methods and tools.

The selected interventions address a wide variety of sustainability related topcis, ranging from energy consumption, water, food, installation of solar panels and water sensors, second-hand clothing markets, or better canteen food through vegetarian options or the sale of surplus food. Also, community gardens and green spaces were created with the participation of students, and university courses and modules dedicated to ecological transition and climate justice were launched. Regarding waste management, weekly flag systems were used and there were competitions between classes to encourage recycling, combining gamification with environmental awareness. Other interventions were specifically focus on awareness campaigns, escape room games, and the use of digital tools, like WhatsApp groups, to reinforce communication. Educational talks and campaigns tackled themes such as fast fashion, cycling, plant-based diets, and nature-based activities, often supported by student-created materials and school-managed social media accounts. New curricular units were introduced as well to strengthen interdisciplinary learning, while dedicated teaching materials and cross-cutting

learning spaces were designed to explore sustainability from diverse academic angles. Finally, hands-on educational visits enabled students to connect with local environmental issues, reinforcing their sense of responsibility through direct experience outside the classroom.

As outlined in D5.2, monitoring these interventions involved various methods and tools, such as the Sustainability Competence Team and Committee meetings, the intervention templates, and a monthly reporting procedure. This reflective, iterative and systematic follow-up approach enabled a deeper understanding of the practicalities of the different interventions, including their goals, tasks, milestones, outputs as well as the associated challenges and opportunities.

This report aims to provide other educational communities with a set of practical experiences to help them develop their own sustainability competences This practical guide demonstrates how to replicate some of the flagship interventions of the ECF4CLIM project.

2. AIMS

The purpose of this document is to generate a practical guide that can be useful for replicating the sustainability interventions developed by the ECF4CLIM project in other educational centres.

The educational communities of the demonstration sites involved in the project engaged in a participatory process through iterative discussion meetings, where all educational community had the opportunity to analyse, propose, and identify areas for improvement even during the implementation of interventions.

The participatory-deliberative methodology relies on the Sustainability Competence Teams and Committees (SCTs and SCCs) meetings. A a total of six SCT and SCC meetings, in which the educational community had the opportunity, to monitor and further understand the relationships between the interventions and ECF4CLIM Roadmap.

A thorough information-gathering process was carried out during this period to obtain clear evidence of the development and improvement of the intended sustainability competences through each intervention.

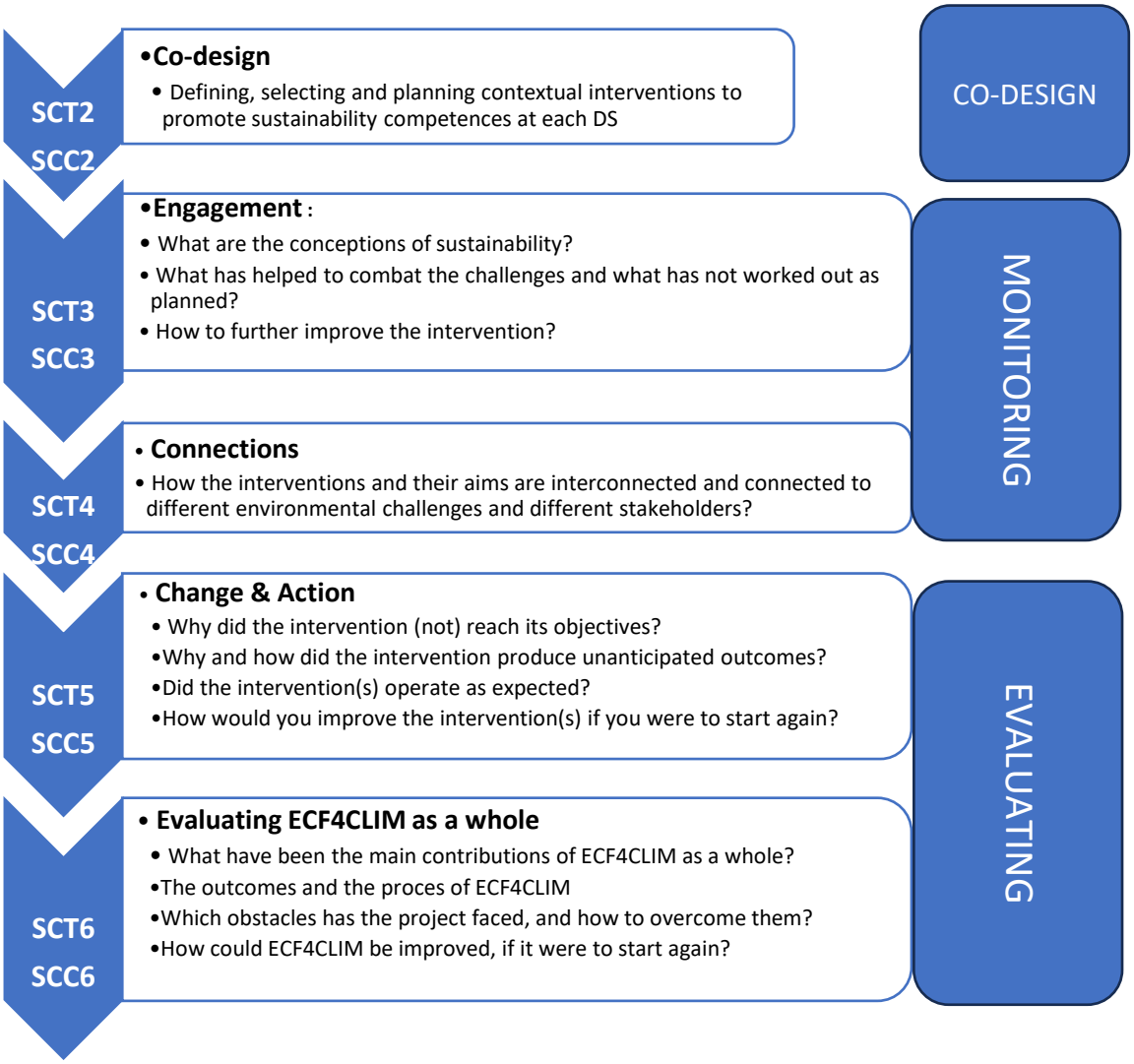
Through the document, an explanation on how the participatory process has accompanied the interventions from their design to their final evaluation (from co-design in SCT/SCC2, through monitoring in SCT/SCC3 and 4, to evaluation in SCT/SCC 5 and 6) is presented. Following, a general overview of the interventions' tipology selected is presented. Finally, this report provides a more in-depth analysis of the highlighted interventions, based on a standardised structure. It outlines the scope, aims and relevant difficulties that arose during implementation, and how sustainable competences were developed through these interventions.

3. CONTEXT AND METHOD

3.1 Context

Following the co-design of sustainability interventions in SCT2 and SCC2, the demonstration sites began planning and implementing the agreed interventions. This process often resulted in design changes or adjustments to objectives, based on experience gained during implementation. The 'learning by doing' approach often necessitated adapting the interventions to the institution's capabilities, with the ultimate goal of improving and developing sustainability competencies.

The comprehensive, participatory process was integral to the ECF4CLIM project and guided the interventions from their initial design in SCT/SCC2 through to monitoring in SCT/SCC3 and 4 and finally their evaluation in SCT/SCC5 and 6. This adaptation process had a significant impact on the educational community and, consequently, on the effectiveness of the interventions.



Once the implementation was over, the demonstration sites were asked to provide a more in-depth report on the intervention they considered to be the most significant.

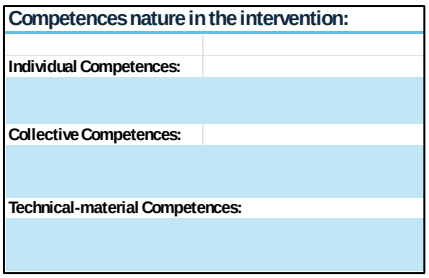
3.2 Intervention Selection Criteria

1. To select the most notable intervention in each school, members of the research team and representatives from the schools/universities involved in the working groups at each demonstration site were invited to consider the following criteria:**High Impact**: Those interventions that left a greater mark on the educational community.
2. **High Replicability**: Considering resources/cost needed as well.
3. Involving as many steps of the **ECF4CLIM Roadmap** as possible (Engagement, Connections, Change, Action)
4. Involving as many areas of the **ECF4CLIM analytical framework** as possible (Individual competences, Collective competences, Technical-material competences).

3.3 Method for reporting evidence on the selected interventions

0A **template** was designed and distributed among the partners to collect further information on the selected interventions, as follows:

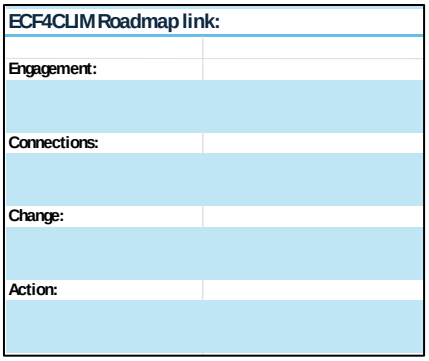
A. Analysis on ECF4CLIM Analytical Framework



These fields are focused on specifying what types of sustainable competencess were promoted by the intervention. This information is mainly obtained from:

- SCT3/SCC3, SCT4/SCC4 and SCT5/SCC5 (reports and short surveys).
- Reports, short surveys and deliberative workshops on the specific intervention.
- Individual interviews and SCT6 (if comments regarding the selected interventions arose).

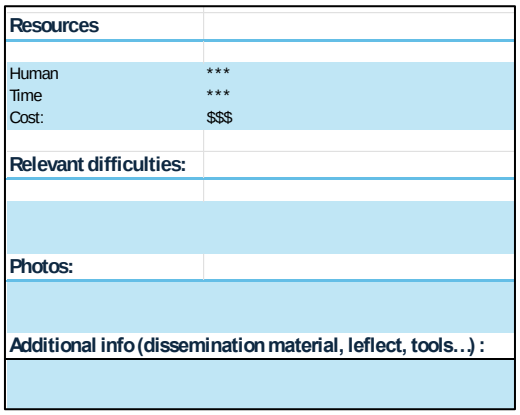
B. Validation of the ECF4CLIM initial Roadmap



- Engagement:
  - SCT3/SCC3 (reports and short surveys).
  - Reports, short surveys and deliberative workshops on the specific intervention.
  - Individual interviews and SCT6 (if comments regarding the selected interventions arose)

- Connections:
    - SCT4/SCC4 (reports and short surveys).
    - Reports, short surveys and deliberative workshops on the specific intervention
    - Individual interviews and SCT6 (if comments regarding the selected interventions arose)
- Change & Action
    - Individual interviews and SCT6 (if comments regarding the selected interventions arose).
    - Reports, short surveys and deliberative workshops on the specific intervention.

C. Other information



Resources	
Human	***
Time	***
Cost:	$$$
Relevant difficulties:	
Photos:	
Additional info (dissemination material, leflect, tools…) :	

In these final sections, relevant information is required in order to understand practicalities for replication.

- Resources:
    - Participants:
        - (*): Fewer than 5 people per day.
        - (**): Between 5 to 10 people per day.
        - (***): More than 10 people per day.
    - Time:
        - (*): Less than 1 week.
        - (**): Between 1 and 4 weeks.
        - (***): More than 1 month.
    - Economic:
        - ($): Less than 100€.
        - ($$): Between 100€ and 1000€.
        - ($$$): More than 1000€.

- Relevant difficulties. The research teams in collaboration with the DS were invited to reflect on the critical factors that can lead to the failure of the intervention. Evidence from interviews and SCT6 provides the relevant data for this point.

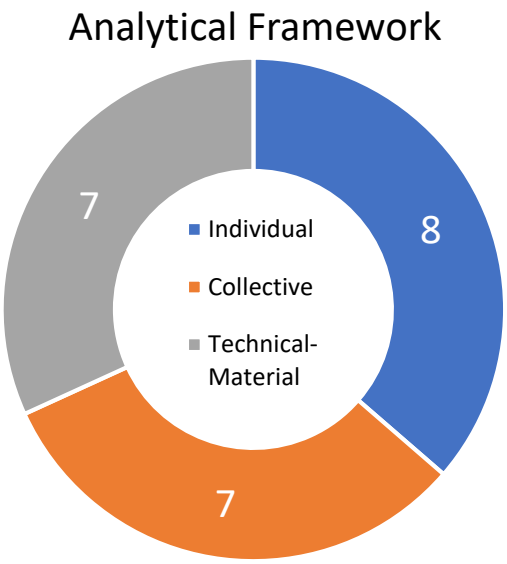
- Photos, linksand additional information, in order to complete the whole description of the intervention

The involvement of the school communities in the interventions could be illustrated by some figures.A total of **430** members of our educational communities participated in the design, monitoring, and evaluation of the 22 selected interventions, spread across the 13 demonstration sites. The profiles of the participants covered all actors within an educational community, not limited to the participation of students and teachers, but also involving school principals, administrative staff, cleaning services (and others), family members, and even external agents.

4. OUTLINE OF THE SELECTED INTERVENTIONS

This report details **22 interventions** chosen as showcases among the 61 interventions implemented at our **13 demonstration sites**. Some interventions shared similar objectives, and others addressed vastly different areas or competencies

- Analysis of the selected interventions vs main Analytical Framework sphere



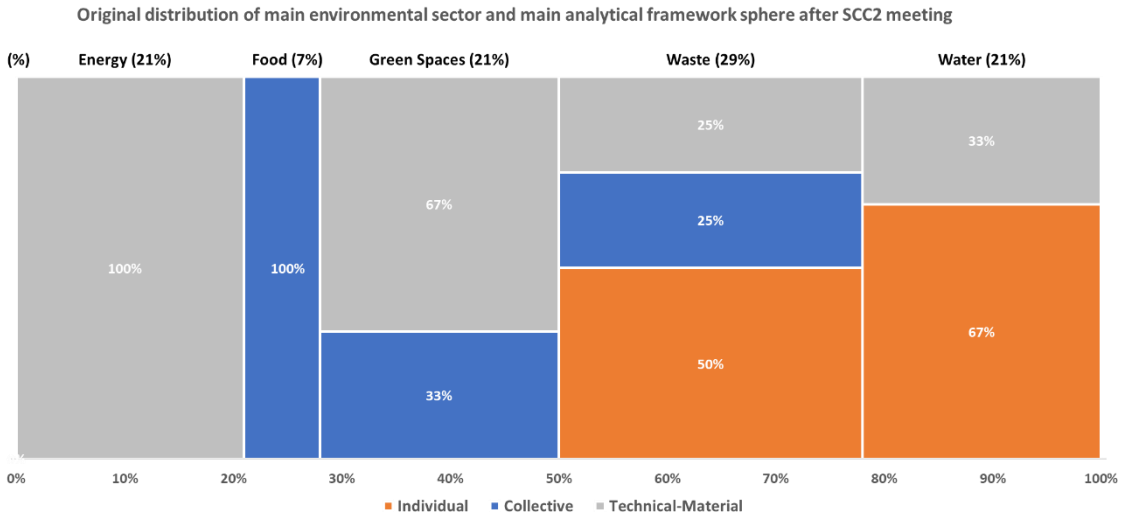
The interventions **balanced the development of individual, collective, and technical-material competencies**.

★ To illustrate the kind of interventions designed to develop individual competences, we can mention SP-DS02-IN03, which focused on raising awareness of carbon footprints and water footprints through the exchange of T-shirts. PT-DS01-IN02 promoted environmental responsibility and awareness with activities outside the classroom related to caring for a section of river. FN-DS02-IN06 promoted the visibility of sustainability and climate action through student sustainability teams.

★ In the case of interventions focused on developing collective competences, SP-DS01-IN09 developed a flag system for evaluating and monitoring waste separation and cleaning tasks in classrooms, as well as creating an environmental department at the centre. Development of courses for technical faculties, such as RM-DS04-IN02, promoting commitment by encouraging students to reflect on their values and roles when addressing sustainability in their professional and personal lives. In FN-DS03-IN02, students' multidisciplinary understanding of sustainability challenges and solutions was reinforced through the creation of a study module. PT-DS03-IN01 consisted of the creation of a curriculum unit focused on the climate crisis and just transition, integrating scientific, ethical, political and practical perspectives.

★ Interventions focusing on echnical-material competences included the design of green space revegetation projects together with the planting of new trees in schools (SP-DS03-IN03 or SP-DS01-IN01), the implementation of renewable electricity installation technologies to achieve more sustainable electricity consumption, electricity consumption monitoring (RM-DS01-IN01; RM-DS02-IN01) or the improvement of equipment to reduce water consumption (RM-DS03-IN01).

The following diagram illustrates the sphere of the analytical framework in which the interventions were intended to develop following the design process. However, as mentioned above, the 22 selected interventions eventually developed individual, collective and technical-material competences in one way or another through the intervention.



The following diagram shows the sphere of the analytical framework that interventions intended to develop and the environmental area they intended to improve

- ((Water Sensors) Infrastructure improvement - water sensors at the sanitary facilities): On the desig this intervention intended to develop sustainable competences as a consecuence of a improvement of infraestructures (technical-material competences). Using sinks with motion sensors was clearly and infrastructural improvement. The implementation process gave rise to develop communication and learning activities, increasing awareness about the importance of water conservation. Also, the created educational materials helped to integrate sustainability topics across different disciplines, and applying project-based teaching methodology *"working together on the project created deeper, more lasting learning outcomes than traditional, individual-focused lessons"*. Finally students gained *"concrete knowledge about environmental protection"* and improved *"communication and expression skills".*
- (Second hand T-shirt market): Was originally designed to enhance individual competences, though a second hand clothes market, highliting not only economical savings, but also the environmental benefit in terms of carbon and water footprint. However, this intervention also achieved an improvement in technical and material competences, by generating concrete *"positive environmental impacts"* on the school (saving 33319g of CO_2 and 58606L of water). Considering collective competencies, executing this *Second-hand T-shirt market* promoted a sustainability culture and fostered ed links with the outside world. Notably, this interventions postulates to be repeated in successive years. The intervention helped to understand the links between environmental challenges and consumption patterns, providing practical knowledge on how to reduce environmental impact, and reflecting on the value of reuse and sharing.
- (Revegetation. Measuring the impact of shading projected by trees): In origin, this intervention aims to improve technical-material competences throught a revegetation plan. This process included quantification of *"the potential energy savings",* the identification of *"the most effective trees in generating shade"*, and a workshop with students where the selected species were planted. The implementation of the intervention was thought to be done with high grade students through research projects, allowing them them to propose actuation areas of the schoolyard, the tree species, their quantity, and assessing the quantity of CO_2 sequestrated. The research projects were supported and supervised by researchers. After closing the proposal, there was a workshop in which students planted trees in designated areas.The practical implementation of this intervention promoted

individual competences in "*environmental impact measurement, data analysis"* and *"tree selection factors"*. Also collective competences were worked as a consequence of this form of execution, fostering and promoting a culture in the school where students "*participate in creating and maintaining green spaces"*. The successive years after the execution of the interventions, students keeped developing research project to address other vegetation issues.

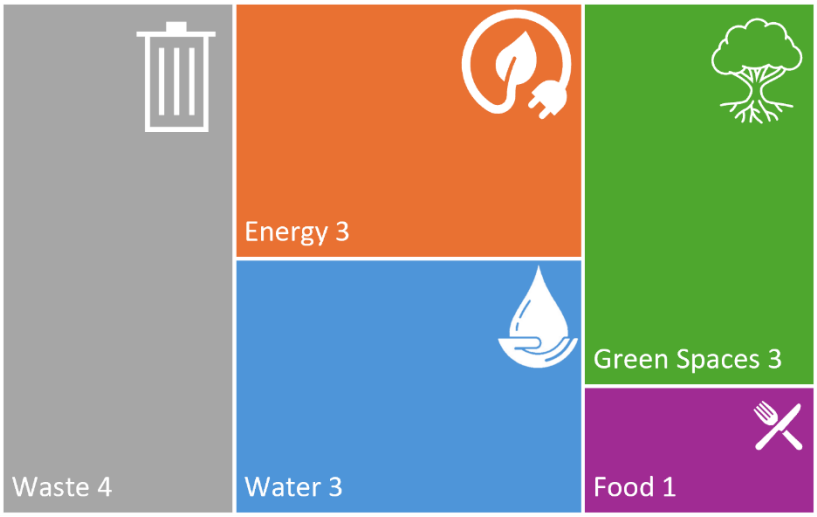
- (FOOD): Its design aimed to develop habits to generate knowledge and awareness about nutrition and sustainable food, enabling waste-free days for the entire school. During the implementation the intervention led to the development of collective and technical-material competences though the *"Collective understanding of the amount of leftover food on different days and with different dishes, inclusion of new practice in everyday school life, holding of meetings", "improving dissemination tools, and measuring and monitoring the amount of wasted food".*

Fourteen of the selected interventions directly targeted transformations within a specific environmental sector. The remaining eight interventions took a more cross-cutting approach, focusing on developing sustainability competencies through conferences, talks, educational materials, or the creation of new courses. These two distinct categories were used for classification.

