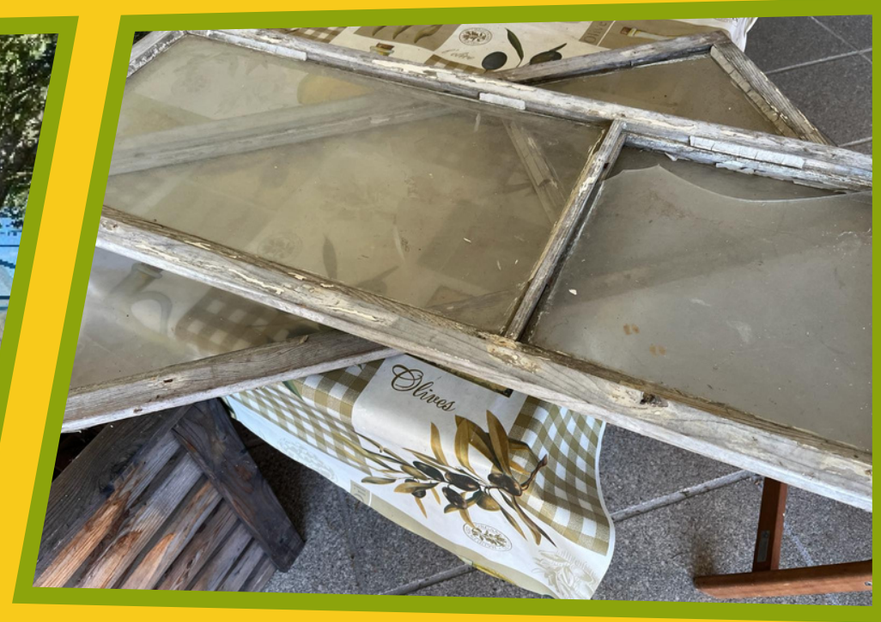
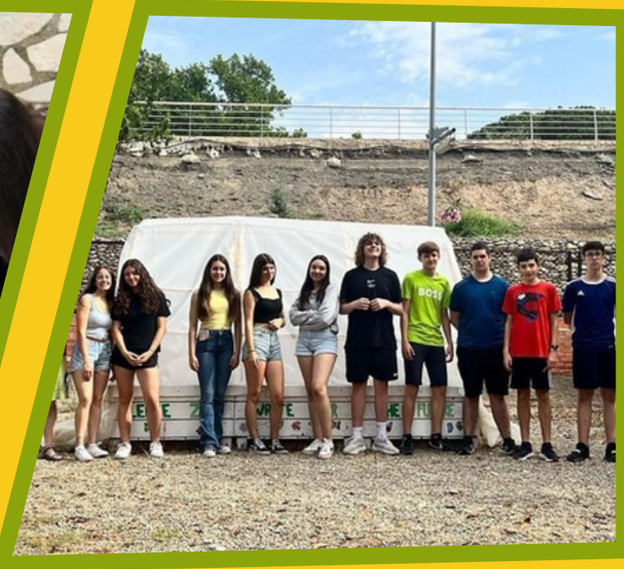
LEAVE ZERO WASTE FOR THE FUTURE

KA2-2021-1-ES01-KA220-SCH-000032782





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IMPRINT

This document is part of the project "Leave Zero Waste for the Future" KA2-2021-1-ES01-KA220-SCH-000032782.

More information at https://leavezerowasteforthefuture.weebly.com/

Publisher / Cooperation partner:

Akademie für Politische Bildung und demokratiefördernde Maßnahmen, Hauptplatz 23, 4020 Linz – Austria

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Organisation responsible for this booklet: Academy for Civic Education and Measures to Promote Democracy

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Content

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1 Foreword

Dear teachers,

We are pleased to present our new compendium with innovative methods on how to build a Greenhouse with materials that would mostly end up in the rubbish bin. The presentation of various greenhouses as part of the "Leave Zero Waste for the Future" project is aimed specifically at people who work with children and young people. This project is the result of a long and intensive collaboration between our team and experts from different fields who have contributed their knowledge and experience to develop different methods to help you develop recycling greenhouses.