- Analysis of the selected interventions vs main Environmental area

Among the interventions directly dealing with sustainability areas (water, waste, food, green spaces, transport, indoor air quality and energy), those related to waste, energy, green spaces and water stood out in several demonstration sites. These types of interventions were developed in schools with lower educational levels (primary/secondary).

Next we illustrate the types of interventions in different environmental areas.



- Waste
  - SP-DS01-IN08: promoted proper separation and recycling of waste through the creation of environmental coordinators and the establishment of an environmental department. A flag system was used to monitor the weekly performance of all classes in the school.

    - SP-DS03-IN06: The evolution of waste generated at the Faculty of Political Science and Sociology was monitored in order to make its volume and typologies visible, with the aim of generating a reflection on the environmental impacts of the Faculty and on how to manage them. Also this intervention contributed to the replacement of the current waste garbage cans by selective collection points.
    - PT-DS01-IN09 & PT-DS02-IN10: A competition was organized to encourage students to separate wastes correctly. Eco-bags were distributed to classes to monitor the waste generated.
- Energy:
    - SP-DS01-IN01: A revegetation plan was implemented at the center through research projects carried out by groups of students. The impact of shading on the school's facade was studied in terms of reducing its carbon footprint and energy demand for air conditioning.
    - RM-DS01-IN01 & RM-DS02-IN01: installing solar panels on the school's roof to generate electricity. An interface was installed to connect the school's electrical network to the public grid..
- Water:
    - SP-DS02-IN03: Organise a local market within the school community for the exchange of good-condition T-shirts. During the market, the CO2 and water savings associated with the second-hand use of the exchanged garments were calculated , raising awareness and promoting sustainable values.
    - PT-DS01-IN02: Students took care of a designated section of the Trancão River, carrying out environmental clean-ups, water analysis, topographic surveys, and artistic representations of ther river surroundings, foster environmental responsibility and awareness among students.
    - RM-DS03-IN01: Replacement of the traditional water sinks with sensor equipped models in all schools sanitary facilities. The intervention included targered communication, learning activities, and educational materials, developed to aware of the importance of water conservation.
- Green Spaces:
    - SP-DS02-IN07: The intervention included a planting session with formation in the schoolyard where children did themselves the tasks necessary for planting. After this, there was a visit to a nursery where the seedlings were produced. Students were able to learn about plant cares, understand vegetation's environmental significance while their actions promote microclimate regulation and sustainability in urban areas.
    - PT-DS02-IN03: This intervention reactivated the biological garden (knowed as "Quinta do Charco"), promoted the engagement and involvement of students, teachers, families and externals. Activities included space diagnosis, collaborative sessions with architects from IST, group reflections on sustainability, and co-design of a multifunctional garden, integrating sustainability on school life and community.
    - PT-DS03-IN07: The intervention enhanced the visibility and impact of sustainability through a physical space dedicated for community engagement, serving as a hub for sharing sustainability-related information, carring out activities, and fostering interdisciplinarity collaboration. The implementation included all the design process of this new space, and is waiting to begin the construction.
- Food.

FN-DS02-IN02: Aimed to improve the sustainability and quality of canteen's food, specially enhancing vegetarian. Also, measuring the amount of Biowaste and include the possibility to buy the leftover food from kitchen at the end of the day were actions that fostered positive sustainable actitudes.

- Analysis of the selected interventions not focused on an specific environmental area

These interventions directly focus on developing educational materials and resources through talks, visits, new educational programmes (PT-DS03-IN01; INTERVENTION WITH SUSTAINABILITY TRANSITIONS -MODULE), new teaching materials (Facilitate transversal learning spaces; Development of educational materials for sustainability), etc.,

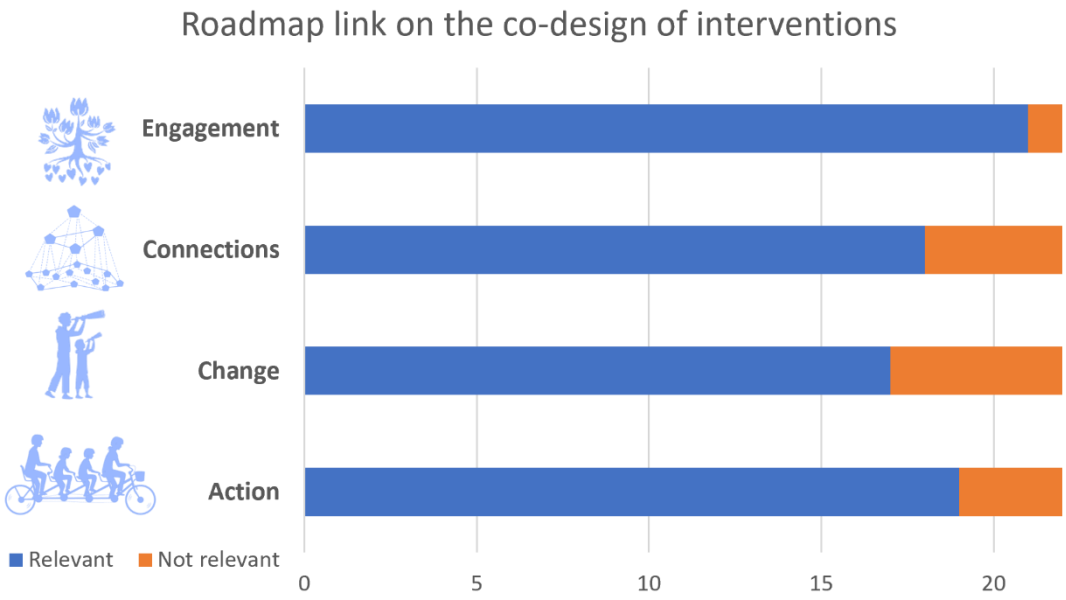
- Educational projects:
  - PT-DS03-IN06: Through this intervention an specific space was designed to be a hub for sharing sustainability-related information, organising activities, or fostering interdisciplinarity collaboration.
  - FN-DS01-IN02:. Discussions, WhatsApp groups for the recycling market, escape room games and organising visits to a school pioneering sustainability education for teachers were all activities that helped to integrate sustainability into the culture of the whole school.FN-DS02-IN06: The intervention included the creation of a sustainability team, development of different activities such as awareness raising campaigns, visits, and excursions. The team was accompanied by a time, place, and resources structure.
- Educational talks
- FN-DS01-IN03: Four campaigns were created to raise awareness of sustainability and encourage students to get involved, including informational slides, an awareness campaign about fast fashion, promoting cycling, encouraging vegetarianism and organising outdoor activities. This included training on how to raise awareness, as well as supporting the dissemination of information through the creation of an Instagram account to manage sustainable competitions..

- FN-DS03-IN01: Through this intervention, seminars and workshops were conducted, teaching materials were created, and a new sustainability curriculum was developed, identifying several improvements to the previous curricula.
- New subjects/courses:
    - PT-DS03-IN01: This new curricular unit is focused on the climate crisis and fair transition, integrating scientific, ethical, political, and practical perspectives. The intervention addresses the need to empower critically understanding of climate challenges, fostering habilities to imagine, debate, and co-create systemic solutions. This new course aims to build both knowledge and action-oriented competences.
    - FN-DS03-IN02: A new 15 ECTs study module centered to strength students' multidisciplinarity understanding of sustainability-related challenges and solutions. This intervention develops competences on tecnhnological innovation, societal governance, and cultural behaviours.
- Teaching materials:
    - SP-DS03-IN07: This intervention developed training courses on the ecosocial crisis, designed on a transversal teaching space. This new space allows for dealing with issues related to sustainability, from a social science perspective, and activities to collect and analyse data from the campus, to be debated and interpreted in accordance with the contents of the course.
    - RM-DS04-IN02: A course "Sustainable Development in a Technological Society", was developed from this intervention. It consists in eight modules reviewed with students and teachers during the hybrid participatory approach. This pilot course steps towards integrating environmental and social responsibility into higher education through these new teaching documentation generated.
- Educational visits (PT-DS01-IN02): This intervention aimed to raise students concienceness and awarenes, fostering environmental responsibility through hands-on activities outside the classroom.

➢ Analysis of the selected interventions vs the Roadmap

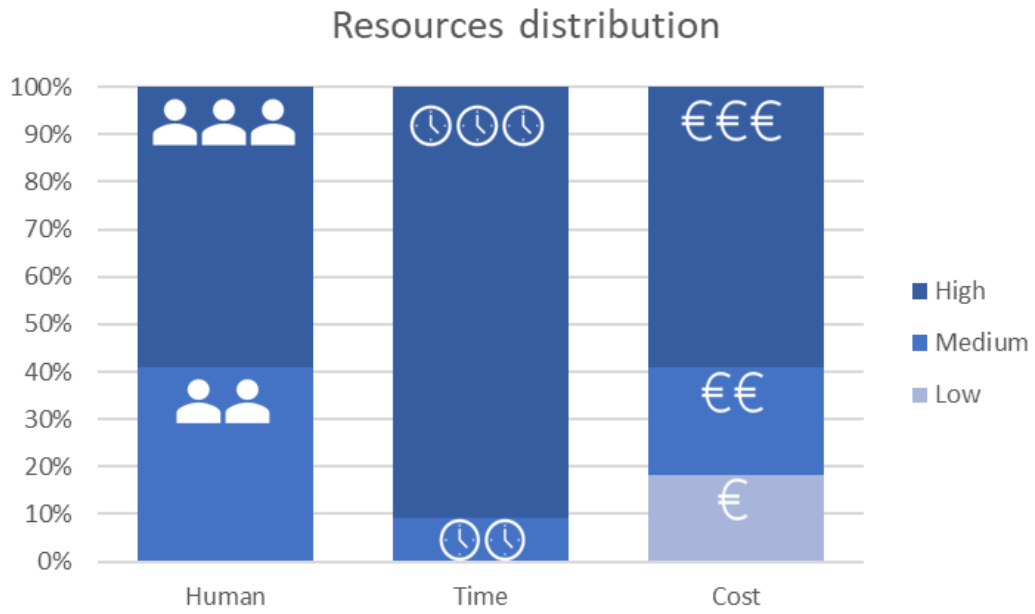
In the intervention co-design process, sustainability compentece teams and committees reflected on the areas of the roadmap to which each intervention would contribute (information available in D.5.1). From the outset, it was clear that the steps in the roadmap were interwoven, as noted in D.3.3. As the figure below shows, from the design stage onwards, all demonstration sites indicated that the interventions designed would relate to

several or all of the steps.



- Analysis of the selected interventions vs Resources needed

Regarding resources needed (human resource, Time, Cost) the selected interventions are distributed as shown in figure below:



Where in therms of resources:

- (👤) means that the intervention need less than 5 people per day, (👥) interventions requires between five and ten people per day, and in (👥👤) interventions, more than 10 people per day are needed.

- In (🕓) interventions the time need to execution is less than one week, (🕓🕓) interventions needs between one and four weeks, and interventions with (🕓🕓🕓) needs more than one month to finalise.
- (€) means costs lower than 100€, (€€) costs between 100€ and 1000€, and (€€€) requires costs exceeding 1000€.

On the one hand, it can be seen that the implementation period for the selected interventions has never been less than one week and, in 90% of cases, is usually longer than one month. On the other hand, the number of people required depends on the intervention in question, but in all cases, a minimum of five people per day has been required (with varying levels of dedication depending on the type of intervention) throughout the development and implementation process. Finally, in relation to the cost of the interventions, there is a varied distribution, which changes depending on the resources available at the center and mainly on the intervention to be carried out (it does not cost the same to take a group on a visit to the river, as in PT-DS01-IN02, as it does to design and build a new photovoltaic installation, as in RM-DS01-IN01). These prices range from less than €100 to more than €1,000. Most of the noteworthy interventions have incurred high costs, either due to the need to invest in facilities or as a result of the high demand for human resources and time.

➢ Relevant difficulties arose during implementation:

During the planning phase, several difficulties that could hinder the proper implementation of the interventions were anticipated. Furthermore, the process of learning by doing involves unforeseen events emerging, which, when approached correctly, provide useful information for the future replication of the interventions. After analysing the selected interventions, the most relevant difficulties encountered are listed below:

⊙ Motivation and commitment
- ⚠ Maintaining the motivation of students, teachers, and coordinators over time, especially in interventions where immediate results are not obtained, has been a challenge.
- ⚠ Initially, in some interventions, student motivation was achieved by offering rewards, but it has since been difficult to maintain motivation by raising environmental awareness.
- ⚠ Commitment is easily achieved in small groups, but it is not usually easy to extend this commitment to larger groups or to the entire educational community.
- ⚠ New volunteer courses tend to attract students who are already motivated and aware of the issues.

⊙ Logistics, coordination, time management and work overload
- ⚠ Resistance to change, overloading the routine with more obligations than necessary, has also been a problem.
- ⚠ The school day is already usually saturated with activities. Visits or other types of activities have usually required time outside of school hours, posing a problem in family logistics and responsibility management (in the case of levels below university).

- ⚠ Communication with external agents and parents for planning has been complicated, hindering the smooth preparation of events.
- ⚠ Coordination between departments at universities has also been a challenge, due to the usual workload and lack of time.

⊙ Lack of resources:

- ⚠ Mainly the lack of availability of staff, students, teachers, and other agents who have participated in the interventions has been a problem that has hindered the progress of the interventions, extending them over time.
- ⚠ Shortage of spaces for activities or facilities. This has been both a problem and an opportunity, given that some interventions have been dedicated to creating new spaces that allow the development of different activities related to sustainability.
- ⚠ Long-term continuity. This concern arose during the implementation and evaluation meetings of the interventions, as maintaining the momentum of the initiatives over time is not an easy task, especially if there is staff turnover (particularly teachers), in addition to the arrival of new students each year, which gives teachers the feeling that they have to start from scratch to cultivate sustainable awareness. On the other hand, planning efforts are required for maintenance tasks and to designate specific people to be responsible for these tasks in the long term for the survival of the new spaces and facilities.
- ⚠ Curricular integration. Creating new curricula or modifying existing ones is a challenge that requires a great deal of time and people to develop study plans that adequately integrate sustainability into the educational requirements of each region without overburdening teaching.
- ⚠ Technical resources. Many interventions (especially those focused on implementing new facilities) have required knowledge that may not be available to the personnel dedicated to their execution, requiring the collaboration of universities or external companies.

⊙ Expectations. This is a fundamental element in achieving greater impact.

- ⚠ It is necessary to raise awareness that small actions are necessary to achieve significant change.
- ⚠ It is difficult to assess whether interventions produce long-term behavioral change, especially when it is not possible to follow up with the same group of students over several years.

5. IDENTIFIED INTERVENTIONS

This section lists the interventions **selected based on the criteria described previously**. For each intervention an **Intervention Summary Sheet is provided**. They will also be available on the ECF4CLIM website and as a resource for guiding school improvements within Sustainability Intevention Tool

The selected interventions were the following:

Spain

SITE 1: SP-DS01. IES ITACA

Intervention identifier	*Name/short description*
SP-DS01-IN01	Revegetation. Measuring the impact of shading projected by trees
SP-DS01-IN09	Waste recicling

Table 1.- List of proposed/selected measures SP-DS01.

SITE 2: SP-DS02. CEIP MOZART

Intervention identifier	*Name/short description*
SP-DS02-IN03	Second hand T-shirt market
SP-DS02-IN07	Planting trees in the school

Table 2.- List of proposed/selected measures SP-DS02.

SITE 3 DS-SP03. UNIVERSITAT AUTÒNOMA DE BARCELONA

Intervention identifier	*Name/short description*
SP-DS03-IN06	Improve the waste system management at Faculty level.
SP-DS03-IN07	Facilitate transversal learning spaces.

Table 3.- List of proposed/selected measures SP-DS03.

Portugal

SITE 4: PT-DS01. EB BOBADELA

Intervention identifier	*Name/short description*
PT-DS01-IN02	Taking care of a river section
PT-DS01-IN09	Competition to promote an efficient waste separation

Table 4.- List of proposed/selected measures PT-DS01.

SITE 5: PT-DS02. EB CAMARATE

Intervention identifier	Name/short description
PT-DS02-IN03	Reactivate the school's biological garden.
PT-DS02-IN10	Competition to promote an efficient waste separation

Table 5.- List of proposed/selected measures PT-DS02.

SITE 6: PT-DS03. INSTITUTO SUPERIOR TÉCNICO

Intervention identifier	Name/short description
PT-DS03-IN01	Climate Crisis and Fair Transition
PT-DS03-IN07	Communication and community involvement

Table 6.- List of proposed/selected measures PT-DS03.

Romania

SITE 7: RM-DS01. SCHOOL NICOLAE BALCESCU

Intervention identifier	Name/short description
RM-DS01-IN01	Intervention 13 (Solar panels) Installation of solar panels for electricity(Solar panels) Installation of solar panels for electricity

Table 7.- List of proposed/selected measures RM-DS01.

SITE 8: RM-DS02. SERCAIA SCHOOL

Intervention identifier	Name/short description
RM-DS02-IN01	(Solar panels) Installation of solar panels for electricity production

Table 8.- List of proposed/selected measures RM-DS02.

SITE 9: RM-DS03. IULIA ZAMFIRESCU HIGH SCHOOL

Intervention identifier	Name/short description
RM-DS03-IN01	(Water Sensors) Infrastructure improvement - water sensors at the sanitary facilities

Table 9.- List of proposed/selected measures RM-DS03.

SITE 10: RM-DS04. UNIVERSITY OF PITESTI

Intervention identifier	Name/short description
RM-DS04-IN02	Development of educational materials for sustainability

Table 10.- List of proposed/selected measures RM-DS04.

Finland

SITE 11: FN-DS01. JUHANNUSKYLÄ KOULU

Intervention identifier	Name/short description
FN-DS01-IN02	Fostering positive attitudes within the teachers and whole school personnel towards sustainability education
FN-DS01-IN03	Attitude: Engaging students and the whole school through awareness raising and positive behaviour campaign

Table 11.- List of proposed/selected measures FN-DS01.

SITE 12: FN-DS02. SAMKE UPPER SECONDARY SCHOOL

Intervention identifier	Name/short description
FN-DS02-IN02	FOOD
FN-DS02-IN06	ENGAGEMENT OF STUDENTS: ESTABLISHING A STUDENT TEAM

Table 12.- List of proposed/selected measures FN-DS02.

SITE 13: FN-DS03. UNIVERSITY OF JYVÄSKYLÄ

Intervention identifier	Name/short description
FN-DS03-IN01	DISCUSSIONS AND COACHING ON SUSTAINABILITY AND CURRICULA DEVELOPMENT WITH TEACHERS AND STUDENTS
FN-DS03-IN02	INTERVENTION WITH SUSTAINABILITY TRANSITIONS -MODULE

Table 13.- List of proposed/selected measures FN-DS03.

Some of these selected interventions participated in a video competition held during the last General Assembly meeting in Tampere (Finland). The following table shows the links to the videos of the participants interventioins:

Intervention identifier	Link to video
FN-DS01-IN03	https://www.youtube.com/watch?v=hWou33XI07Q https://www.youtube.com/watch?v=K0aCSNuLVQM
SP-DS02-IN03	https://www.youtube.com/watch?v=gjqX9k2QOFo&t=3s
RM-DS01-IN01	https://www.youtube.com/watch?v=RHaLCdpl9zU
RM-DS02-IN01	https://www.youtube.com/watch?v=Q57FkwuAA0E
FN-DS02-IN06	https://www.youtube.com/watch?v=v-vr2ziXusw
RM-DS03-IN01	https://www.youtube.com/watch?v=tgoByWjMgNM&t=1s

SP-DS01-IN08 *SP-DS01-IN01*	https://drive.google.com/file/d/1BO0x4BixRp4v6-16jNJJpkjSL9WF9_DW/view
FN-DS03-IN01	https://www.youtube.com/watch?v=WpyT_9YmL-4
RM-DS04-IN02	https://www.youtube.com/watch?v=G6kXXwEevww

Table 14.- Videos presented of some of the selected interventions.

These videos particularly reflect the positive impact that the development of the interventions has had at the demonstration sites, where some of the participants have been able to explain what the interventions consist of and how they have been implemented.

In the next pages the summary sheet corresponding to each of the selected intervention are shown.

SP-DS01-IN01

REVEGETATION. MEASURING THE IMPACT OF SHADING PROJECTED BY TREES

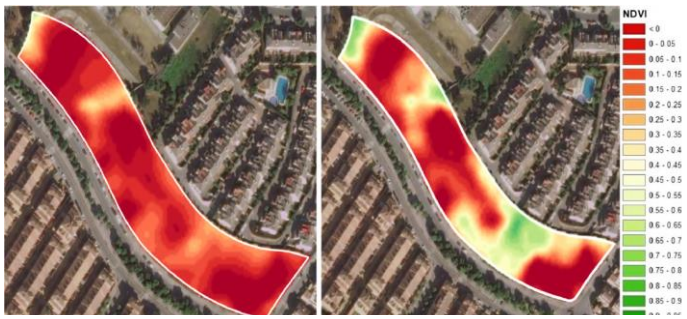
Secondary and High school

Resources

Human	👥
Time	🕒🕒
Costs	€€€

Although initially design for measuring the impact of shading projected by trees, the intervention progress to a more general revegetation and green area topic.

The intervention included measuring the impact of the shade cast by trees on a school facade that can be an important aspect, especially in locations with a warm climate. To priorities sustainability and energy efficiency, understanding the impact of surrounding vegetation on the building's energy demand is a crucial aspect of responsible resource management. At the same time it presents an opportunity for revegetation on the schoolyard. This increase of shade can reduce the need for cooling, saving economic resources and reducing the school's carbon footprint.



As a result of this intervention, the research team responsible for supporting its implementation was able to publish a research article, showing the process followed and the effects of the intervention, measuring parameters such as the normalised difference vegetation index. https://digibug.ugr.es/handle/10481/101964

Relevant difficulties

- The possibility of finding areas where the planted trees do not grow properly, due to a lack of care during the first year, or possible bad practices of the company during the replanting of the species.
- Difficulties in finding a company ready to carry out the planting process by conducting a training session with the students.
- Find a moment during the school year to pause your usual activities for a day and carry out this revegetation session. This session can be held in the afternoon so as not to interfere with classes, but it requires extra organisation, parental authorisation to return to school in the afternoon, which can be a logistical problem for many families.

Individual Competences	Collective Competences	Technical-material Competences
✓ To understand the influence of good shade management on reducing school cooling demand.	✓ The intervention exceeded expectations by not only enhancing students' understanding of the importance of urban trees but also by encouraging their active participation in creating and maintaining green spaces. This has fostered a stronger environmental awareness and sense of school ownership.	✓ Technically, the project requires access to tools for monitoring (such as temperature sensors) and scientific information about tree species best suited to local climate conditions.
✓ Identify the most effective trees in generating shade and their strategic location.	✓ Create a regular reporting system for sustainable shade management on campus.	✓ If possible, support from experts in bioclimatic architecture and urban design is an asset to integrating these elements into the built environment, maximising shading and cooling benefits.
✓ Develops students' skills in environmental impact measurement, data analysis, and understanding the role of trees in reducing heat and energy demand.	✓ Establish guidelines for tree maintenance and pruning based on their impact on shade.	✓ Quantify the potential energy savings by minimising the need for cooling.
✓ Development of knowledge about tree selection factors, combining environmental, technical and economic aspects.		✓ To improve thermal comfort on campus, contributing to a more sustainable and pleasant learning environment.

Sustainability competences in place in the intervention

Engagement

- People's engagement has been driven by the hands-on student-led nature of the project, which connects learning to real-world environmental challenges. The potential to reduce energy costs and greenhouse gas emissions, along with collaboration with experts, has further sparked interest within the school community.
- Help students grasp the long-term benefits of tree shade and its impact on reducing indoor temperatures. Ensuring consistent involvement and balancing the project with other school activities has also been a challenge.
- Organise research groups in advanced secondary school courses. Allowing students to make proposals about tree species and their location is a factor that helps to engage students, as they appreciate that their proposals are listened to and implemented by the school.
- Repeat annually the measurement of shadings projected by trees to present to the educational community the importance of green spaces.
- Teachers are expected to be fully commited and needs environmental consultancy company predisposition and organisation. This type of activity is common in schools in the region, so at the planning level, the organisation of the visit is relatively simple.

  Through active student engagement in planting and caring for trees, leading to increased awareness of their benefits. As students measure the effects of shade on temperature, they will develop a deeper understanding of environmental issues. This knowledge can inspire advocacy for more green initiatives within the school and community, fostering a culture of sustainability that extends beyond the project.

Connections

- Relevant issues include local climate change impacts and community attitudes toward green spaces. Key actors not controlled by our organisation are local government agencies, environmental organisations, and the school community. Activities like citywide tree planting initiatives and public awareness campaigns also influence our intervention.
- The development of this intervention requires cooperation with external stakeholders, the school administration (to support and coordinate the revegetation project).
- Regarding students and the educational community, it is important to select a group of students to participate in the planting process, and to develop proper dissemination campaigns to communicate results and to transmit how to care for and protect these new spaces.
- Cooperation with external stakeholders aims to align goals and share resources through participating in collaborative workshops.

  Integrate the research project into the regular curriculum, emphasising the immediate effects of tree shade on comfort and energy savings. Hands-on workshops with experts and the use of interactive tools, like temperature sensors, have also helped students engage and understand the project's impact. The participation in the Young With Research program improves students' engagement by following up on proposals throughout the course.

Change

- The realisation of a revegetation project not only requires the process of planting the trees. This intervention emphasises the importance of all the previous work related to analysing the available spaces, proximity to the school facade, and possible effects on the envelope. This previous work is the key to developing competencies in students to envision future scenarios about impact, the resources needed to execute them, and the possible issues during execution.
- To find a solution that maximises CO_2 sequestration impact, is not too expensive, in keeping with the other green spaces on the premises, and that is made up of tree species compatible with the climate and conditions of the area, are relevant aspects to design and formalise a proposal.

  Engaging students in discussions about the benefits of increased shade has helped us envision the expected impact. Collaborative workshops with researchers have provided insights into long-term effects, while sharing success stories from similar projects has inspired our vision and motivated support for sustainable practices in our school environment.

Action

- The sessions ultimately took place both at the Architecture School in Seville and at the school where planting was conducted, achieving even better outcomes than expected. This dual-location approach enhanced engagement, with students and teachers showing greater involvement and enthusiasm despite initial challenges with schedules and resources.
- Several factors have helped us achieve our goals, including strong collaboration with the school administration and support from researchers who provided expertise. Good relationships with the school community have fostered enthusiasm and participation, while remote sensing tools have facilitated simulation and decision-making. Engaging students through hands-on activities has promoted ownership of the project, and effective communication of its benefits has generated broader support.
- Regarding the planting, it is necessary to find a time when students do not have exams nearby so that students can focus on the development of the session. This could be either at the beginning of the course or after the term of their exams.

SP-DS01-IN09

WASTE RECYCLING

Secondary and High school

Resources

Human	
Time	
Costs	€

Awareness of selective garbage collection, especially in the schoolyard, by promoting the proper use of waste bins and waste separation. This measure not only contributes to the reduction of waste sent to landfills but also can educate students about environmental responsibility and the positive impact they can have through simple everyday actions.

AUDITORÍA AMBIENTAL. 0-6: Mal 7-8-9: Mejorar 10-11: Bien

AULA	TOTAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1º A	130	10	9	9	7	6	9	9	9	10	9	8	9	9	9	8
1º B	130	8	8	9	8	8	9	9	8	8	7	10	9	9	10	10
1º C	136	8	9	8	7	7	10	8	9	9	10	10	10	10	11	10
1º D	130	10	7	10	9	9	9	9	9	7	10	7	9	9	8	8
2º A	149	10	10	8	10	10	10	11	11	11	11	8	9	10	9	11
2º B	139	8	9	9	9	8	9	10	11	9	9	10	10	10	9	9
2º C	138	6	7	10	9	9	9	11	9	11	10	9	10	8	11	9
2º D	133	7	9	10	11	9	10	8	9	8	9	8	9	8	9	9
3º A	149	10	10	9	10	10	10	11	10	11	10	9	11	9	11	8
3º B	122	8	9	7	7	9	9	7	9	9	7	8	10	8	8	10
3º C	131	8	10	10	8	10	9	9	7	9	8	9	8	10	8	8
3º D	126	8	5	8	10	7	9	7	9	10	8	10	7	11	9	8
4º A	123	8	9	8	8	8	10	9	7	8	9	8	9	7	7	8
4º B	137	7	8	9	10	11	9	9	10	7	10	10	8	9	10	10
4º C	145	10	9	11	9	10	10	8	11	7	9	9	11	11	9	11
4º D	142	8	7	9	11	10	11	9	10	7	11	10	9	11	9	10
4º E	152	11	10	10	9	11	11	8	9	9	11	11	11	11	11	9
1º BA	118	7	9	7	9	6	9	8	6	9	9	7	7	9	9	7
1º BB	132	8	7	8	11	8	11	10	8	9	8	10	8	10	8	8
1º BC	141	6	9	8	10	9	11	10	8	10	11	9	9	11	11	9
2º BA	125	7	10	8	5	9	10	7	7	7	8	6	9	10	11	11
2º BB	126	7	9	8	7	7	9	7	8	7	8	7	9	11	11	11

Weekly reports for monitoring and dissemination on each class performance is a key element to achieve success, improve cleanliness and to strength environmental commitment, at the same time that generates good habits.

Relevant difficulties

- Pupils' engagement. This intervention must involve all students of different ages to work well.
- Lack of motivation of environmental coordinators. The duration of this intervention is the whole school year, so classroom coordinators can be tired in some school year stages, neglecting their functions.
- Functions neglect of the sustainable development department's head.
- Loss of motivation among an entire class after receiving poor scores for several weeks in a row. If a course that struggles to separate correctly loses the chance to compete for the prize, it loses interest in participating. To address this, several sustainable competition committees proposed the inclusion of penalties if two consecutive weeks of red flags are issued. This modification was added and helped maintain a minimum level in the objectives set by the head of the environmental department.

Individual Competences	Collective Competences	Technical-material Competences
✓ Development of pupils' awareness of the selective waste collection. ✓ Promote the proper use of litter bins in the school playground. ✓ To educate pupils about the correct separation of different types of waste and its impact on the environment. ✓ Improve student motivation to work collectively for a prolonged period of time to achieve a common goal. Adding a prize at the end of the course for the class with the highest final score has been an incentive that has been taken into account since the beginning of the intervention.	✓ Regulations regarding waste management, selection of environmental coordinators and environmental department functions. Additionally, a clear strategy for waste management has been formalised, including the establishment of internal regulations and detailed procedures for weekly audits. ✓ The head of the environmental department scores each class performance in several tasks regarding cleanliness and classroom order, setting a colour flag depending on the mean of all tasks. The scores are uploaded weekly, and all students receive an email with a report that contains the results of all grades. ✓ Increase of comunication between differents school employees (professors and cleaning staff mainly). The cleaning staff collab in the process of evaluate each group.	✓ Reduce the amount of non-recyclable waste sent to landfills. ✓ Change the kind of litters and bins used in the school to separate waste. ✓ Change of cleaning company. The new one has adapted to the separation system proposed, replacing the type of rubbish collection carts they use.

Sustainability competences in place in the intervention

Engagement

- Students start to participate more strongly in this kind of intervention after activities/visits like those done on the SP-DS01-IN09 intervention.
- In some classrooms of the lowest educational levels (11-12 years), there seems to be a big disparity between engaged students and pupils who do not want to participate in this waste management intervention. On higher levels, students may argue that they do not have enough time to worry about these issues.
- The best incentive found to engage students was to propose an excursion for the class that best suited during the year.
- Also, to engage classrooms' coordinators, the proposal is to make them participate in all environmental interventions, excursions or local actions.

Connections

- An award to the best class in waste management helps the desire of students to participate for a while, but pupils need to see that their effort serves to achieve a major purpose, so as not to depend on this kind of incentive to act towards sustainability. To build this relationship, the environmental coordinators have quarterly meetings to monitor the performance of each class, and the environmental knowledge developed across subjects helps to make this connection.
- Greater willingness on the part of the cleaning company.

Change

- The intervention generated a durable and structural impact on the educational community. The implementation of this flag system aims to promote a change in attitude throughout the school year. On the other hand, during the course, the aim is to work on individual initiative skills, although the development of collective skills is also emphasised, both through the implementation of the regulations and the need to make a joint effort to maintain an acceptable level of waste separation throughout the course.
- The motivation is provided initially by the proposed reward, encouraging the group to promote waste separation and keep the classroom clean. Over time, the aim is to develop a habit in the students, whereby the reward becomes less important and the correct separation of waste the caring for the common good, and the respect for cleanliness becomes more important.

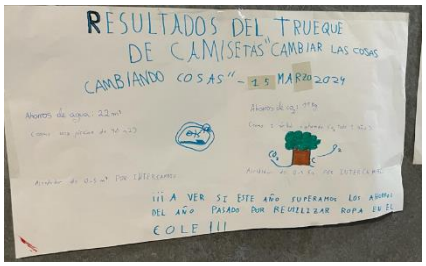
Action

- The use of a colour-coded flag scoring system, while also publishing a weekly overall ranking, motivated and generated competition among students.
- The a need to purchase new recycling bins, as well as the reluctance of some groups to participate in this type of initiative.
- This intervention does not require time in any of the subjects, nor does it require reserving a place for a talk or training session. Each group is informed at the beginning of the course about how the rules work and the final prize.
- The responsibility to act falls on the students, promoting coordination and engaging with each other.

SP-DS02-IN03

CO2 AND WATER MARKET. EXCHANGE T-SHIRTS. "CHANGE THINGS BY CHANGING THINGS"

Primary school



Resources

Human	
Time	
Costs	€ €

Organise a local market within the school community for the exchange of good-condition T-shirts. The CO_2 and water savings associated with wearing a second-hand T-shirt are calculated using a weighing scale and a carbon and water footprint calculator (taking into account the weight and the type of textile.). Participants receive CO_2 and water vouchers reflecting the savings compared to buying a new T-shirt, and sign a commitment agreement not to buy a new T-shirt. At the end of the activity, the total savings made by the school through this intervention are calculated, after which participants engage in a deliberative workshop to reflect on their experience.

There is a possibility of repeating the activity in successive years.

The initial objectives of the intervention focused on raising awareness, promoting values and motivating students (i.e. developing their individual competences), as well as saving emissions and water (i.e. improving environmental performance).

The main challenges to the intervention's success were identified at collective (infrastructure, logistics, resources and cooperation) and individual (motivation and commitment of teachers) levels. Finally, proposals for improvement clearly focus on the collective dimension: resources, opportunities for participatory learning and visibility campaigns for the entire educational community.

Relevant difficulties

The primary challenge for leaders and staff lies in logistics, such as time, coordinating communication with parents and managing tasks like moving furniture or relocating a digital board outdoors. Communicating with parents is particularly challenging. Although the school uses a dedicated mobile application for this purpose, its effectiveness is limited. Teachers concur that many parents are 'too busy' to stay informed about school activities and developments. Another critical issue was the timetable: should the market take place during or after class hours? No matter what time it is, there will always be someone who cannot go.

Among students, concerns have emerged about the expected impact of the market (it may not change the need or desire to buy more T-shirts; small actions like this one are insufficient or irrelevant; holding the market once a year may not be frequent enough). Practical issues have also been raised about the second-hand market, such as not liking the clothes or them not fitting.

Despite these challenges, the activity has been a great success at the school, and the school intends to make it a regular activity at the school for future years.

Engagement	Connections	Change	Action
The SCT findings suggest that the market was effective in encouraging engagement. Students declared that they had gained knowledge and	The market helped to understand the links between environmental challenges and consumption patterns. It also promoted lifecycle	Both students and staff felt that the market raised awareness of the impact of our actions on shaping a better future. It also	Leaders and staff played an active role in preparing for and managing the flea market, working closely with the research team. Given the

understanding of sustainability and the impact of our daily habits on water consumption and CO_2 emissions (second-hand = less pollution). It fostered attitudes of a caring nature and reflection on the value of reuse and sharing. Teachers and staff particularly valued the market's potential to encourage students to think more deeply about sustainability. They also emphasised engagement challenges as critical issues, such as communicating and disseminating information about the market, and a lack of teacher commitment. Broader engagement of teachers beyond the ones directly involved in the SCTs.	thinking, identifying the root causes of environmental impacts at a personal level and encouraging a critical re-evaluation of previous assumptions. For example, the idea that a single T-shirt is insignificant was challenged. Students became aware of the various environmental impacts of different types of textiles, such as water consumption and CO_2 emissions, and possible simple solutions, such as reusing T-shirts.	provided practical knowledge on how to reduce our environmental impact. Apart from the progress in terms of knowledge, attitudes and behaviour, the school leaders see the flea market as an activity that should be repeated every year, given the amount of water saved and the amount of CO_2 not emitted. Participants were surprised to discover how much of an impact their collective action could have on water savings and emissions.	success of this initiative, they are proposing that the market be included in the Centre's General Action Plan as an activity to be repeated in the future. During the SCT, teachers start thinking about the logistics, generating fruitful conversations regarding how best to hold the next market. They even think about reusing the "lost but not found" clothes that are never reclaimed (even though those clothes are sometimes very expensive). Most teachers are particularly enthusiastic about the new market and the possibility of improving the previous edition. Parents and teachers collaborate to develop proposals that connect the content of the flea market with textbooks. The footprint calculator is useful for assessing the impact of your actions and choosing between different options.

Additional information:

- ★ Guidance to replicate de intervention:
- ★ Educational material presenting the market, its environmental benefits and operation
- ★ CO2 and water savings calculator
- ★ Commitment agreement to reuse second-hand t-shirts
- ★ CO2 and water savings bills

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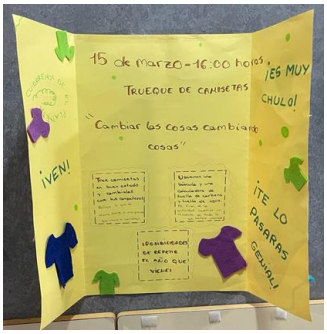
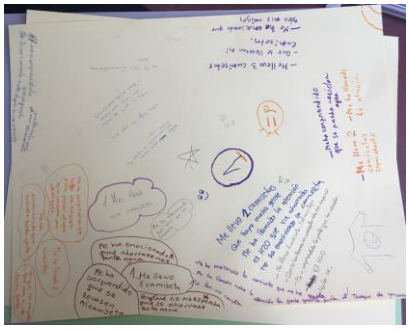
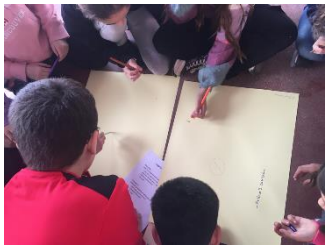






Analytical Framework

Individual Competences	➢ Increased awareness of the impacts of daily behaviours, such as the purchase and use of clothing, among all actors. ➢ Increased awareness about the importance of reusing clothing to reduce the environmental impact of fashion. ➢ Increased awareness of the impact of small actions. ➢ Caring attitudes to nature and the planet. ➢ Knowledge about concrete environmental impacts ➢ Awareness of how our material choices reflect attitudes to nature and sustainability
Collective Competences	➢ Given the success of this initiative, leaders and teachers are proposing that the market be included in the Centre's General Action Plan as an activity to be repeated in the future. ➢ Parents and teachers collaborate to develop proposals that connect the content of the flea market with textbooks. ➢ Increased awareness among leaders and staff of collective action, including committed teachers and families and suitable infrastructure.
Technical-material Competences	➢ Measuring concrete environmental impacts as a motivation for action. ➢ Illustrating how educational interventions change the environmental impact of a school ➢ Using environmental indicators to promote reflection on personal and collective values

CO_2 and H_2O FLEA MARKET SAVINGS			
Year	Nº of Changes	gCO_2	Litres of H_2O
2023	46	11000	22000
2024	57	15803	25217
2025	25	6516	1138
Total	**128**	**33319**	**58606**

SP-DS02-IN07

PART A: PLANTING TREES IN THE SCHOOL

PART B: VISIT TO THE NATIVE PLANT GREENHOUSE OF ARBA / TRES CANTOS (ASSOCIATION FOR THE RECOVERY OF THE NATIVE FOREST)

Primary school

Resources	
Human	
Time	
Costs	€€

This intervention consisted of a planting session in the schoolyard, where the children learnt about the benefits of plants and how to plant and care for a tree. Working in groups of five or six with an adult supervisor, the children carried out tasks such as digging the planting hole, removing the plant from its pot, placing the plant in the hole and filling it with soil, and watering. This intervention took place over two sessions. The first session involved tree planting and included a workshop on planting procedures and the environmental benefits of native vegetation. The second session involved a visit to the ARBA greenhouse, where there were workshops on greenhouse and plant nursery work, identifying plant species (including medicinal plants and their healing properties), and composting organic matter from vegetation for use as fertiliser.