The compendium of innovative methods includes a wide range of techniques and tools that are applicable in different work areas and focus on the specific challenges and needs related to waste prevention and the promotion of a sustainable future. We have endeavoured to design the methods so that they are easy to understand and apply, regardless of your background or experience.

Our goal is to help you improve your work related to reducing waste and promoting a sustainable future by providing you with practical and effective methods. We believe that each of us can play a role in creating a more sustainable future for our children and young people and we hope that this compendium of innovative methods will help you to play your part.

We all know how important it is to teach our students the importance of sustainability and environmental protection. Today we would like to introduce you to our new compendium for developing innovative greenhouses, designed specifically for people working with children and young people and focussing on the theme "Leave Zero Waste for the Future".

We are confident that this compendium of innovative greenhouses will help you to improve your work in reducing waste and promoting a sustainable future and achieve your goals more effectively. We hope that you will enjoy trying out the different methods and that you will share your feedback with us.

We believe that each of us can play a role in creating a more sustainable future for our children and young people, and we hope that this toolkit of innovative methods will help you to play your part.

Thank you for your interest in our project and we wish you every success in using the methods!

Yours sincerely

Your Leave Zero Waste for the Future project consortium

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2 Introduction

In this compendium, we present a range of methods that focus on building greenhouses from used materials in the spirit of "Leave Zero Waste for the Future". Our aim is to equip educators with creative and impactful tools to prepare young people for a more sustainable and environmentally conscious future.

The world is facing urgent environmental challenges and it is vital to instil a sense of responsibility and respect for our planet in the next generation. These methods are designed to encourage waste minimisation, promote recycling practices and encourage artistic expression while developing an understanding of nature and its conservation.

We firmly believe that as educators, you have the power to create positive change. These versatile and hands-on activities can be used in a variety of educational contexts and provide an enriching experience for you and your students.

2. 1 Conceptual approaches

When selecting methods for building greenhouses with used, old materials, various conceptual approaches were considered to maximise sustainability while encouraging creative solutions.

Here are some conceptual approaches:

UPCYCLING AND REPURPOSING:

Concept

Instead of simply recycling materials, they can be upcycled and used in a new context.

Application

Using old window frames, for example, as building elements for greenhouse walls or greenhouse roofs.

Wooden pallets for shelves or as storage units.

CRADLE-TO-CRADLE DESIGN:

Concept

Materials have been selected so that they can be reintegrated into the production process at the end of their life cycle without generating waste.

Application

Materials were used that are recyclable and can be easily taken apart and reused after use.

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COMMUNITY ENGAGEMENT:

Concept

Involving the community (school community) in the building process not only promoted cohesion but also enabled the use of local resources.

Application

Community collection drives for materials were organised and the entire community actively participated in the construction of the greenhouse.

PERMACULTURE DESIGN:

Concept

Permaculture design principles emphasise sustainable, self-sustaining systems.

Application

Incorporate elements such as rainwater collection, natural ventilation and use of shade to create an ecologically balanced greenhouse.

BIOMIMICRY

Concept

Design inspired by principles from nature to create efficient and sustainable solutions.

Application

Studying natural structures such as leaves or honeycombs to gain inspiration for greenhouse design and make it more efficient.

CIRCULAR ECONOMY:

Concept

Looking at the entire life cycle of materials and products to maximise resource efficiency.

Application

Considering the construction, as well as the later disposal or reuse of the greenhouse.

EDUCATION AND AWARENESS-RAISING:

Concept

The greenhouse is used as a learning tool to promote environmental awareness and sustainable thinking.

Application

Incorporate educational elements into the design that teach students about recycling, upcycling and protecting the environment.

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These conceptual approaches can be combined to create comprehensive and sustainable greenhouse projects with used materials.

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3 Compendium – How to build alternative recycling greenhouses?