Around 70 fourth-grade primary school students, three teachers and two CIEMAT researchers attended both sessions.

Objectives:

- ★ *Individual competences: Learning to plant and care for various trees and bushes, fostering positive attitudes toward plant maintenance, and understanding vegetation's environmental significance.*
- ★ *Collective competences: Promoting cultural awareness of plants' roles in carbon sequestration, climate change mitigation, oxygen production, biodiversity enhancement, soil conservation, and erosion prevention through participatory learning.*
- ★ *Environmental performance: Plantations aimed at improving microclimate regulation and sustainability within schools and urban areas.*

Relevant difficulties

It is crucial to prepare the land before planting in order to ensure the success of the activity. In our case, the city council cooperated by sending its gardeners to the school to help dig the holes; without their assistance, the activity would not have been possible. It was the school leadership who dug the holes for planting.

The limited space available for planting posed a challenge to the efficient organisation of the planting areas, which caused some difficulties during the activity. Students had expected to plant in an urban garden, so they were surprised when the planting took place on school grounds instead. Additionally, many students did not expect to be directly involved in the planting, resulting in an unexpected yet positive interaction with nature.

A lack of curiosity, responsibility and motivation among some students could hinder the effectiveness of the intervention. Without sustained interest and commitment, tree planting efforts could become short-term actions rather than impactful, lasting solutions. Furthermore, inadequate explanations from teachers and distractions affecting student performance emphasised the importance of clear communication and structured activities.

Individual Competences	Collective Competences	Technical-Material Competences
✓ Knowledge and skills on how to plant vegetation (trees and brushes) ✓ Positive attitudes toward vegetation. ✓ Increased knowledge and awareness of the relevant environmental role of vegetation	✓ Effective logistics and organisation, and valuable long-term collaboration with ARBA. ✓ Good organisation and clear instructions from the school management contribute to students' motivation and participation. ✓ Inspirational leadership (headmaster's active engagement) ✓ Participatory learning experience	✓ Measuring concrete CO2 uptakes ✓ The plantations help regulate the microclimate, increase biodiversity and improve soil conditions at school and in the city. ✓ Estimated carbon sequestration: 95 kg CO2/year.

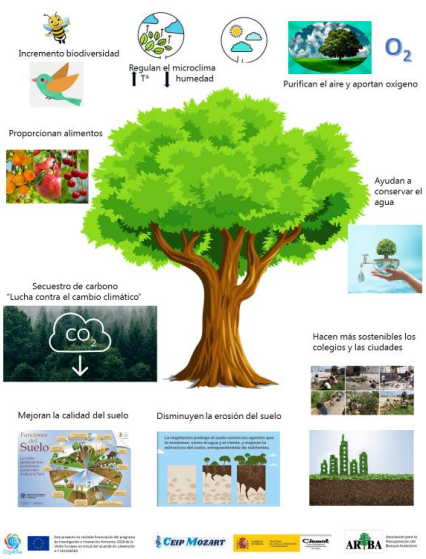
Additional information:

https://drive.google.com/drive/folders/1lATkp_xMOzNjxP_6WQX81PRK1GkcV__m?usp=sharing

★ List of average carbon capture per year by plant species
★ Educational materials on how to carry out planting at school by children
★ Educational material explaining the environmental benefits of vegetation.

https://arba-s.org/

https://www.arba-trescantos.org/



Sustainability competences in place in the intervention

Engagement

- Students gained important environmental knowledge and developed a sense of responsibility for caring for the plants.
- Students felt reassured and motivated knowing that their involvement directly contributed to the benefit of the environment, in particular by reducing around 80kg of CO_2 emissions.
- The knowledge that their efforts were having a tangible impact on the environment further enhanced the students' motivation and sense of purpose during the intervention.
- The fun and engaging nature of the planting activities helped to maintain a high level of student interest and participation.
- Good organisation and clear instructions from the school management contribute to students' motivation and participation.

Connections

- Understanding the roles of trees and vegetation in the carbon cycle
- Students became aware of the various environmental benefits of vegetation: biodiversity improvement, soil conservation, and microclimate regulation.

Change

- Knowledge about possible ways to reduce environmental impacts, both at the local and the global level.
- The engagement of three different school levels in the intervention and the preparation of the video for the ECF4CLIM Best Intervention Award (BIA) helped to generate a collective vision on ways to achieve transformational changes.

Action

- The students learnt about the importance of vegetation and developed strategies for looking after their family's plants at home.
- The motivating presence of the school headmaster significantly influenced the positive outcome.
- The necessary materials were gathered efficiently, enabling even the most restless students to engage and concentrate.
- Measures taken by the school leadership, including the introduction of an irrigation system, effective information dissemination and growth incentives, proved to be essential for the sustainable success of the intervention.

SP-DS03-IN06

IMPROVE THE WASTE SYSTEM MANAGEMENT AT FACULTY LEVEL

University

The objective of this activity has been to monitor the evolution of waste generated in the Faculty of Political Science and Sociology, in order to make its volume and typologies visible, with the aim of generating a reflection on the environmental impacts of the Faculty and on how to manage them. It was also intended to contribute to the replacement of the current waste garbage cans by selective collection points, more in line with current legislation and trends, as well as to provoke a debate on the issue of waste. Pilot program for selective waste collection at the faculty to identify challenges and improvements in the collection and sorting process, while encouraging students, teachers, and staff to adopt sustainable habits.

Resources		
Human	Time	Costs
👥	🕒🕒🕒	€€€

- The purchase of the new waste bins (it was a long and complex bureaucratic process)
- Getting the Faculty and the technicians to agree on the best time to make the change.
- Recruiting student volunteers to monitor the waste (in two rounds, before and after the change).

Relevant difficulties

However, the main difficulty has been involving the faculty in the process, as it has not been possible to convince them to attend the deliberative meetings on the topic. Not only that, but many of the faculty members still do not sort waste for recycling (which is why some action is planned in the future to force them to do so).

These were foreseeable difficulties, but they have not prevented the intervention, which has been very successful from the perspective of the students and the Faculty.

Individual Competences	Collective Competences	Technical-material Competences
According to the evidence collected (SCT3, 4, 5, and 6, and the respective brief surveys and observation protocols), individual competences have been strengthened in the following ways: Students report having greater knowledge of what waste separation and recycling entail. On the one hand, the group of student volunteers who separated and weighed waste during the monitoring activity we organised were able to learn about and directly experience the type of waste generated at the Faculty, as well as the process of its management by the cleaning company. On the other hand, the rest of the students who participated in the waste discussions were able to learn and reflect on the different responsibilities of companies and users, as well as on the importance of reducing the amount of things we use. They also reflected on how difficult it is to do so. Furthermore, the intervention has helped change the habits of students and teachers, who, following the changes in the waste management system, are forced to travel to selective collection points and consider where to dispose of each piece of waste (something that is not always easy, as some items can be confused).	The intervention has involved replacing numerous undifferentiated wastebaskets with a few selective collection points (there is one per floor, with a container for each type of waste). This has led to the implementation of new internal regulations, since garbage disposal requires new guidelines, which all students and faculty must follow. The data collected shows that the majority of students already follow the new rules, while a significant portion of the faculty has not yet adopted them. Furthermore, it should be noted that, although the system change was funded with resources from the ECF4CLIM project, after observing its operation, the University has decided to replicate the model in other Faculties. Thus, the pilot test carried out at the Faculty will serve to modify waste management throughout the university. Finally, it is important to highlight that the various workshops held with students to discuss the evolution of waste and its management have provided a very interesting participatory and deliberative space, which has served to involve students and, ultimately, has been key to the rectorate taking the intervention seriously (and deciding to replicate it in other faculties).	This intervention involved replacing the Faculty's wastebaskets with new containers suitable for selective collection. The new containers were installed at the request of students, designed in conjunction with university technicians, and funded through the ECF4CLIM project. In addition, scales were used to weigh the waste during the monitoring process.

Sustainability competences in place in the intervention

Engagement

To involve students in this activity, a call was made among those enrolled in the training course (Ecosocial Crisis Cycle) to see who wanted to participate. We managed to get 6 students to sign up in the first round and 8 in the second. Furthermore, the results were discussed in two forums: first, in the aforementioned training cycle, with the remaining enrolled students (56); and second, within SCT5 and 6, with the students who were part of these SCTs.

However, it was practically impossible to involve teachers in this intervention. It was only possible to discuss its development and results with the teachers participating in SCT5 and 6.

It is observed that this type of intervention can be very interesting for groups of students concerned about sustainability, while it is not so easy to involve teachers, who have different rhythms and agendas and seem to prefer not to mingle with the students.

The intervention allowed students to reflect on the waste cycle. Normally, they only see the waste in the bin, which magically disappears the next day. Participating in waste monitoring allowed them to map the path waste takes

Connections

through the different stages, until its final disposal (learning about the companies involved, recycling criteria, the responsibilities of the different actors, etc.).

The students discovered that most of the Faculty's waste came from vending machines, which prompted a reflection on the university's shortcomings when contracting these vending services (products with less packaging could be required).

Change

The question of "change" has been ambivalent. On the one hand, participants promoted a change in the Faculty's waste management system. Furthermore, they were able to compare the environmental, economic, and social impacts before and after the change (and observed the savings generated). However, on the other hand, in the discussions held, students were made aware of the difficulties in reducing waste volume, as it is something over which users have little influence, as it depends on the industrial and commercial design of a business environment and a global market. This observation has led to a certain disenchantment among students, who perceive that they have little ability to influence the commercial decisions behind waste generation.

Action

The intervention has promoted actions and behaviours among the Faculty (especially students, and to a lesser extent, faculty). The implementation of a new waste management system has forced people to change their waste disposal behaviour.

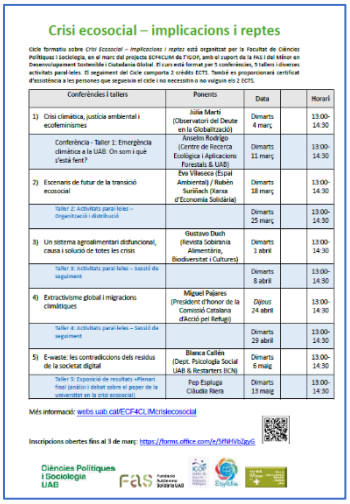
Furthermore, the students who participated in the monitoring activities, both before and after the change in model, have learned to work in groups. Under the professor's instructions, they have organised themselves to carry out the task of separating and weighing waste for three weeks in each round.

SP-DS03-IN07

FACILITATE TRANSVERSAL LEARNING SPACES

University

The intervention consists of a training course on the ecosocial crisis, designed as a transversal teaching space, open to students from all backgrounds, and also to teachers, which allows for dealing with issues related to sustainability from a social science perspective, and which also allows for various activities to collect and analyse environmental data from the campus, to be debated and interpreted in accordance with the contents of the course. The training cycle consisted of five lectures, five workshops, and a final discussion session. The topics were: a) Ecological crisis, environmental justice, and ecofeminism; b) Future scenarios for the ecosocial transition; c) The sustainability of the agri-food system; d) Global extractivism and climate migration; e) The sustainability of e-waste. The lectures were given by specialists in the respective topics (some from the university and others from outside). After each lecture, a workshop on the same topic was held with data from the campus.



Relevant difficulties:

There were no particular difficulties with this intervention, beyond the work involved in organizing it (requesting permission from the university, securing two credits for students, advertising the series on campus, contacting speakers and agreeing on dates, moderating debates, coordinating workshops and parallel activities, summarizing the debates on the series' website, keeping track of students attending each session, issuing attendance certificates, etc.). Otherwise, we have had significant support from various university services (rector's office, faculty dean's office, Autonomous Solidarity Foundation, sustainability office, etc.).

Resources		
Human	Time	Costs
👥	🕒🕒🕒	€€€

Individual Competences	Collective Competences	Technical-material Competences
In this case, the students themselves responded (through the brief survey given at the end of the activity) that they had learned much knowledge that they considered useful. Ultimately, this was one of the objectives of this intervention: to provide information, data, and theories to interpret the ecosocial crisis from a constructive perspective. In addition to knowledge, as the intervention included several voluntary group activities, the students also learned certain skills (calculating with the collected data, preparing presentations, organising collectively, performing group work, etc.).	This intervention, which consisted of a training cycle aimed at students from across the campus, served to introduce teaching on sustainability and climate change (from an eco-social crisis perspective) at the university. It has been repeated twice and is expected to continue in the future with the support of the Faculty of Political Science and Sociology. Furthermore, the Rector's Office is designing a future cross-curricular course on sustainability and climate change, which will be offered to students across all degrees, and this intervention served as a pilot test for how to organise it. In terms of collective competencies, this intervention, in addition to a series of lectures, provided students with a participatory space in which to deliberate and participate in data collection on campus sustainability. This participatory space is unprecedented and should be taken into account.	In this case, no new equipment or infrastructure was installed to improve sustainability. The only thing worth noting in this regard is that one of the groups of student volunteers participating in the cycle analysed data from air pollution sensors (PM2.5) that we distributed throughout the campus. The sensors were loaned to us by CIEMAT and were returned to them after the activity.

Sustainability competences in place in the intervention

Engagement

The training cycle was open to students and faculty. In the case of students, we persuaded the university to award 2 ECTS credits to those who completed the full cycle. This was very helpful in convincing students to sign up (more than 50 signed up for each cycle, of which between 30 and 40 actively participated).

As for faculty, it was more difficult to involve them, although we managed to have a few professors at each conference, who actively participated in the discussions. Faculty engagement seems to be more difficult because they do not feel challenged, tend to consider these topics unfamiliar to them, and rarely have time to participate. The few who attended did so because they were specifically invited.

Connections

Since this is a series on sustainability and climate change designed from a social science perspective, it has been very useful for all types of students. According to the brief survey we conducted, science and engineering students found it very interesting because it opened their interpretive field by making them aware of the social and political consequences of technological and market decisions. Furthermore, for humanities and social sciences students, the training series was also interesting in connecting their theories and concepts with environmental issues. Ultimately, the intervention helped students understand how seemingly separate things are part of a single system.

Change

The course has not generated immediate changes. At most, it has helped some people imagine other future scenarios (in terms of ecological modernization, degrowth, etc.), and thus reduce certain attitudes of fatalism and passivity. It also seems to have served to reduce some eco-anxiety among the students. The participatory and deliberative design of the workshops and activities has helped achieve this.

Action

The training cycle has not led to any concrete actions, either individual or collective. However, it has allowed for the establishment of a nascent network of students and professors interested in sustainability issues, which could be used in the future to demand further action from the rector's office. However, this has not yet materialised.

PT-DS01-IN02

TAKING CARE OF A RIVER SECTION

Primary and secondary school

A school-wide initiative where 8th-grade students take care of a designated section of the Trancão River. Activities include environmental clean-ups, water analysis, topographic surveys, and artistic representations of the river surroundings. It is part of the "Escola Azul" programme and aims to foster environmental responsibility and awareness among students through hands-on activities outside the classroom.

NATURE OF THE INTERVENTION: involving individual action and requiring collective action.

OBJECTIVES:

- ★ *Allow students to have experience and insight in the field of how they can contribute to the preservation of a resource as important as water.*
- ★ *Increase awareness in the school community about water protection and preservation.*
- ★ *Promote sustainable practices.*

Relevant difficulties

- ♦ Difficulty in coordinating schedules and ensuring continuity over time.
- ♦ Some students lack motivation or interest.
- ♦ Teachers' involvement is inconsistent, affecting class participation.
- ♦ Logistical challenges: excessive number of students per session, activities under the sun without enough structure.
- ♦ Lack of school-wide awareness and communication. Disconnection between what happens at school and habits at home.

Resources

Human	
Time	
Costs	€ €

Individual Competences	Collective Competences	Technical-material Competences
✓ Environmental awareness and responsibility.	✓ Cooperation among students from different classes.	✓ Application of scientific methods (e.g., water analysis).
✓ Skills in scientific observation and fieldwork.	✓ Peer-to-peer learning and communication.	✓ Use of topographic and mapping tools.
✓ Emotional connection to nature and sense of initiative.	✓ Collective planning and shared responsibility.	✓ Basic environmental engineering and clean-up practices.

Sustainability competences in place in the intervention

Engagement

The intervention encourages students to connect emotionally with their local environment and to take responsibility for its conservation. Student engagement is crucial, as their motivation determines the success of activities. Teachers' involvement varies; some are highly engaged, while others show limited interest, which affects student participation. The intervention also opens space for stronger collaboration with families and external entities, such as the municipality and river management bodies.

Connections

The intervention promotes connections between environmental education and citizenship, linking school activities with real-world ecological issues. It fosters interdisciplinary learning (science, geography, civic education) and enhances collaboration among students from different classes. It also creates a connection between the school and the surrounding community, particularly within the scope of the Blue School program.

Change

Students developed a deeper sense of environmental responsibility and awareness. Many began to reflect on the impact of their actions. The intervention triggered behavioural shifts in some, especially those directly involved. However, the change was limited by the lack of broader engagement and recurring organisational issues. A shift in school culture was initiated, but sustained effort is required.

Action

Students conducted environmental clean-up actions, water sampling, analysis, mapping, and artistic representations of a river section. These actions are planned to be repeated regularly. However, execution has been hampered by logistical challenges and insufficient structuring. Future actions should include better planning, smaller groups, and more frequent activities.

PT-DS01-IN09

PROMOTING PROPER WASTE SORTING AND ENCOURAGING ECO-FRIENDLY BEHAVIOURS THROUGH INTER-CLASS COMPETITIONS. SCHOOL WASTE PRODUCTION

A school-wide competition was organized to encourage students to separate waste correctly. The contest involved all 8th-grade classes, each guided by a teacher responsible for coordinating and motivating their group. Points were awarded based on the total weight of recyclable materials brought to school, regardless of their origin. Students were encouraged to collect materials not only from their daily school activity but also from home or their neighbourhood, promoting family involvement and broader community engagement. The competition was monitored and managed by a team of teachers and school staff, who were responsible for weighing the materials and updating the scoreboard.

This model combined an internal awareness campaign with participation in an external competition (Valor Sul), which rewarded each kilogram collected with a monetary value. While this dual purpose increased engagement, it also raised challenges such as uneven contributions between students and the perception of unfair advantage by those who brought waste from outside the school. Despite these issues, the initiative helped raise environmental awareness and promoted teamwork and collaboration among teachers, students and staff.

Relevant difficulties

- Motivation driven more by prizes than internalised environmental values.
- Uneven engagement from teachers and limited involvement from families.
- Competition rules were not clearly defined or consistently applied, generating confusion and frustration.
- Recyclable waste was measured by weight, which, combined with unclear rules, encouraged some students to bring waste from outside the school.
- The action was implemented in parallel with an external contest (Valor Sul), which influenced its structure and objectives.
- The municipal waste collection service does not enter the school grounds, creating logistical difficulties for regular disposal and monitoring.
- Recycling bins were missing from several key school areas (e.g., outdoor/common spaces).
- Lack of long-term planning and follow-up actions limited sustained behavioural change.

Resources

Human	
Time	
Costs	€

Individual Competences	Collective Competences	Technical-material Competences
✓ Awareness of environmental issues, particularly recycling. ✓ Responsibility for personal actions and waste. ✓ Motivation to contribute to class efforts, although participation was also influenced by the prospect of external recognition and the collective performance of the class. ✓ Exposure to the connection between individual behaviour and community-wide environmental goals.	✓ Coordination within the class to manage waste, guided by a teacher assigned to each class. ✓ Cooperation between students, teachers, and staff, with teachers and school staff overseeing the points system, measurement and reporting. ✓ Shared responsibility within the school community, promoted through structured coordination rather than autonomous student-led organisation.	✓ Proper use of eco-bags and recycling bins. ✓ Sorting waste by material. ✓ Understanding of recycling logistics and challenges (e.g., collection, external companies), especially through participation in an external competition (Valorsul), which helped contextualise recycling beyond the school space.

Sustainability competences in place in the intervention

 Engagement	The intervention actively engaged students through a competitive format, which initially boosted participation. However, motivation was mostly extrinsic (prize-driven), and engagement decreased after the competition ended. Each class was supported by a teacher who promoted participation and collection. Scoring and monitoring were handled mainly by staff and teachers, not students. Although the community generally welcomed the initiative, low student protagonism and unclear rules limited deeper engagement. Family participation was likely higher, as waste brought from home contributed directly to class scores.
 Connections	The intervention aligned with environmental education curricula (science, citizenship) and was connected to an external recycling competition promoted by Valorsul. This dual structure allowed the school to leverage ECF4CLIM goals while participating in a broader initiative. Cooperation with municipal waste services was initiated, although communication limitations with families and external actors reduced systemic coordination.
 Change	The intervention triggered increased awareness of recycling and promoted behavioural change among participating students, some of whom continued these habits at home. However, long-term impact is uncertain due to structural constraints and minimal student-led governance. The lack of shared rules and reliance on external motivation created uneven levels of responsibility and engagement.
 Action	A school-wide waste separation competition was held, involving waste collection, weighing, and scoring by class. Eco-bags were placed in classrooms, and bins were monitored. Teachers and school staff managed logistics, while students contributed waste brought from home and school. Points were awarded based on weight, not material separation, and aligned with the rules of an external recycling campaign (Valorsul). Despite its success in generating enthusiasm, challenges included inconsistent rule application, competition manipulation, and limited integration of sustainability learning beyond the prize-oriented activity.

PT-DS02-IN03

REACTIVATE THE SCHOOL'S BIOLOGICAL GARDEN

Secondary school

Reactivate the school's biological garden (known as “Quinta do Charco”) by involving students, teachers, families and external actors in a participatory process. Activities included space diagnosis, collaborative sessions with architects from IST, group reflections on sustainability, and co-design of a multifunctional garden. The aim is to transform the space into a sustainable and educational green area integrated into school life and the community.

Relevant difficulties

- Lack of material and human resources for the construction and maintenance of the garden.
- Dependency on external partners (e.g., municipality, architecture teams).
- Risk of discontinuity due to high teacher turnover and variable commitment.
- Difficulty integrating the space into the school curriculum and routines.
- Unclear governance: Who will maintain and manage the space long-term?

Resources

Human	
Time	
Costs	

Individual Competences	Collective Competences	Technical-material Competences
✓ Environmental awareness and responsibility.	✓ Co-creation and collaborative decision-making.	✓ Spatial planning and participatory design skills.
✓ Sense of ownership and pride in shaping school space.	✓ Negotiation and dialogue among diverse school actors.	✓ Understanding of ecological gardening and land use.
✓ Motivation to contribute to sustainability and health.	✓ Shared responsibility for the long-term future of the garden.	✓ Awareness of technical needs (e.g., irrigation, accessibility).
✓ Reflection on the role of nature in well-being and education.	✓ Strengthening of trust and school-community bonds.	✓ Ability to communicate ideas visually (models, drawings).

Sustainability competences in place in the intervention

 Engagement	The reactivation of the garden generated strong emotional engagement among students, especially those from classes with direct participation in the design sessions. Many students expressed a desire to use the space regularly. Engagement from teachers was mixed — some were deeply involved, while others were hesitant due to workload. There was growing engagement from the school board and community actors, especially the parents' association and parish council. One of the main challenges is expanding engagement to the entire school community and maintaining continuity.
 Connections	The intervention was clearly linked to citizenship and science curricula and also created links with architecture and design (via collaboration with IST). It promoted interdisciplinary connections and potential community use of the garden. The activity was positioned within broader school projects on sustainability and health, but still needs stronger integration into the school's operational routine and pedagogical plans.
 Change	The intervention triggered changes in students' perspectives on sustainability, nature, and school spaces. Students became more aware of the value of green areas and expressed a desire to participate in their care. The process also changed some teachers' views on co-creation. While physical transformation of the space has not yet been implemented, behavioural and attitudinal changes were observed in terms of ownership and long-term vision.
 Action	Activities included student-led diagnosis of the garden space, participatory design sessions with architects, group discussions on sustainability, and development of conceptual models for the future garden. Although the physical transformation is still pending, the planning and design phases were completed, and collective visions for the garden were co-created.

PT-DS02-IN10

PROMOTING PROPER WASTE SORTING AND ENCOURAGING ECO-FRIENDLY BEHAVIOURS THROUGH INTER-CLASS COMPETITIONS. SCHOOL WASTE PRODUCTION

Secondary school

A recycling competition was implemented across all 8th-grade classes with the goal of improving waste separation practices and increasing environmental awareness. The competition focused strictly on the waste produced within each classroom, ensuring that students were accountable for managing their own space and promoting sustainable behaviours in their daily routines. Each classroom received dedicated recycling bins, and points were assigned based on the quantity and correct sorting of materials.

The process was coordinated by two teachers and a selected 8th-grade class, which played a leading role in managing the competition. This student group conducted awareness sessions in classrooms, monitored compliance with the rules, verified the contents of the bins, and maintained the scoreboard throughout the week. The initiative relied on clearly defined rules and internal oversight, reinforcing a sense of responsibility, fairness, and ownership among participants. The structured, student-led model fostered strong engagement through collaboration and playful competition, culminating in a symbolic prize awarded to the winning class.

Relevant difficulties

- Rules were not fully clear or uniformly enforced across all classes.
- Student motivation was partly extrinsic (focused on prizes), though some showed deeper engagement.
- Teacher engagement varied, with some highly committed and others less involved, affecting implementation.
- Some students manipulated the system (e.g., bringing waste from outside the school to boost their class scores).
- Limited infrastructure (e.g., lack of recycling bins in key areas) created logistical challenges.
- Maintaining motivation and environmental commitment beyond the competition period proved difficult.

Resources

Human	
Time	
Costs	€

Individual Competences	Collective Competences	Technical-material Competences
✓ Intrinsic motivation for sustainability: Some students expressed that what mattered most was helping the planet, not winning prizes. This shows a shift toward internalised environmental values. ✓ Autonomy and personal responsibility: Students took the initiative to follow the rules, suggest improvements, and reflect on their own behaviour regarding waste. ✓ Critical awareness of daily practices: Students began observing how others dealt with waste, often taking on a peer-monitoring role and reflecting on what could be improved. ✓ Sense of impact and agency: Students realised their actions had real consequences, both within the school and potentially at home, encouraging a feeling of empowerment.	✓ Collaboration within and between classes: The class-based competition structure encouraged teamwork and strategic collaboration to increase scores. ✓ Participatory decision-making: Students helped define and adjust the competition rules, co-designing part of the process with teachers and staff. ✓ Strengthened school community identity: The shared goal of improving sustainability fostered a collective sense of pride and responsibility toward the school environment. ✓ This competence was particularly strengthened through the delegation of leadership and monitoring tasks to one of the 8th-grade classes, which took on an active role in overseeing the competition, fostering ownership, peer engagement, and responsibility.	✓ Correct waste sorting and recycling practices: Students learned to identify, separate and dispose of paper, plastic, and organic waste appropriately. ✓ Familiarity with waste collection systems: They became aware of how school bins were used, the limitations of external collection (e.g., Valorsul not entering the school), and discussed infrastructure improvements. ✓ Eco-point usage and monitoring: Students engaged with eco-points and adapted to the school's specific system, applying rules in a real context.

Sustainability competences in place in the intervention

 Engagement	The intervention managed to actively engage students, especially through the competitive format. Many students reported feeling motivated by the idea of points and prizes, but others revealed that the environmental goal itself was important, showing intrinsic motivation. The competition was co-managed by a student class and two teachers, who also conducted awareness sessions in all participating classes. This peer-led structure promoted student protagonism and strong engagement. However, engagement among teachers varied, and some janitors supported the action informally. Family involvement was limited, and extending engagement to more stakeholders remains a challenge.
 Connections	The intervention connected environmental education with citizenship and science curricula. It built on students' prior knowledge of recycling and expanded it into hands-on school-level action. The initiative was entirely managed within the school, without links to external municipal services or waste management companies. However, it created opportunities for internal collaboration between students and staff and helped raise awareness about the school's internal waste management limitations
 Change	The competition sparked behavioural changes in some students, who became more attentive to waste separation. Some reported replicating these practices at home. Stronger behavioural shifts were observed in classes more involved in awareness activities. However, structural limitations and inconsistent participation between classes affected the long-term systemic effect.
 Action	A school-wide competition was created to promote correct waste separation. Students earned points by sorting waste properly within their classroom bins. Eco-bags and dedicated bins were placed in all classrooms. A selected student class monitored the process and awarded scores based on clear, shared rules. Teachers and students co-designed the system. Although generally effective, some issues arose, including challenges in maintaining consistency and follow-up beyond the competition period.

PT-DS03-IN01

CLIMATE CRISIS AND FAIR TRANSITION

Higher education

Creation of a curricular unit focused on the climate crisis and fair transition, integrating scientific, ethical, political, and practical perspectives. The intervention addresses the need to empower university students to critically understand climate challenges, while fostering their ability to imagine, debate, and co-create systemic solutions. It adopts participatory, interdisciplinary methods, encouraging collective reflection and civic engagement. The unit aims to build both knowledge and action-oriented competences, positioning students as active agents of the climate transition.

Relevant difficulties

- Need for continuous updating: the fast-evolving nature of the climate crisis requires constant revision of content and pedagogical approaches.
- Voluntary nature of the course: as the unit is optional, it may only reach a self-selected group of students already interested in climate issues, limiting its broader transformative potential.
- Measuring long-term impact: It may be challenging to assess whether the course leads to sustained behavioural or civic action beyond the classroom.
- Integration into broader curriculum: the course might remain a niche offer unless further institutional alignment promotes more widespread inclusion of climate transition themes.

Resources

Human	
Time	
Costs	€

Individual Competences	Collective Competences	Technical-material Competences
✓ Critical understanding of the climate crisis through systemic, scientific and ethical lenses. ✓ Reflective autonomy in engaging with complexity and recognising the intersectionality of climate and social justice. ✓ Agency and responsibility to act as informed citizens and professionals in the face of climate emergencies.	✓ Deliberation and co-creation: students engage in collective reflection, discussion and solution-building. ✓ Solidarity and fairness: exploration of the just transition fosters shared ethical positioning. ✓ Institutional and community awareness: understanding the roles of different actors (government, industry, academia, civil society) in addressing the crisis.	✓ Climate science literacy and knowledge of sustainability tools and indicators. ✓ Ability to analyse policy, emissions data, and transition strategies. ✓ Practical skills in scenario planning, systems thinking, and participatory methodologies.

Sustainability competences in place in the intervention

 Engagement	The curricular unit engaged students deeply through participatory methods, critical discussion, and personal reflection. The open-ended, systemic nature of the topic encouraged students to connect academic content with their values and experiences. The engagement was supported by interdisciplinary teaching and real-world problem-solving.
 Connections	The intervention connected scientific, political, ethical, and economic dimensions of the climate crisis, breaking disciplinary silos. It linked classroom learning with external debates on energy, inequality, climate justice, and governance. It also connected the university context with the global climate agenda, and encouraged students to see their role beyond the academic environment — as future professionals, citizens, and community members.
 Change	The intervention is expected to foster changes in students' mindsets, emotional awareness, and sense of agency. Through exposure to systemic and participatory approaches, students may begin to see themselves not only as learners but as future professionals and citizens capable of contributing to the climate transition. It is anticipated that this unit will encourage students to engage more critically with their academic paths and their roles in society. Instructors may also begin to shift their pedagogical approach, incorporating more interdisciplinary and reflective elements into their teaching.
 Action	The course is designed to promote transformative action, both in students' thinking and in their capacity to develop climate-related solutions. Through scenario-building, group work, roleplay, and practical projects, students are expected to explore real-world challenges and co-create potential responses. Although implementation is not guaranteed, the intervention aims to prepare students to initiate or contribute to sustainability transitions in academic, professional, and civic contexts.

PT-DS03-IN07

COMMUNICATION AND COMMUNITY INVOLVEMENT

Higher education

The intervention aims to enhance the visibility and impact of sustainability actions at IST by creating a dedicated physical space for community engagement. The space will serve as a hub for sharing sustainability-related information, organizing activities, and fostering interdisciplinary collaboration. The project includes a participatory design phase, involving architecture students, staff, and researchers. The intervention is currently in the implementation phase, with a final plan developed and awaiting approval for construction.

Relevant difficulties

- Risk of institutional delay or lack of priority for approving and funding the space.
- Engagement may remain limited to a small core group, reducing wider impact.
- Long-term maintenance and programming of the space are still undefined.
- Sustainability communication efforts risk becoming fragmented without coordination.
- Need to maintain student involvement over time, considering academic turnover.

Resources

Human	
Time	
Costs	

Individual Competences	Collective Competences	Technical-material Competences
Students, staff, and researchers developed values and motivation toward sustainability. The project fosters critical thinking, systems thinking, and personal responsibility through co-creation and discussion of sustainable campus infrastructure. It also helps participants become more confident in communicating about sustainability and reflecting on their role in shaping institutional practices.	The collaborative design process brought together diverse actors, promoting teamwork, participatory learning, and shared decision-making. This collective approach aimed to create a sense of belonging and co-ownership of the space, strengthening community engagement and enabling long-term sustainability of the intervention.	Participants applied practical skills such as space planning, architectural design, and sustainable material selection. Communication skills were also key—participants worked on strategies for visual and digital engagement (e.g., signage, QR codes, interactive screens). The intervention integrates physical and digital tools to enhance sustainability outreach on campus.

Sustainability competences in place in the intervention

 Engagement	Engagement grew progressively throughout the co-creation process. Initially, participation was focused on a small group of highly motivated students and researchers. However, the participatory design sessions broadened interest and visibility within the IST community. Architecture students were especially engaged through coursework directly related to the intervention. A key challenge is maintaining long-term engagement, particularly from leadership and non-academic staff, and expanding awareness to the broader student population.
 Connections	The intervention connects communication, sustainability, architecture, and institutional development. It also links curricular learning (especially in architecture and design) with real-world sustainability challenges. Although primarily internal to IST, the project has the potential to connect with external sustainability networks or public outreach in future stages .
 Change	The intervention is expected to help shift how sustainability is communicated and perceived at IST. By creating a physical and symbolic space for sustainability it encourages the integration of environmental thinking into the institutional culture. It is anticipated that the space will empower students and staff to take initiative, host activities, and strengthen the visibility of ongoing sustainability efforts .
 Action	The action involved the co-design of a physical space for sustainability communication. Architecture students developed project proposals, including technical drawings and sustainability features. A consolidated plan was submitted to the school board for implementation. Although construction has not started, the design phase engaged the academic community and generated a shared vision for the space. The next steps include approval, funding, and execution.

RM-DS01-IN01

(SOLAR PANELS IN URBAN AREA) INSTALLATION OF SOLAR PANELS FOR GREEN ELECTRICITY

Lower secondary school

Resources

Human	
Time	
Costs	€€€

The intervention involved installing solar panels on the school's roof to generate electricity. Initially, solar thermal panels were proposed to provide hot water for the school canteen and reduce gas consumption. However, due to technical limitations—such as the lack of hot water demand during the long summer break and the need for antifreeze protection in winter—the plan was revised. The shift from solar thermal to photovoltaic panels provided greater flexibility. An interface was installed to connect the school's electrical network to the public grid, enabling the school to obtain prosumer status. This was achieved by preparing the necessary technical documentation, securing approvals, and coordinating with the electricity provider.

To monitor electricity consumption and production, a smartphone application was installed. Additionally, an educational component was integrated into the project. Large posters were displayed throughout the school, visible to students, staff, parents, and visitors, illustrating the intervention and its outcomes.

The ECF4CLIM team developed dedicated educational materials on solar energy—covering both heat and electricity generation—and energy conservation in the context of climate change. These materials were discussed with students and teachers, with feedback incorporated into updated versions. The finalized resources serve as foundational documents for teachers to design interdisciplinary sustainability lessons.

Finally, communication and dissemination activities were carried out to encourage replication of the initiative in other schools and households.

Relevant difficulties

The solar panel project at Drăgășani School faced no major issues, but key recommendations emerged for future implementations:
• **Technical Expertise** – Professionals should assess roof integrity, panel positioning, and provide necessary documentation. . • **Project Planning** – Clear contracts outlining roles, timelines, and quality standards are vital. Schools often need help from local authorities or inspectorates due to limited technical capacity. • **Educational Value** – Watching installation alone is insufficient; tailored teaching materials on solar energy should be integrated into interdisciplinary lessons. • **Funding** – Despite the modest €5,000 cost, funds must be secured in advance via municipal support or project grants• **Data Use** – Monitoring data from the panels should be accessible and actively used in classes to deepen students' understanding of sustainability.

Engagement	Connections	Change	Action
Engagement was achieved through collective reflection and participation in sustainability. The transition from solar thermal to PVs demonstrated adaptability and commitment. Educational posters and curriculum integration ensured the whole school community could	The intervention connected technology, learning, and community involvement. Students saw firsthand how renewable energy use connects to broader themes such as climate change, energy policy, and responsible consumption. Collaboration between	Initial plans for thermal panels had to be reconsidered due to real-world constraints such as seasonal use patterns. This led to a more suitable PV solution. Students and staff were encouraged to see the links between energy use, technology, and climate	Concrete action was central to the intervention. Beyond the technical installation, the project included active involvement of the school community, implementation of educational materials, real-time monitoring of energy use, and public communication efforts.

reflect on and internalize sustainability values. The development of personal responsibility and environmentally conscious behaviors among individuals is a testament to strong engagement with sustainability principles.	teachers, local authorities, and technical experts strengthened ties across sectors, showing how interdisciplinary and cross-sectoral cooperation is essential for impactful sustainability efforts.	change. The educational component emphasized these interconnections, helping participants understand how local decisions and infrastructure choices relate to global environmental challenges.	These activities exemplified how individuals and collectives can "walk the talk." The result was not just reduced carbon emissions but also strengthened technical, cognitive, and collaborative competences within the school.

https://ecf4clim.eu/materials-from-demonstration-sites/

https://www.youtube.com/watch?v=RHaLCdpl9zU

Analytical Framework

Individual Competences

The solar panel intervention played a significant role in developing important individual competences among participants, including practical skills, critical thinking, communication, initiative, and environmental responsibility. These outcomes contribute to nurturing more informed, proactive, and reflective individuals who are better equipped to address sustainability challenges in their personal and professional lives.

- Increased Environmental Awareness - Participants became more conscious of their daily action impacts. They developed a greater sense of personal responsibility and began to reflect more critically on their choices, particularly in terms of resource use and sustainability.
- Development of Practical and Technical Skills - The intervention provided hands-on opportunities to understand the principles of solar energy and renewable technologies fostering new technical competencies.
- Enhanced Critical Thinking - Activities encouraged reflection, analysis, and questioning, leading to noticeable improvement in critical thinking, especially concerning ecological issues.
- Improved Communication Skills - Participants gained confidence in expressing their ideas more clearly during group discussions. The experience helped them develop the ability to articulate viewpoints.
- Personal Initiative and Responsibility - Many participants began taking the initiative in their daily lives, choosing environmentally friendly behaviours such as walking instead of driving or actively promoting sustainability in their routines. This reflects a growing sense of agency and proactive engagement.
- Curiosity and Motivation to Learn - Exposure to real-world applications of renewable energy stimulated curiosity and encouraged further learning about sustainability topics.