3.1 Greenhouses developed by Spanish partner

Greenhouse with a cane structure and a self-supporting vertical garden

Aim of exercise

To make students aware of the importance of reusing, recycling and reducing materials and using big wooden fruit boxes and local and traditional materials.

To build a greenhouse and a vertical garden.

To set an example to other local schools.

Preparation

We followed a traditional local method of building structures using reeds. Therefore, we went with the 3rd ESO students to the banks of the Cinca River during the waning moon of February to cut the canes that grow on the riverbank.

These canes have to be left to dry a little bit but they cannot dry out completely otherwise they lose their flexibility and they should be stored vertically. We let them dry for 3 weeks and then we used them to build the structure of our greenhouse during the LTTA in Spain (20th to 24th March 2023).

Other materials we needed to build our greenhouse and vertical gardens were obtained after appealing to local families and businesses to donate us materials to be reused. In this way we obtained big wooden fruit boxes, pallets and discarded irrigation pipes.

Method / Process description

First we placed the big wooden fruit boxes in 2 rows of 3 elements each separated by a 1m aisle. Then we stapled anti-weed fabric to the sides and bottom of each big wooden fruit box. At the corners of each big wooden fruit box, we placed some washers and inside them long pieces of open irrigation pipe to guide and protect the canes that were going to support the structure. And we filled two palms of the bottom of the big wooden fruit boxes with gravel to facilitate the drainage of the irrigation water and we finished filling in with fertile soil.

The structure was formed by arches of canes. Each arch was made up of 3 canes: one on each side and one to make the shape of the arch, and they were joined together by hemp rope.

We built 6 arches in this way and inserted them into the tubes and washers.

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Finally, we reinforced the cane structure with horizontal cross beams and interior pillars also made of cane and joined with hemp rope and open pieces of reused irrigation pipe.

Once the structure was finished, we covered it with greenhouse plastic. We stapled the plastic to the outer walls of the big wooden fruit boxes and screwed a wooden slat on it to reinforce the joint.

At one end we cut a door in the plastic with a rectangular shape, weight at the bottom and self-adhesive Velcro on the sides to open and close the door.

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We built a **SELF-SUPPORTING VERTICAL GARDEN** using 4 pallets that we screwed together to form a square. The planters were made using the legs of the pallet and screwing a wooden slat at the bottom to create cavities.

We stapled anti-weed fabric to the sides and bottom of the pallet cavities and filled the bottom with a little bit of gravel to facilitate the drainage of the irrigation water. And we finished filling in with fertile soil.

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SHORT FACT

Target group	All students of Ramon J Sender high school and our partners' students
Setting	Group work
Duration	All the 2nd term (about 20 hour-sessions)
Resources	Materials: - Reused irrigation pipes - reused big wooden fruit boxes - reused pallets - Canes - Stapler and staples - Greenhouse plastic - Fertile soil - Gravel - Some washers - Screws and screwdrivers - Hemp rope - Anti-weed fabric - Scissors - self-adhesive Velcro

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3.2 Greenhouses developed by Lithuanian partner

Greenhouse Construction Journey

Aim of Exercise

To provide teenage learners with a practical, hands-on experience in constructing a sustainable greenhouse using repurposed materials. The aim is to instill a sense of environmental responsibility and connect students to the food they cultivate.

Preparation

Gather repurposed pallets, scrap metal, plastic film, plastic bottles, cans, and other recycled materials.

Secure access to a nearby construction site for soil and additional materials.

Organize tools such as scissors, zip ties, adhesive, wooden poles, and bricks.

Ensure a suitable outdoor setting for greenhouse construction.

Method / Process Description

Base Assembly and Vertical Gardens:

Assemble a tall base using repurposed pallets, creating side shelves for vertical gardens.

Utilize scrap metal to form semi-circular structures, serving as supports for recycled plastic film repurposed from packaging.

Vertical Gardens with Creative Repurposing:

Creatively repurpose plastic bottles and cans for vertical gardens.

Fill used bags with soil obtained from a nearby construction site.