Collective Competences	The solar panel intervention proved to be an effective context for fostering collective competences such as teamwork, shared leadership, collaborative problem-solving, and joint environmental responsibility. These competences are essential not only for the success of sustainability initiatives, but also for the broader development of active, engaged, and cooperative citizens. ➢ Teamwork and Collaboration - Participants developed the ability to work effectively in teams, recognising the value of each member's contributions. They successfully organised themselves around common objectives, demonstrated shared responsibility, and supported one another in achieving collective goals. ➢ Shared Decision-Making - The intervention encouraged the practice of democratic and inclusive decision-making. Teams planned activities collectively, discussed options respectfully, and reached consensus on actions, reinforcing a participatory culture. ➢ Role Distribution and Responsibility Sharing - Individuals took on diverse roles within group activities, showing flexibility and a willingness to support the team in various ways. The recognition that every role is important contributed to a more cohesive and functional team dynamic. ➢ Collective Problem-Solving and Creativity - Groups engaged in collaborative problem-solving, combining their ideas to address challenges. This approach enhanced their ability to generate creative, group-based solutions rather than relying on individual efforts. ➢ Ecological Awareness through Collective Action - Participants connected environmental learning with group behaviour, reinforcing the idea that small, collective actions—such as advocating for sustainability or promoting recycling—can contribute to broader ecological goals. This fostered a sense of shared responsibility for environmental stewardship.
Technical-material Competences	Beyond the installation of a renewable energy system, the project provided a tangible learning environment that helped participants understand environmental principles, sustainable infrastructure, and everyday eco-responsible behaviour. Participants developed a stronger understanding of sustainable infrastructure, improved their capacity to analyse environmental data, and adopted more responsible behaviours toward energy and resource use. ➢ Understanding of Renewable Energy and Sustainability Concepts - Participants developed a clearer understanding of the distinction between renewables and non-renewables and how solar energy reduces carbon emissions. ➢ Monitoring and Interpreting Environmental Data - Students learned to read and interpret energy consumption and production data, enhancing their ability to engage with real-world environmental metrics. This competency supports evidence-based thinking and decision-making in sustainability practices. ➢ Energy and Resource Conservation Practices - Through active participation, students adopted more mindful behaviours in conserving water, saving energy, and minimising waste in their daily routines. ➢ Connection Between Local Actions and Global Impact - Participants gained a deeper understanding of how individual and local efforts—like energy conservation or waste reduction—contribute to broader environmental goals. They recognised the link between everyday actions and global issues such as climate change. ➢ Improvement of the Physical School Environment - The school community engaged in activities that led to a cleaner, more eco-conscious environment. These included better recycling practices, reduction of waste, and small-scale improvements that enhanced the school's overall ecological footprint.

RM-DS02-IN01

(SOLAR PANELS IN RURAL AREA) INSTALLATION OF SOLAR PANELS FOR GREEN ELECTRICITY PRODUCTION

Lower secondary school

Resources

Human	
Time	
Costs	€€€

The PV panel installation was planned and carried out, similar to the intervention (RM-DS01-IN01) at Nicolae Bălcescu School in Dragășani. However, this took place in a rural setting, which differs significantly from urban areas in Romania, especially in terms of community knowledge and attitudes. As in Dragășani, solar thermal panels were initially proposed to provide hot water, but technical issues—like limited summer use and antifreeze needs in winter—led to a shift toward photovoltaic panels, offering better flexibility and year-round use.

Similarly to Dragasani, an interface was installed to connect the school's electrical system to the public grid, and prosumer status was obtained by submitting technical documentation, securing the necessary approvals, and coordinating with the electricity provider. A smartphone application was implemented to track electricity consumption and production at the school level. To facilitate the understanding on the solar energy and to communicate the results of the intervention large posters were produced and displayed throughout the school. The targeted audience consists of students, staff, parents, and visitors. Additionally, the ECF4CLIM team developed educational materials focused on solar energy and energy conservation in the context of climate change.

A common material was produced for Dragasani and Sercaia schools by integrating the feedback received from the discussions with the students and teachers. The material is uploaded in the ECF4CLIM web-site (https://ecf4clim.eu/materials-from-demonstration-sites/).

The finalized educational materials now serve as a foundational resource for teachers to develop interdisciplinary lessons on sustainability. Communication and dissemination activities were also conducted to promote the replication of this intervention in other schools.

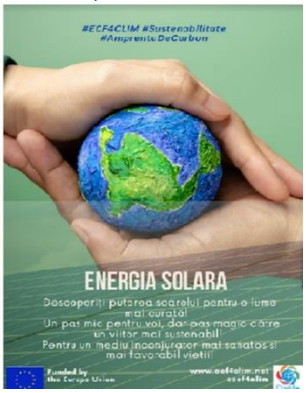
Relevant difficulties

The solar panel project at Șercaia School was successful, but offered valuable lessons for other rural schools:
Funding: Despite the modest €5,000 cost, securing funds was challenging. Rural schools rely on local authorities or external grants. Early planning and well-prepared applications are crucial. **Technical Needs**: Expertise was needed to assess the roof, orient the panels, and manage permits—tasks beyond school staff, requiring specialists. **Project Management**: Clear contracts outlining responsibilities, timelines, and quality standards are essential. External support from inspectorates or local experts is highly recommended. **Educational Use**: Real learning requires more than observing installation. Locally relevant teaching materials should integrate solar energy into subjects like science and geography. **Monitoring Data**: Solar system data is a powerful teaching tool. In rural areas, making it accessible—via posters or displays—can enhance student interest in energy and sustainability.

Engagement	Connections	Change	Action
Switching from a thermal system to PVs showed that the school is open to new, cleaner technologies—even in a rural area with fewer resources.	The intervention showed how rural communities can manage the real-life challenges of putting sustainability into practice. The school adjusted its plans to fit local conditions—like	The solar project at Șercaia School gave students and teachers a clear picture of what a cleaner, more self-reliant future could look like. Using real-time energy monitoring, they could	The project at Șercaia School turned ideas into real action. The school installed solar panels, became a prosumer, and used monitoring tools to track energy use—showing a

Teachers, students, and staff took part in activities, displays, and lessons that made them think more about their impact on nature. These experiences encouraged real conversations, both in school and at home, about how to protect the environment. The project helped the school become a local example of how rural communities can take action for a greener future.	dealing with seasonal changes, limited resources, and maintenance needs—which led to practical and lasting solar energy solutions. Students and staff explored how different systems are connected, such as energy use, climate, and natural resources. Through hands-on activities and tracking energy data, they saw how local choices can have wider effects.	actually see the benefits of switching to solar power. The project inspired new lessons that combined different subjects and encouraged students to imagine how renewable energy could become a normal part of life—even in a rural setting. These activities helped students see that they can make a difference and be part of building a more sustainable community.	strong commitment to sustainability. At the same time, students started making greener choices in their daily lives and worked together to solve problems. They also helped spread the word through school activities and campaigns, showing that even small rural schools can lead by example and inspire others to do the same.

https://www.youtube.com/watch?v=Q57FkwuAA0E
https://ecf4clim.eu/materials-from-demonstration-sites/



Analytical Framework

Individual Competences

The implementation of the solar panel intervention at Șercaia School went beyond technical improvements, becoming a meaningful learning experience that helped shape important individual competences among participants, including responsibility, critical thinking, communication, initiative, and practical skill-building. These outcomes not only benefit the participants personally but also contribute to creating a more sustainable and informed future generation.

- ✓ **Personal Responsibility and Environmental Awareness** – In a community shaped by tradition, the intervention introduced new perspectives on sustainability. Despite limited initial knowledge, students showed strong motivation to learn about solar energy, quickly developing relevant competences. **Practical Skills** – The rural context enabled hands-on learning. Students connected solar concepts to farming, home energy use, and local infrastructure, making skills directly applicable.
- ✓ **Critical Thinking** – Students gained the ability to reflect on local challenges like wood heating and limited infrastructure, considering how renewable energy could address them.
- ✓ **Communication Skills** – The project gave students a chance to express their views on environmental issues, boosting confidence in school and community dialogue.
- ✓ **Proactive Behavior** – Students began practicing and promoting sustainable habits at home, showing the school's role in spreading change.
- ✓ **Problem-Solving Confidence** – Limited resources encouraged creative thinking. The project has built students' resilience and adaptability—key for rural sustainability.

Collective Competences

The solar panel intervention at Șercaia School, in a rural setting, became a strong platform for building collective competences through shared experiences and teamwork. As a central part of community life, the school used the project to strengthen social and organizational skills like collaboration, shared decision-making, inclusive communication, and joint problem-solving—key to rural resilience and sustainability.

- ✓ Teamwork and Cooperation – Students and staff worked together naturally in group settings, with the project adding new layers of coordination and goal-setting.
- ✓ Shared Planning – Participatory planning methods enhanced informal decision-making traditions, promoting ownership and shared leadership.
- ✓ Inclusive Communication – Structured dialogue encouraged participation from all voices, improving mutual respect and community unity.
- ✓ Problem-Solving – Facing limited resources, participants used local knowledge to co-create practical, context-aware solutions.
- ✓ Environmental Goals – The focus on sustainability felt tangible, aligning with everyday rural life through actions like home energy saving and awareness-raising.
- ✓ Role Flexibility and Peer Support – Students took on various roles, with peer learning enhancing skills and creating a supportive, empowering environment.

Technical-material Competences

The solar panel intervention at Șercaia School, located in a rural area, provided a highly relevant and accessible context for developing environmental and technical-material competences among students and staff. In a setting where hands-on, practical engagement often plays a central role in learning, the project not only involved the installation of solar panels but also created opportunities for deepening understanding of sustainability principles in ways that resonated with local realities. These competences—ranging from technical understanding to resource awareness and environmental stewardship—helped nurture a more ecologically conscious school culture and empowered participants to become active contributors to rural sustainability.

- ✓ Understanding Renewable Energy – Students gained practical knowledge of solar panel function, linking it to local issues like wood use and low energy efficiency. The intervention filled a key knowledge gap, showing how solar energy reduces both school and community carbon footprints.
- ✓ Energy Awareness – In a setting where resources are manually managed, students adopted conservation habits like turning off lights or using daylight—often sharing these practices at home.
- ✓ Data Literacy – Working with solar data helped students grasp real-time energy use. Despite varying digital skills, hands-on tasks like meter reading built foundational environmental monitoring skills.
- ✓ Pollution Awareness – The project deepened students' connection to nature through activities like waste sorting and local clean-ups, turning abstract pollution issues into concrete, visible concerns.
- ✓ Sustainable Habits – The rural context supported daily sustainable practices. Students reduced plastic use, reused materials, and cared for school green spaces, modeling environmental responsibility in their community.

RM-DS03-IN01
(WATER SENSORS)
INFRASTRUCTURE
IMPROVEMENT - WATER
SENSORS AT THE SANITARY
FACILITIES

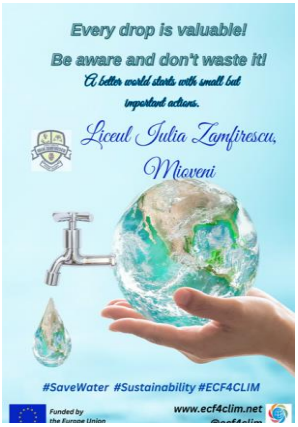
Upper secondary school

The intervention replaced traditional sinks with sensor-equipped models in all school restrooms. These motion-sensor sinks automatically control water flow, improving efficiency, hygiene, and convenience. Baseline water use was measured to assess impact accurately.

An educational component included posters in restrooms showing daily water use and promoting conservation. The ECF4CLIM team also created educational materials on water use and climate change, revised based on student and teacher feedback. These now serve as core teaching tools for integrating sustainability across subjects.

To support wider adoption, communication efforts promoted replication in other schools and homes.

Apa, o poveste educațională ...



Resources

Human	
Time	
Costs	

Relevant difficulties

While the process was ultimately successful, several challenges emerged that should be addressed to improve future replications:

- Funding and Procurement - Although water sensors are not prohibitively expensive, securing funds remains a barrier. The school relies heavily on municipal funding or must seek support through special projects. Clear budget planning and early engagement with funding bodies are essential.
- Technical Planning and Installation - The installation of water sensor requires preliminary planning regarding sensor placement, compatibility with existing plumbing infrastructure, and data connectivity. Schools typically lack in-house technical personnel with enough expertise. Coordination with suppliers and municipal utility departments is recommended to ensure proper setup.
- Maintenance and Data Reliability - Unlike passive infrastructure, water sensors require ongoing maintenance, calibration, and data verification. Schools may not have the capacity or knowledge to manage these technical needs. A maintenance plan, training for staff, and access to technical support are crucial to ensure long-term functionality.
- Educational Integration - For the intervention to have a meaningful educational impact, simply installing the sensors is not enough. Dedicated learning materials should be created to help students understand water consumption, conservation, and the broader context of environmental monitoring.
- Use of Collected Data - The effectiveness of water sensors as an educational tool depends on how the collected data is used. The information should be visualised in accessible formats and regularly shared with students and teachers.

Engagement	Connections	Change	Action
The intervention at Mioveni High School exemplified how sustainability values can be	The project illuminated the connections between infrastructure, behaviour,	By showcasing the tangible benefits of simple, sustainable technologies, the	The installation of water sensors was a direct and impactful action for

embedded into everyday school practices. By replacing traditional taps with motion-sensor models and integrating educational tools such as posters and learning activities, the school fostered a sense of environmental responsibility among students and staff. Participants engaged in meaningful reflection about water conservation and hygiene, leading to greater self-awareness and personal responsibility.	and environmental impact. Students learned to recognise the broader implications of water usage—understanding it not just as a utility, but as part of a global sustainability challenge. Participants linked small-scale technological changes to systemic issues like resource depletion and climate change. Educational materials helped deepen this to wider ecological, social, and economic dimensions.	school inspired a vision of a more resource-efficient and environmentally conscious future. The project encouraged students to imagine how thoughtful design and infrastructure can lead to long-term ecological improvements. Teachers used the intervention as a launchpad for interdisciplinary sustainability education, helping students envision practical steps toward a more sustainable society.	sustainability, leading to an 11% reduction in water usage. Beyond infrastructure, the initiative empowered students to take ownership of their behaviours and to promote conservation practices actively. The communication and dissemination of the intervention's outcomes also ensured that its influence extended beyond the school, serving as a replicable model for sustainable action in other educational settings and communities.

Analytical Framework

Individual Competences

The water sensor intervention supported the growth of a wide range of individual competences, including sustainability literacy, critical thinking, self-reflection, and initiative. These skills empower students to become active contributors to a more sustainable society and confident advocates for environmental change in their communities.

- ✓ Acquisition of Practical Sustainability Knowledge - Participants gained concrete knowledge about environmental protection, particularly in relation to water conservation and sustainable resource use. This knowledge extended beyond theoretical understanding to include actionable behaviours in everyday life.
- ✓ Development of Critical Thinking Skills - The intervention encouraged deeper reflection on environmental challenges. Individuals demonstrated improved abilities to identify, analyse, and propose solutions to sustainability-related problems, including the systemic roots of overconsumption and waste.
- ✓ Integration of Sustainable Habits - Students reported integrating eco-conscious behaviours into their daily routines. This behavioural shift reflects the ability to turn knowledge into practice and illustrates personal ownership of sustainability values.
- ✓ Increased Self-Awareness and Reflective Thinking - Participants showed growth in self-reflection, including a heightened ability to recognise their own limitations and to evaluate the impact of their actions. This introspection supports personal responsibility and ongoing development.
- ✓ Improved Communication and Expression - The experience helped individuals gain confidence in expressing their opinions, particularly around environmental topics. This included greater clarity in articulating ideas and a stronger willingness to engage in dialogue with peers and community members.
- ✓ Personal Initiative and Influence - Students displayed greater initiative in advocating for sustainable practices, often influencing behaviours in their homes and social circles.

Collective Competences

The water sensor intervention cultivated valuable collective competences, including teamwork, shared environmental responsibility, group problem-solving, and coordinated action. These skills contribute to building a school culture that supports sustainability and prepares participants for future collaborative efforts in both academic and real-world environmental contexts.

- ✓ Effective Teamwork and Collegial Collaboration - Participants consistently highlighted the importance of working together. The intervention created an environment where teamwork was not only necessary but valued, enhancing group cohesion and reinforcing the positive effects of collective effort.
- ✓ Shared Environmental Responsibility - The project nurtured a collective sense of care for the environment. This group-oriented attitude went beyond compliance, reflecting a sustained engagement with sustainability issues that was more impactful than isolated classroom instruction.
- ✓ Collaborative Problem-Solving and Analytical Thinking - Through joint planning and reflection—particularly among science-oriented students—the group developed collective analytical skills. This facilitated more effective project design and a deeper understanding of both the technical and environmental dimensions of the intervention.
- ✓ Common Understanding and Collective Action for Sustainability - Participants built a shared understanding of key sustainability challenges and demonstrated the capacity to act together in response. This common knowledge base and action-oriented mindset are seen as foundational for future environmental projects and initiatives.
- ✓ Enduring Impact Through Peer Learning and Group Engagement - The collective learning process reinforced the idea that long-term change is best achieved through sustained group engagement. Time spent working together on the project created deeper, more lasting learning outcomes than traditional, individual-focused lessons.

Technical-material Competences

The water sensor intervention successfully strengthened environmental and technical-material competences by connecting infrastructure improvements with practical learning. The experience fostered a better understanding of sustainable technology, encouraged responsible water use, and empowered participants to extend their conservation efforts to the broader community.

- ✓ Understanding of Sustainable Infrastructure - Participants gained concrete insights into how simple technological upgrades—such as sensor-based taps—can lead to real environmental benefits. The intervention served as a clear, observable example of sustainable infrastructure in action, reinforcing the practical connection between technology and ecological outcomes.
- ✓ Awareness and Monitoring of Resource Consumption - The intervention led to a measurable reduction in water usage—specifically, an 11% decrease—highlighting the effectiveness of consumption monitoring and efficient technology. This helped embed an understanding of how resource-saving devices can directly impact environmental performance and reduce operational costs.
- ✓ Promotion of Water Conservation Behaviour - Engagement with the project increased awareness of water as a finite and valuable resource. Participants became more mindful of daily water use and more committed to conservation practices, both within and beyond the school setting.
- ✓ Spillover Effects into the Wider Community - The behavioural changes observed extended beyond the school walls, as participants shared water-saving practices and insights with their families and local community. This dissemination of sustainable habits reflects an emerging competence in environmental communication and advocacy.

RM-DS04-IN02

DEVELOPMENT OF EDUCATIONAL MATERIALS FOR SUSTAINABILITY

University

The selected intervention consists of the development of a course "Sustainable Development in a Technological Society", course for students from the technical faculties.

It is structured in 8 modules: (M1) Introduction to Sustainable Development, (M2) Technical Aspects of Sustainable Development, (M3) Sustainable resource management, (M4) Responsible technological development, (M5) Green and Renewable Technologies, (M6) Climate Change and Technical Adaptation, (M7) Global Collaboration and the Future of Technical Sustainability, (M8) Practical Sustainable Development Projects.

The first draft was completed in Spring 2024 and reviewed with students and teachers in the SCT/SCC, as well as in a broader context. The feedback was incorporated, and the final version was ready and tested in the autumn 2024.

Resources

Human	
Time	
Costs	

To more info:

- https://www.youtube.com/watch?v=g6kxxweevww&t=2s
- https://ecf4clim.eu/materials-from-demonstration-sites/

Relevant difficulties

The initiative to develop and pilot a course on sustainability was a forward-looking step toward integrating environmental and social responsibility into higher education. However, several challenges emerged throughout the process, offering valuable lessons and recommendations for future curricular innovations in similar academic contexts:

- Curriculum Integration - Incorporating a new interdisciplinary course into existing technical programs is a complex process. Sustainability, by nature, spans multiple disciplines, and aligning its content with the traditionally rigid and technically focused curricula of engineering required negotiation and curriculum adjustments. Ensuring that the course fit within credit structures was a key challenge.
- Academic Engagement and Awareness - Initial engagement from faculty members varied. Some teachers lacked familiarity with sustainability concepts or did not immediately see their relevance to their specific technical field. Promoting the importance of sustainability in engineering education and gaining the support of academic staff required sustained dialogue and demonstrations of practical relevance.
- Content Development and Interdisciplinary Approach - Designing course content that was both technically rigorous and interdisciplinary posed a challenge. The development team had to ensure that the course balanced theoretical understanding of sustainability with sector-specific applications. Creating such content required collaboration across departments, which was not always easy to coordinate.
- Student Engagement and Expectations - Students in technical faculties are often trained to focus on concrete, solution-oriented problems. Introducing broader concepts such as systems thinking, social responsibility, and long-term environmental impacts required a shift in mindset. Active teaching methods, such as project-based learning and real-world case studies, helped increase interest and relevance.
- Evaluation and Feedback Mechanisms - Identifying appropriate evaluation tools to measure learning outcomes, student engagement, and interdisciplinary understanding required careful planning. Furthermore, incorporating student and faculty feedback to improve the course in real time demanded flexibility and an iterative approach to course design.

 Engagement	 Connections	 Change	 Action
The course actively fostered engagement by encouraging students to reflect on their values and roles in addressing sustainability within their professional and personal lives. Through structured learning, collaborative discussions, and interdisciplinary interaction, students were empowered to internalise environmental responsibility. The integration of student and teacher feedback during course development further emphasised the collective ownership of sustainability values. This ongoing reflection nurtured a culture of care, responsibility, and ethical commitment to sustainable development in the university community.	The course helped students explore the multifaceted and interdependent nature of sustainability challenges. By examining environmental issues through the lens of technical systems—energy production, resource use, technological development—students learned to navigate the complexity of sustainability in real-world contexts. The modular structure (from technical aspects to global collaboration) provided a systemic perspective, helping students recognise interrelated causes and consequences and the need for interdisciplinary thinking.	The intrvention inspired students to reimagine the role of technology and engineering in building a sustainable future. Modules on renewable technologies, responsible innovation, and climate adaptation encouraged learners to envision green futures where technical knowledge serves ecological and societal well-being. Students began integrating sustainability into their career ambitions and technical projects, aligning their learning with a broader mission of sustainable transformation.	This course translated theory into concrete learning and applied sustainability in a technical context. Students not only acquired knowledge but also acted on it by designing and evaluating sustainable solutions in practical projects. They practised environmental impact assessment, incorporated green principles into engineering work, and took personal and academic steps to reduce their carbon footprints. The university environment itself benefited as students and educators began to embody sustainable behaviours, reinforcing the institution's role as a site of meaningful, systemic change.

Analytical Framework

Individual Competences

Students emerged with stronger critical thinking, practical skills, personal responsibility, and communicative confidence—tools that will support their contributions to a more sustainable future.

- ✓ Critical and reflective thinking - Students reported a stronger ability to analyse complex problems and to think more deeply about the broader implications of their actions. They became more reflective in assessing environmental trade-offs and more discerning in evaluating sustainable choices.
- ✓ Improved environmental awareness and responsibility - Participants demonstrated increased awareness of their personal environmental impact and a sense of responsibility for integrating sustainability into daily decisions—both within academic and personal contexts.
- ✓ Application of theoretical knowledge to practice - Learners successfully transferred academic knowledge into real-life scenarios, gaining practical skills in designing, evaluating, and contributing to green projects. This helped them bridge the gap between abstract concepts and practical solutions.
- ✓ Integration of technical and sustainability skills - Students developed the ability to merge their engineering or technical expertise with sustainability principles, improving their capacity to design environmentally conscious solutions and systems.
- ✓ Growth in communication and expression - The course created opportunities for students to articulate their ideas more clearly and confidently, particularly during debates, presentations, and collaborative activities. This also contributed to their openness to diverse perspectives and new ideas.
- ✓ Initiative and independent learning - Participants exhibited greater autonomy and curiosity in their learning process. They showed initiative in exploring sustainability themes and applying what they learned beyond course requirements.

Collective Competences

The course successfully cultivated collective competences essential for sustainability-oriented professionals. Through interdisciplinary collaboration, shared decision-making, and mutual support, students developed the capacity to work collectively toward common environmental goals—an indispensable skill set for tackling complex societal challenges.

- ✓ Teamwork and collaborative problem-solving - Students learned to work together more effectively, leveraging one another's strengths and combining diverse skills to generate solutions. Groups facilitated joint decision-making and highlighted the value of working in coordinated, supportive teams.
- ✓ Co-creation across disciplines - The course created opportunities for students having different preferences and performances in different disciplines to co-develop sustainability solutions. Such collaboration broadened perspectives and allowed for more creative and holistic responses to environmental challenges.
- ✓ Inclusive and respectful communication - Participants practised open and respectful communication, where all voices were valued. Group work encouraged inclusive dialogue and the appreciation of different viewpoints, contributing to richer outcomes and stronger group cohesion.
- ✓ Shared focus on sustainability goals - Students remained aligned on common objectives throughout the development of the course. The shared focus on environmental responsibility gave the group work coherence and helped translate abstract principles into actionable outcomes.
- ✓ Collective engagement in green mindsets - Beyond completing tasks, students supported and reinforced each other's commitment to sustainability. Working as a group strengthened their motivation and deepened their sense of shared purpose in pursuing more sustainable behaviours and solutions.

Technical-material Competences

The course offered a structured opportunity for engineering and technology students to integrate ecological awareness into their disciplinary perspective and project work. It enabled future engineers to evaluate the environmental impact of their work, design more sustainable solutions, and act as responsible agents in the transition to a greener society.

- ✓ Understanding of environmental impact in technical contexts - Students developed a clearer awareness of how technology affects the environment. They learned to assess the ecological implications of energy production, resource consumption, and infrastructure development, integrating sustainability principles into their technical knowledge base.
- ✓ Reduction of carbon footprint through informed decision-making - Participants reported an improved ability to recognise and reduce their personal and professional carbon footprints. This awareness was translated into practical actions and became an evaluative dimension in student project work.
- ✓ Integration of green principles into engineering solutions - The course fostered a shift in design thinking. Students began to incorporate sustainability as a core value in their technical proposals, treating environmental impact as a criterion for responsible engineering and innovation.
- ✓ Resource efficiency and conscious consumption - Students showed increased attention to energy use and resource efficiency, both personally and in the context of the university. This awareness reflects a maturing understanding of sustainability as a systemic challenge, influenced by everyday habits and technological systems alike.
- ✓ Greening the academic environment - The course contributed to creating a more environmentally conscious university culture. Through project-based learning and reflective discussions, students and educators alike took responsibility for promoting sustainable behaviours and reducing the institution's environmental footprint.

FN-DS01-IN02

FOSTERING POSITIVE ATTITUDES WITHIN THE TEACHERS AND WHOLE SCHOOL PERSONNEL TOWARDS SUSTAINABILITY EDUCATION

Primary and lower secondary school = comprehensive school

AIMS: Fostering positive attitudes and engagement within the teachers towards sustainability education. Talking about and actions for sustainability would increase. Sustainability would become as visible and integrated in whole school culture. Establishing continuous teachers' and students' teams both at primary and secondary school. Sustainability become as lenses for critical reflection, if our practices are sustainable and meaningful or not. ACTS: Facilitating discussions about roles and links of different subjects to sustainability education. Fasilitating value discussions, organising vegetarian cooking evening for teachers. Organising a recycling market Whats App group for teachers, integrating sustainability teams' issues in every staff meeting, choosing sustainability as the theme for inquiry-based/phenomenon-based learning week for three years, organising a testing of sustainability education escape room game for teachers, organising a school visit in a pioneer sustainability education school for group of teachers and a well known pioneer teacher (from the school the visited) came for a visit and talked to all the teachers.

Relevant difficulties: *Multiple tasks and duties in teachers' work, sustainability considered as an extra, if not considered and integrated as a core goal of education. Sharing responsibilities and expertise. Enough time for planning and collaboration. Sustainability issues need to raised continuously within the school community. Often social problems, security issues require so much attention and become prioritised that sustainability issues are not considered equally important and do not gain attention. Thus the understanding how promoting students' agency also in ecological sustainability campaigns can improve students' general engagement and wellbeing, and thus social benefits and security, too.*

Resources

Human	
Time	
Costs	€ € €

Analytical Framework

Individual Competences	Headmaster: raising and prioritising, and allocating resources for sustainability education and teachers' sustainability teams. Teachers' understanding of sustainability and sustainability education, considering students' interests, skills of an Inclusive and dialogical, participatory approach, effective organisation, positive and inclusive leading of teachers' and students' teams, communication, managing time and prioritisation of sustainability education. Making initiatives and collaboration.
Collective Competences	Inclusive and dialogical, participatory approach, effective, positive and inclusive leading of teachers' and students' teams. Allocation of resources. Shared leadership in sustainability education. Established team meetings for teachers and students. Priorisation and emphasis on sustainability education in the municipality's strategies. Positive attitude and awareness of how sustainability is integral in the school culture.
Technical-material Competences	The old school building will be renovated soon, no sense in improving, e.g. recycling system or other technical issues in the school. Technical constraints: Not enough space, e.g. vegetarian food options in the school restaurant's "main tables" or ineffective communication screens at school.

Sustainability competences in place in the intervention

 Engagement	 Connections	 Change	 Action
Positive attitudes and motivation among teachers - without it, nothing will succeed was regarded as the main goal by headmasters at the beginning of the ECF4CLIM projects. Making visible the efforts already made for sustainability. Ongoing discussions are needed. The management team should include someone interested and raising the issues of sustainability. Restricted time resources constrain teachers' possibilities of organising extra activities. Listening and meeting inspiring visitors, learning from other schools' practices. Working together, being a part of a bigger project and network of people acting for sustainability, empowers compared to acting alone.	Municipal strategies for sustainability education and carbon neutrality, general attitudes to promote sustainability education matter. Teachers need to find meaningful connections and possibilities to integrate sustainability education into their teaching. During the last campaign days, sustainability issues have been raised more by the teachers and discussed in the lessons. Understanding how acts for sustainability and fostering students' agency can improve social wellbeing and atmosphere can improve engagement (this was raised in the school visit and by the visiting teacher). This inspired the teachers very much!	The aim was to promote collective will-formation towards sustainability education. Interventions: Continuous and resilient talks enabled by leaders, active teachers and visitors about the importance and relevance of sustainability. Talk about sustainable acts during the lessons. Also, individuals' initiatives for collective action and individuals' acts matter.	Active teachers' enthousiasm and engagement have been the key, finding meaningful rolfor teachers to participatees, having realistic goals to succeed, considering the rhythm of the school year, teachers' resources, and teachers' working loads. Scheduling a yearly calender. Integrating sustainability education in basic work and schedule, not being an extra. Receicing support from ECF4CLIM, being part of a bigger movement.

FN-DS01-IN03

FOSTERING POSITIVE ATTITUDES WITHIN THE TEACHERS AND WHOLE SCHOOL PERSONNEL TOWARDS SUSTAINABILITY EDUCATION

Primary and lower secondary school = comprehensive school

Engaging and promoting positive attitudes among the whole school community for promoting sustainability were brought up as one of the key issues in SCTs and SCCs. Different acts, 4 campaigns were organised to make sustainability visible and to activate students in acts for sustainability. The 1st campaign "sustainability Christmass calendar" included info slides motivating people for sustainability actions in 2023. This intervention failed in visibility due to technical issues. This was further developed to a 5 week campaign competition in spring 2024 to boost small, but meaningful acts for sustainability like raising awareness about fast fashion, promoting biking, favoring vegetarian food and activities in nature. The campaign was co-created and designed together with lower secondary school students and researchers. The students were familiarised with different motivation profiles and they designed communication slides during a whole day meeting. The students were responsible of sharing the information, creating an Instagram-account for the competition and evaluation the results of the competition. The campaign designed by lower secondary school students was launched also in primary school, where classes were competing with each other. This 5 week campaign failed in lower secondary school due to poor communication and technical problems in Instagram. However, in pimary school it went better in those classes where teachers were actively involved and encouraged their students to participate. The problem of this campaign was timing: campaign was realised during the most hectic weeks in the end of the school year, when all the extra activities take place. Perhaps if the teachers had been more engaged in planning this problematic timing would have been better considered. New campaigns were planned for the autumn term 2024 and realised during the school term 2024-2025, crical consumerism, recycled toys market for primary school and immaterial gifts campaign for lower secondary before Christmass and big Earth Hour 2025 campaign for the whole school and this campaign challenge spread to other 2 schools. In these last campaigns teachers were more involved and designed the campaigns with the students.

Relevant difficulties

Hectic school life, lack of time for extra activities, planning interesting meetings for students, not too much talk, but concrete action, and integrating activities that improve social relations within the students' teams. Communication issues, how to inform about the campaigns.

Resources

Human	
Time	
Costs	

Analytical Framework

Individual Competences

Understanding of the relevance of sustainability (systems thinking), motivation and knowledge about how to act for sustainability. Critical awareness of current practices and lifestyles' unsustainability. Communication, positive approach, considering students' interests and life-worlds (awareness of motivation profiles). Practical organising skills, making initiatives, collaboration and creative thinking.

Collective Competences	Scheduling skills, integrating campaign days in the school's calender, organisation of events that make sustainability visible in school life. Finding time for planning meetings. Participatory culture in the planning and organisation of events and campaigns. Positive attitudes and enough people are interested.
Technical-material Competences	Technical communication tools (which made the first campaigns fail). How to use technical (screens and apps) for communication

Sustainability competences in place in the intervention

Engagement

Engagement was the main focus of the interventions. The Students of the team created info sheets for communication, learned to consider different motivation profiles/interests of students, and they were also encouraged to use humour in advertising. Interesting activities, skipping boring lessons when participating in these activities, helped to engage students. For the last years' campaigns, social aspects, students' interests were very well considered, and the Earth Hour also addressed the social challenge of creating alternative social activities rather than just using your mobiles during the breaks. CHALLENGES: Students do not want to skip their lessons. Students have many interests. They are not interested, youth culture, by e.g. TikTok or YouTube do not encourage or motivate students to sustainability. Continuous reflection was the way to overcome the challenges.

 Connections	It would have been important to focus better on communication within the whole school, with teachers, those persons who are responsible for the screen communication. If teachers had been more involved, maybe the timing would have been considered better. Connecting campaigns better in the school yearly rhythm - a yearly calender was created in the last spring of ECF4CLIM.
 Change	The aim was to make sustainability visible and interesting for students to engage them in sustainability actions. The ECF4CLIM team and teachers facilitated reflections on students' life-worlds and motivation profiles to help the student team invent appealing campaigns and events. The last Earth Hour campaign was really a success, with a great atmosphere of joy and creativity and planned well with students. The social aspect was well considered.
 Action	Trying out, not giving up, organising various campaigns several times during 1,5 years. Challenges: timing, other competing events and issues at school, changing teachers/personnel. Enabler: scheduling events better. Yearly calender for planning campaigns.

FN-DS02-IN02

FOOD

Samke upper secondary (= Sammon keskuslukio =Sampo central upper secondary)

This intervention aimed to improve the sustainability and quality of food served at the school canteen. The students and teachers had found especially the quality of vegetarian food poor, which led to students not choosing the vegetarian option, and an unnecessarily large amount of biowaste. They wanted to decrease the amount of leftover food, decrease the environmental impact of the food, and foster positive attitudes towards (more sustainable) vegetarian food, especially among students.

- Zero biowaste days for the whole school- info slides from the student team on info screens
- Query about food
- Meetings with students, teachers, municipality administration, and food service company
- Measuring the amount of Biowaste from the school: acquiring a password from the recycling company for getting the statistics about the changes in amount (kg) during the project
- Experiment on taking trays away from the lunches, because washing the trays uses lots of water and energy every day. During the experiment, it was noted, that with such a big school and many students in the canteen same time, the trays are very important.
- The new practice: the students and teachers and other staff can buy leftover food from kitchen at the end of the day, so it won´t go to biowaste
- The purchase of the biowaste scale https://biovaaka.fi/en/
- A tasting day for student team to comment on new vegetarian dishes, organised by the lunch service company

Relevant difficulties

Hectic school life, lack of time for extra activities, planning interesting meetings for students, not too much talk, but concrete action, and integrating activities that improve social relations within the students' teams. Communication issues, how to inform about the campaigns.

Resources

Human	
Time	
Costs	€€€

Analytical Framework

Individual Competences

- ✓ The collaboration and argumentation skills of all the people involved
- ✓ Systems understanding: what really matters, being able to understand all the connected and interfering issues.
- ✓ Skills for choosing sustainable nutrition and food
- ✓ Understanding the meaning of vegetarian food
- ✓ Skills of cooking by restaurant and food service company members
- ✓ Realising the personal amount of leftover food with the bio scale

Collective Competences	✓ Finding time and space for meetings ✓ Structures for cooperation with the lunch service company, the principals, teachers and students ✓ Affecting the norms of the whole municipality by negotiating with the common lunch service company ✓ Trying to have an impact on increasing the resources for sustainable nutrition and food ✓ Collective understanding of the amount of leftover food on different days and with different dishes ✓ New practice: You can buy leftover food from the kitchen at the end of the day ✓ Background: existing strategy of the lunch service company ✓ Background: existing sustainability strategy of the municipality, stating increasing the vegetarian food as a goal
Technical-material Competences	✓ Possibilities for information: a big screen in the canteen ✓ Biowaste scale to measure the amount of wasted food, individual feedback and figures from the statistics on different days

Sustainability competences in place in the intervention

 Engagement	 Connections	 Change	 Action
➢ The quality of food served at school is important for students and their well-being, so they had the motivation to engage in sustainability efforts concerning lunch. ➢ The CO2 emissions of food served at schools are a relevant and remarkable issue in municipality CO2 calculations, and the municipality is engaged in decreasing the emissions from the food served at schools. ➢ The engagement of the municipality with quality food shows when the lunch service company is obliged to consider students' feedback. ➢ The engagement of students to think about the sustainability of food is poor on average: the atmosphere in a school devoted to sports has other priorities, like having enough calories and the right share of nutrients in the food.	➢ Most of the issues related to school food are not controlled by the school or its own canteen personnel, as production and decisions are centralised. ➢ The poor national budget and the budget of the municipality are connected to the quality of food, because lunches are free for students, which comes under the legislation of Finland.	The hope was that the quality of school food would slightly improve, the feedback system from students to the lunch service company would improve, and people would learn how they could influence and collaborate for a more sustainable food system at school. The student and teacher teams tried different innovative ways to make the lunch system more sustainable. The meetings (including SCTs and SCCs) to consider the possibilities and plan action were crucial in promoting the activities.	➢ Meetings of the students' team and the teachers' team have been crucial in taking action, and the positive, resilient attitudes of the team members. When people regard this as important, they prioritise the collaboration, and time is easier to find. Limited time resources of students and teachers have been an obstacle. ➢ The purchase of the biowaste scale wouldn´t be possible without the ECF4CLIM project. It has an annual cost, and there is a preliminary desicion that the school will pay the scale even in the future, without the help of any project.

FN-DS02-IN06

ENGAGEMENT OF STUDENTS: ESTABLISHING A STUDENT SUSTAINABILITY ACTION GROUP

Upper secondary

AIMS: to foster visibility of sustainability and climate action at school and establishing a culture and structures for students' participation. Thus, to foster collective awareness and positive attitudes about sustainability and climate action, therefore, it also aims to foster individual competences. Establish a student sustainability team for Samke high school through participatory approach. Raise students' awareness about the possibilities to participate and act in a sustainable way. Organising different activities with students like improving schools' practices towards more sustainable, awareness raising campaigns, visits and excursions. Creating a structure of time, place and resources for the team. Improving the whole school practices to become more sustainable. Short meetings organised almost every week. During the year 2022-2023 the focus was on mapping the issues the students regarded as important. Improving the quality of school food and recycling were considered as the main issue. During the year 2023-2024 new recycling and collecting bottles systems were established and also campaign days related to decreasing the bio waste at the school restaurant. Also critical consumerism days were organised. Both years 2022-2023 and 2023-2024 students visited primary schools to tell about problems of fast fashion. 2025 spring a panel discussion of green careers organised. Evaluation day in May 2025 results: (1) yearly calendar for sustainability activities, (2) establishing the schedule and credits for students to participate, (3) teachers and students will have meetings together as students' perspectives and ideas are very important to consider.

Facebook post by ECF4CLIM Finland: Sustainability experts are needed in many fields!