Challenges and Reinforcement:

Address the challenge of the wet soil's weight by reinforcing the tall structure with extra pallets and scrap wood.

Maintenance and Care:

Assign student responsibilities for watering crops and managing the greenhouse cover.

Open the cover during the day for sunlight and close it at night to protect against frost.

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First Week's Outcome:

Observe and document the outcomes of the greenhouse construction within the first week, noting the growth of vibrant green shoots.

Expansion and Additional Greenhouses:

Decide to construct two additional greenhouses, opting for larger structures positioned lower than the first one.

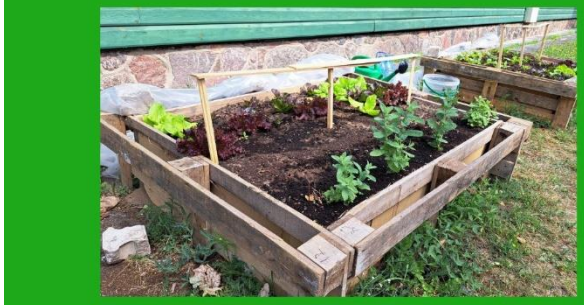
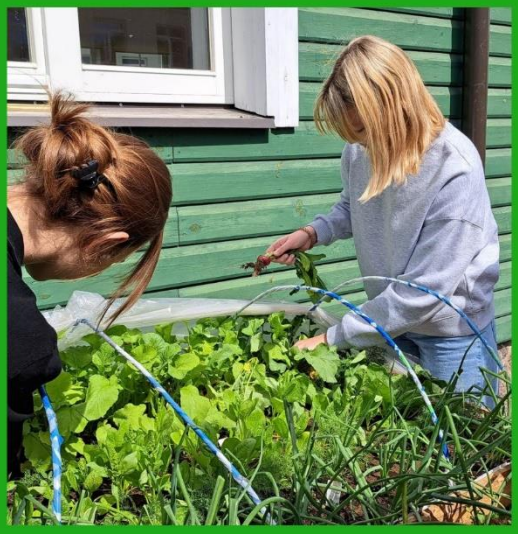
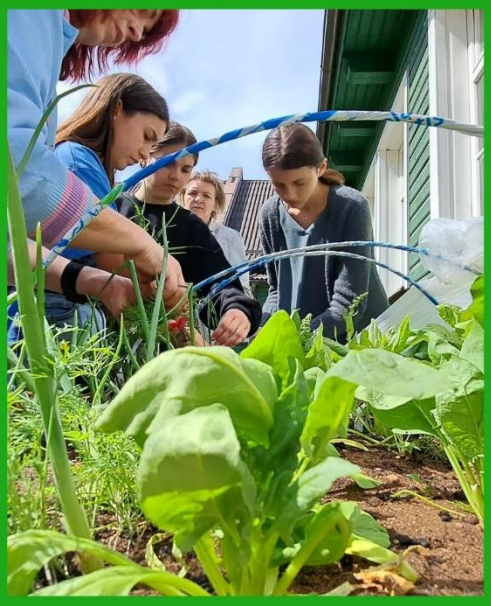
Utilize wooden poles to support the plastic cover and bricks sourced from the construction site to anchor the cover to the ground.

Cultivation Expansion:

Expand cultivation efforts by planting more flowers, greens, and cultivating mint in the additional greenhouses.

Download Material

Photos of activity: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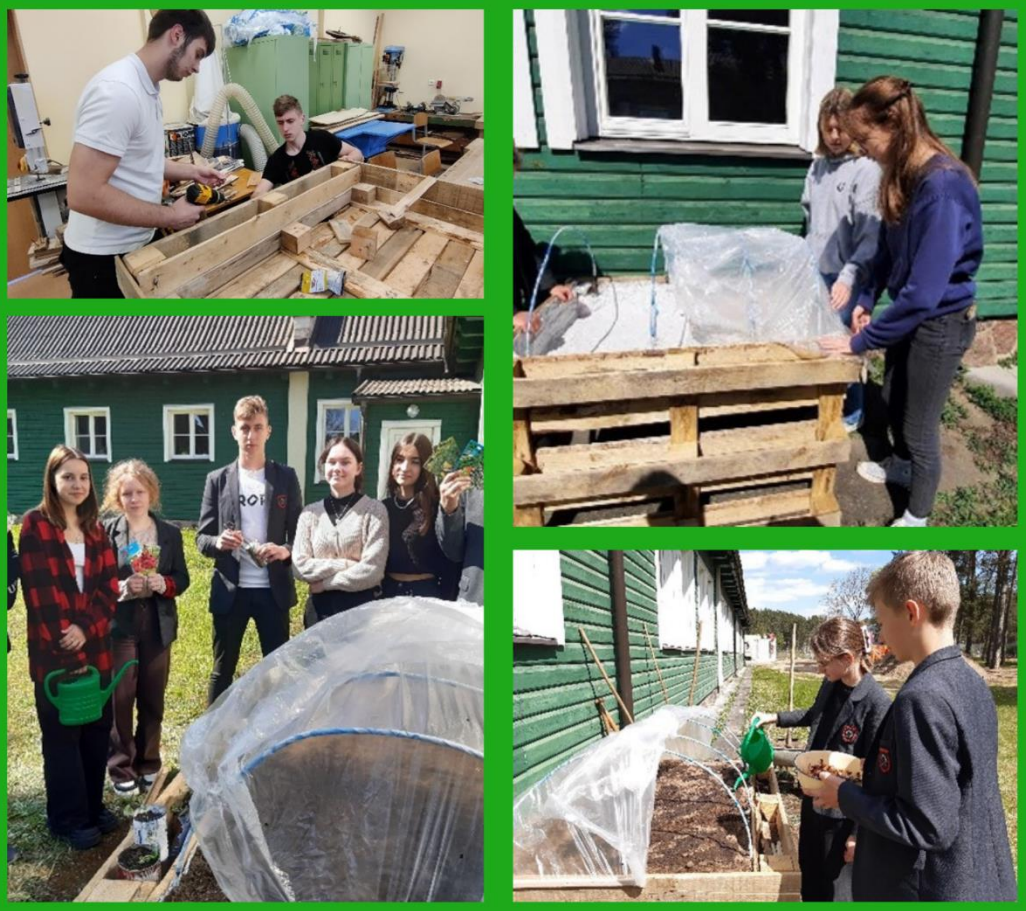

SHORT FACT

Target group	All students of school and our partners' students
Setting	Group work, outdoor construction site
Duration	Ongoing project, with initial construction lasting several weeks
Resources	Materials: Repurposed pallets, scrap metal, plastic film, plastic bottles, cans, soil from construction site, scissors, zip ties, adhesive, wooden poles, bricks;

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3.3 Greenhouses developed by Italian partner

Building up the recycled Green House with wooden boxes for fruit

Aim of exercise

- Enable students to gain the ability to build something using recycled materials.
- Learn how to seed and know about the life cycle of the essences used.
- Promote interactive learning through workshop activities.
- Develop and enhance practical and applied skills.

Preparation

- Collect the necessary material in order to build up the recycled Green House with recycled material.
- Prepare the area where the students will work within the class.
- Divide the class into work groups.

Method / Process description

Use the straw oil to impregnate the wood of the boxes for the purpose of protecting them from the weather. Combine red mineral earth with the oil and carefully mix it to give the crates a nice shade of color..

Impregnate the fruit boxes and fir squares with the straw oil you prepared and to wait for it to soak in (you can continue working only the next day).

Line the inside of the boxes with plastic bags salvaged from those used for transporting fruit (especially banana bags); secure the bag with a pincushion gun and then tie the crates together using ropes.

Build the lids: determine the size of the lids by taking it directly on the three lined up boxes. Recycled boxes are not always all the same size. Then cut wooden squares to build the frame on which to attach the cut-tolength polycarbonate sheets.