What do you have to offer the world? This is one of the questions asked, for example, in job interviews at Colliers Finland Oy, as shared by Jussi From from Colliers Finland Oy yesterday during the Green Career Path panel discussion organized by students and teachers of Sammon keskuslukio.

Representatives from six different companies and also the city were present. They shared how their work contributes significantly to reducing climate emissions.

For example, VR (the Finnish railway company) has managed to reduce emissions by 10% simply by improving train drivers' driving habits—when there is the will, there is a way.

Attitude makes all the difference!

Relevant difficulties

During the three years of ECF4CLIM, searching for time for the meetings has been discussed; thus, lack of time is the key difficulty, very tight schedules, and no breaks during the day for extra activities (structural challenges). Different solutions and timings were tried out, and finally, solutions were found. Sports-oriented students are not generally interested in sustainability. Lack of time to activate students during lessons, students used to having a passive role, mainly following instructions/ doing things teachers tell them to do in lessons at school. The solution was to consider students' interests carefully, students' gaining credits and diploma (might be beneficial for searching jobs) according to their participation and collaborating among students and teachers in common regular meetings.

Resources

Human	
Time	
Costs	€€€

Individual Competences	Collective Competences	Technical-material Competences
Engaging students in sustainability, raising interest and activating collaboration, courage of acting differently than mainstream students, making initiatives, dialogue, listening, understanding different motivation profiles/ways of thinking, understanding of sustainability issues and possible solutions. Teachers: participatory skills, collaboration and openness to work with students as equal participants, being interested in and widening perspectives to students' lifeworlds, cultivating a positive atmosphere, acting as a positive role model, analysis and use of e.g. bio-waste data. Making surveys to gain an understanding of students' attitudes.	Managing time: Scheduling meetings, creating a team, communication, and planning together. Resources for monetary compensation for leading teachers. Participatory approach. Yearly calender with a strategic plan on how to recruit students, including campaign days and excursions. A credit system for students participating. Effective and positive communication. Supportive and effective leadership and allocation of resources for sustainability. Developing a school culture that aims to consider sustainability in all its activities.	Big screen in the school restaurant for communication, new recycling bins, bio waste scale

Sustainability competences in place in the intervention

 Engagement	Main focus: how to engage students in a sustainability team and generally, raising interest and motivation to act. Creating a sustainable culture of practices in the whole school to engage students. Enablers: Inviting the friends of those mapped as interested in environmental issues with them to the meetings, listening to and considering students' wishes and perspectives. The students also get easy study credits out of participating in the team, organising interesting events and excursions related to the students' interests and wishes. Telling about the option to influence positively also through the possibility to participate in the ECF4CLIM research project. Students and teachers started to plan and work together. Engaging all the students through surveys, with a video on the sustainability efforts of the school. Designing a yearly calendar to engage students in sustainability throughout the school year. See also connections (how to engage students through awareness of connections to sustainability)
 Connections	Connecting sustainability to students' life worlds: consumerism, clothing, future careers, sports and the sustainability issues raised by them: recycling and food. Collaboration among teachers (also students are interested) between Tampere municipality and the high school of the area- participants of the meetings were collective/centralised timings of the schedules (to enable cross-studying between schools) have been decided. Challenges: General attitudes and social identities questioning the importance and relevance of sustainability among especially boys. Collaboration with the centralised food and maintenance company is challenging and complicated due to the structure.
 Change	Aimed change: to promote teachers' skills to engage and motivate students, or organise student-centred activities. Moreover, it is a collective change of the structure of the students' schedule - find a good time for student team activities. Reflecting these issues together with teachers and headmaster, and students, by finding out and sharing experiences on how these issues have been organised in other high schools or trying to lobby the curriculum work on how this kind of student-centred and participatory activities could be part of the curricula. Learning about and reflection on different motivation profiles and focusing on and considering students' interests.
 Action	Students' team's responsible teacher conducted evaluative discussions with each participating students, this has best fostered his understanding. Continuous reflective discussions with ECF4CLIM researchers with headmaster and teachers during evaluation days.

FN-DS03-IN01

DISCUSSIONS AND COACHING ON SUSTAINABILITY AND CURRICULA DEVELOPMENT WITH TEACHERS AND STUDENTS

University

The main goal of this intervention was to promote sustainability in the university's curriculum reform process from 2021 to 2024, in other words, promote collective sustainability competences in the University of Jyväskylä. The aim was for sustainability to become visible, connected, and prioritised.

Resources	
Human	
Time	
Costs	€ €

With the ECF4CLIM project, we organised happenings, meetings, and discussions:

1) The ECF4CLIM project, Student Union, Student's Sustainability forum and sustainability officers of the university organized 24.1.2023 a seminar and a panel discussion on sustainability and curricula. Students were in a crucial role in organizing the seminar. They contacted faculties and asked representatives of curriculum planning to join the panel discussion and seminar. All faculties joined. They also advertised the seminar to students. Students also hosted the whole seminar and had a speech for participants. People from university administration joined the planning of the seminar. ECF4CLIM researchers facilitated the whole process and took part in informing, analysing and reporting about the seminar to the university. In addition to the seminar, during the intervention, the ECF4CLIM project created materials for curriculum development in sustainability, provided information on sustainability in curriculum reform, and held several other events for various faculties.

2) The ECF4CLIM researchers organised workshops and discussions with the Faculty of Education and Psychology, Jyväskylä University School of Business and Economics, and several vstudent groups from Surent union. The goal was to coach students and teachers in the promotion of sustainability competences, based on the initial ECF4CLIM Roadmap, and sharing ideas on how to take part in the curriculum reform process. within the university. Target groups of the evenyts were the staff, teachers, and students of the university.

3) The ECF4CLIM researchers created materials for curriculum development about sustainability competences. The materials were shared on curriculum planning platform for all university personnel.

4) Implementation of the new curricula started autumn of 2024. In autumn 2024, after the impelentation of the new curricula started, the ECF4CLIM team from JYU asked a student group of various disciplines from the Students' Union to assess their own new curriculum. They identified several sustainability contents, and improvements from the previous curricula.

Relevant difficulties

The main obstacle to incorporating sustainability into studies appeared to be limited resources. Curriculum development was carried out alongside other responsibilities. Even teachers designing courses within the faculty lacked the resources for collaborative planning. Finding time to cooperate with the ECF4CLIM team was nearly impossible. The administration's mandate to include sustainability in every student's studies was left to the responsibility of individual teachers who were planning the courses. After the reform, this responsibility still relies on teachers' own initiative, as the curriculum statements are so general that they can be interpreted in various ways.

Also, it was hard to organise meetings with students, because they do not have time for extra work either, even if they were motivated or engaged in sustainability issues. Universities are nowadays very busy places with lots of different kinds of demands.

Engagement

The students organising the seminar were deeply engaged and motivated to promote sustainability. The seminar offered them a framework to send their message to all the faculty and the designers of the curriculum. The representatives of all the faculties joined the panel discussion. The meaning of the events, webinars and materials created in this intervention was to ease the curriculum designers' work in implementing sustainability contents in their curricula. The aim of the whole intervention was that all the faculties would engage in the sustainability contents in planning the curricula.

The ECF4CLIM project tried to engage people in coming to events by offering some coffee, too.

Connections

The intervention was connected to the curriculum reform of the university, so the framing of the intervention came outside the ECF4CLIM project. During the intervention, we found out that each faculty has the interests of their own interests, and sustainability is not at the core of curriculum design, but for example, division of resources, like how many hours are allocated to each course. Some disciplines have special demands for the contents of education connected to legislation (e.g. teacher education and psychology education), the curriculum frame is full, and it is hard to include courses focused on sustainability. The ECF4CLIM project had no close connection to the faculties (we researchers come from the Finnish Institute for Educational Research, which does not have directly students or linked degree courses), so it was hard to become part of their development process. The ECF4CLIM team was considered an outsider.

Change

At the beginning of the ECF4CLIM project, students expressed concern that studies at JYU do not sufficiently incorporate sustainability perspectives. They noted that at the university level, everything seems to start from scratch, and the teaching does not acknowledge the sustainability competence they have already developed in primary and secondary education. They emphasised the need to integrate sustainability competence into their disciplinary studies to deepen their understanding. The risk, both then and now after the reform, is that new sustainability content remains superficial, preventing meaningful change and the development of students' comprehensive, multidisciplinary sustainability competence. The students seemed to be more ready for the change towards sustainability, while teachers with established teaching habits and contents.

Actions

The students were deeply engaged in organising the seminar, which turned out to be the most successful part of the intervention. The main obstacle was the lack of time among both students and teachers (see the question below), which made cooperation between the ECF4CLIM team and other stakeholders difficult. This also contributed to the ultimate goal—more sustainable curricula—being less ambitious than originally planned.

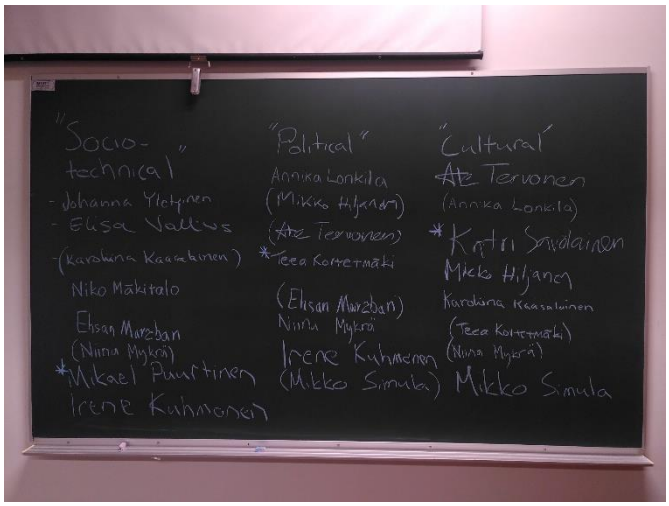
Analytical Framework

Individual Competences	The students, the teachers, and the other staff gained knowledge about sustainability and sustainability competences during the process. Also, the students organising the seminar got skills in organising events, contacting the leaders of the faculties, and engaging people. The efforts of ECF4CLIM hopefully also affected the attitudes of the members of the JYU community through information on sustainability competences and a news article, both open to the whole community.
Collective Competences	The curriculum is a focal part of collective competences at universities. During the process, one of the themes that the university focused on was "Responsible expertise and sustainable development". The theme was based on the agrements and desicions made earlier by the university: The agreement between the University of Jyväskylä and the Ministry of Culture and Education, the vice rector decided that all future JYU graduates will have necessary understanding for the promotion and development of sustainability, The Environmental Programme of the University of Jyväskylä, and the Theses on sustainable development and responsibility of the Council of Rectors of Finnish Universities align these goals. The collective competences of JYU developed through the process: the curriculum has more sustainability contents than before. It cannot, though, be assessed what part of the development exactly is due to the ECF4CLIM project.
Technical-material Competences	Technical-material competences were not the goal in this intervention.

FN-DS03-IN02

INTERVENTION WITH "SUSTAINABILITY TRANSITIONS" MODULE

University



The ECF4CLIM project and the ECF4CLIM researchers were asked to take part in the planning process of a novel "Multidisciplinary Studies on Sustainability Transitions" study module (15 ECTs). A central objective of the study module is to strengthen students' multidisciplinary understanding of sustainability-related challenges and solutions. It explores sustainability transitions through the lenses of technological innovation, societal governance, and cultural behaviours. These transitions are framed as complex processes that demand multi-level and cross-disciplinary approaches.

The ECF4CLIM project was to bring insights on sustainability competences to the process. GreenComp and the initial ECF4CLIM Roadmap for sustainability competences were introduced to the dplanning team. The planning of the study module started in late 2023, and the first courses were implemented during the spring 2025. The planning process involved all faculties of the multidisciplinary university. The aim was to create an integrated module where disciplines are interwoven rather than treated separately.

A collaborative team of 25 participants designed the courses and lessons, emphasizing collective planning over isolated contributions. In addition to regular meetings, with the resources from ECF4CLIM, the team of 15 participants held an intensive two-day seminar in April 2024 at the university's off-campus research station. Trough discussion and group work in a focused environment, the planning process and cooperation deepened. After the seminar, one ECF4CLIM researcher had focus group interviews with the planning group members. The interview data was used also in other research project, in the study about connections of the wisdom and sustainability competences, based on the Holistic Wisdom Model created by researchers of JYU. This study gave aslo insights to the ECF4CLIM research and this report. Finetuning of some courses , e.g. design of course about cultural and behavioural aspects of sustainability transition, is still going on. During the autumn 2025, ECF4CLIM researchers will create some videos for the course, based on the experiences in ECF4CLIM project.

Relevant difficulties

A big part of the resources comes to the university from the government, and the resources are not so huge - new openings are always hard. Finding time for the planning process was really hard for some teachers. In some faculties, a supervisor even prohibited participation unless the university provided additional resources for the initiative. In these cases, some teachers used their free time (away from their families) to join the planning, because they saw this study module as so important. There is still a risk that there are not enough resources to implement the plans and run effective courses and classes amid everyday responsibilities.

Resources

Human	
Time	
Costs	€€€

Engagement

Personal interest and engagement of designers in developing sustainability studies at the university were the main drivers in the planning of this study module. Also, the knowledge about sustainability crises and the need for interdisciplinary approaches to solve the problems was crucial in engagement. Staff at the university are very busy, and it is a challenge to find as much time as needed. For engagement, it was very fruitful to organise a two-day seminar with the help of ECF4CLIM resources - when taken away from the university and their computers, designers could focus on deep conversations on their values and thinking, and on negotiation about the goals of this course.

Connections

The policies, decisions and practices of the university framed the planning process, so the decisions of the planning group were connected to JUY structures. Sustainability is stated as a goal of the university in the contract between the university and the Ministry of Education, and it has helped to design this course. The connections between faculties and the administration of the university have been crucial. Each faculty has power only over its own things, and in some faculties, there are nationwide demands for the contents of studies (psychology, teacher education), so for those students, this kind of course is hard to fit into their studies. The group could not make autonomous decisions, but negotiations were needed between various parties. For example, the main facilitator of this planning process negotiated with the administration and faculties. Some negotiations have been hard: not all the deans buy the idea of this course. There are diverse understandings of what research and knowledge are, and what are only opinions. The whole variety of life philosophies also exists at universities.

During the process, many designers said that persistent discussions helped to understand and also accept the different views of others. It was important to understand and accept that the goal is not a single tone and vision, but parallel understandings, and it is still possible to go forward. The meetings and discussions on the overall goals of the module were needed to frame the problem in sustainability transitions. The future students will have a systemic understanding about sustainability transitions. The goal is that their competence on the driving forces of sustainability transition will be enhanced, and their thinking will widen from single discipline to multidisciplinary thinking.

Change

The long-term vision of this course is that students will broaden their understanding of sustainability and the driving forces behind the sustainability transition—from a single-discipline perspective to multidisciplinary thinking—and gain the competence to become professionals in their field, contributing to sustainable change and transition. The goal is that the students get competence to negotiate with professionals from different disciplines to find together the best results for sustainability in their future work. The idea was also that with this novel multidisciplinary approach, it is possible to create something totally new, because we need new solutions to current sustainability problems.

The goal of this ECF4CLIM intervention was that, with the ideas from the ECF4CLIM project, this course could be better. Our vision was that we could promote the learning of designers.

Actions

The biggest challenge with the planning process is the scarcity of time of teachers and staff. One solution was to organise the planning seminar, which gave the designers an isolated place and time for planning and discussing. The ECF4CLIM resources were crucial in this.

A prerequisite for this study module was that the university had introduced new policies promoting both multidisciplinarity and sustainability. These policies likely made it possible for the rectorate and deans to approve the inclusion of this course in JYU's curriculum.

The personal engagement of the designers was very important for making the planning process happen. Also, patience was needed: big changes in thinking and action take time. The designers made personal choices to prioritise the planning over other tasks or free time. The main facilitator of the module planning did a very good job in planning the meetings and structuring the results from the meetings. Without his personal contribution, the planning would be really hard. The cooperation of the designers in a friendly and supportive atmosphere was also a crucial factor in realising the study module.

Analytical Framework

Individual Competences	It was important that the designers of this study module had comprehensive knowledge of the sustainability crisis from the perspectives of their disciplines and understood the need for sustainability transition. They were ready to communicate their perspectives, were open to different views, and were able to negotiate the interdisciplinary goals of this study module with others by widening their assumptions. In the interviews, the designers said that the planning process has been a learning experience for them, and it is something they would like to offer to the students, too. In the process, there were only limited time resources for planning, and they had to prioritise the planning work over some other demands of the work in the busy life of the university. The main facilitator of the process needed individual competence to make compromises between different views of participants, so that the result was acceptable for all. The researchers of the ECF4CLIM project needed to have competence to present the ideas from the ECF4CLIM project so that the ideas were beneficial to the planning process. In the future, the students will gain individual competence in multidisciplinary sustainability transition: knowledge from different disciplines, skills to cooperate with people with different backgrounds, and the ability to make a change with them toward sustainability.
Collective Competences	This novel study module enhances the university's collective competence. The study module is part of the curriculum of JYU, and every student in the University of Jyväskylä includes this multidisciplinary study module in their studies. During the planning process, new resources for this course promoting sustainability will be negotiated. The university was not used to this kind of study modules that combine many faculties, so there were no ready structures for, for example, allocating resources for planning and teaching, or defining administrative owners of the module, so new structures were created in negotiations with the rectorate and deans of faculties. The atmosphere in the planning group was accepting and pro-co-operation, and the participants in the planning group inspired each other.
Technical-material Competences	Students will also gain competence - both knowledge and skills - in understanding technical-material issues in sustainability transition.

6. CONCLUSIONS

This deliverable, D5.3, represents the culmination of Task 5.1 and 5.2 of the ECF4CLIM project, detailing, among the implemented interventions, those selected as more significant aimed at fostering sustainability competences. The core strength of these initiatives lies in the hybrid participatory process developed within the ECF4CLIM project framework, involving the Sustainability Competence Teams (SCTs) and Committees (SCCs). This collaborative approach ensured that the co-designed interventions were not only relevant but also deeply rooted in the needs and context of the educational community for each demonstration site and at the same time allining with the steps of the ECF4CLIM Roadmap (D3.3).

Out of the 61 interventions in the ECF4CLIM project, 22 have been selected as showcases to illustrate the potential of the project to foster transformational change. The selection of these interventions was based on criteria reflecting their potential for significant impact on the educational community, their replicability (considering human, time, and financial resources), their alignment with the steps of the ECF4CLIM Roadmap (Engagement, Connections, Change, Action), and their contribution to the development of the competencies outlined in the project's analytical framework: individual, collective, and technical-material.

The selected interventions encompassed a wide range of formats and thematic areas—including energy, water, waste, food, and green spaces—as well as cross-cutting educational initiatives such as new curricula, educational visits, awareness campaigns, and interdisciplinary learning environments. This diversity reflects the complexity of sustainability challenges and the need for locally adapted solutions. Interventions ranged from low-cost awareness actions to technically complex infrastructural changes, all demonstrating that effective learning for sustainability can be pursued through multiple, context-sensitive pathways.

The selected interventions show a balance in developing individual, collective, and technical-material competences. Rather than prioritising one type of competence over others, the interventions work on different competence areas evolving from their initial design to address broader dimensions than originally planned. The dynamic process was strengthened through the progressive co-implementation and continuous use of the ECF4CLIM Roadmap, leading to deeper involvement from educational communities.

All the co-implementation an co-evaluation process were guided by the hybrid participatory process. Regular reporting procedures further enriched this process by enabling continuous feedback and documentation of the challenges and progress encountered at each site. The co-evaluation process, supported by the two last set of SCT/SCC meetings, should allowed to face a realistic assessment of the impact of the interventions.

7. ANNEX: TEMPLATE FOR REPORTING ON SELECTED INTERVENTIONS

ECF4CLIM, European Competence Framework for a Low Carbon Economy and Sustainability through Education

Intervention ID:	
Title:	
School level:	
Intervention description:	
Competences nature in the intervention:	
Individual Competences:	
Collective Competences:	
Technical-material Competences:	
ECF4CLIM Roadmap link:	
Engagement:	
Connections:	
Change:	
Action:	
Resources	
Human	***
Time	***
Cost:	$$$
Relevant difficulties:	
Photos:	
Additional info (dissemination material, leflect, tools…) :	