Fasten the frame in the four corners with the pincushion gun. Screw the polycarbonate sheet using screws and washers onto the frame. The washers are important because they prevent the screw head from puncturing the polycarbonate.

Prepare pots for planting: cut plastic bottles in half height; use bottom half to fill with potting soil. Sow seeds.

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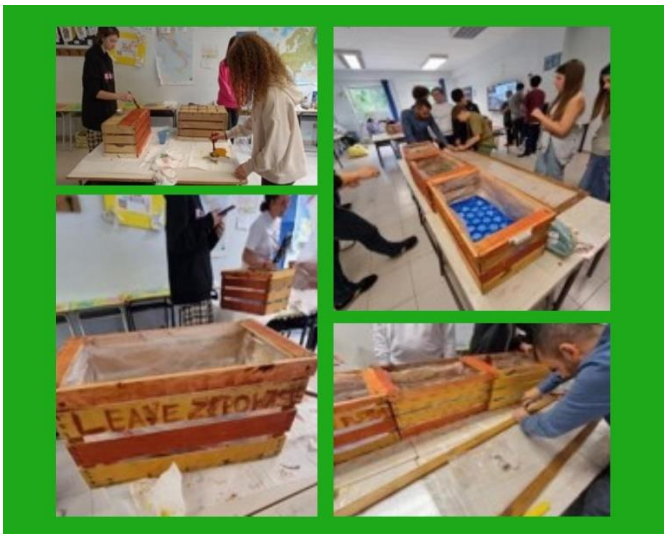
Photos of the activities and the equipment



References

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SHORT FACT

Target group	Mobility Students
Setting	Group Work
Time	2 days (3 hours per day)
Resources	6 recycled fruit crates, 2 liters of straw oil, brushes, some red mineral earth, 4 200 cm fir squares (they will be used for the greenhouse lid), sheets of polycarbonate that we salvaged from an old greenhouse (will be needed for the greenhouse lid), screws, screwdriver, vegetable seeds, potting soil, 50 or so plastic bottles.

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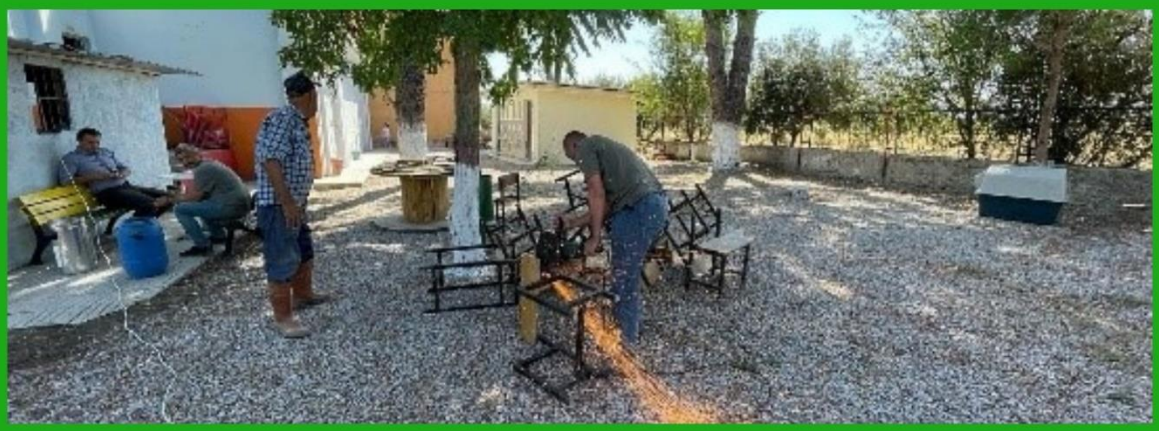
3.4 Greenhouses developed by Turkish partner

Greenhouse with a cane structure and a self-supporting vertical garden

Aim of exercise

- To make students aware of the importance of reusing, recycling and reducing materials and using old school desks and plastic bottles.
- To build a greenhouse and a vertical garden.
- To set an example to other local schools.



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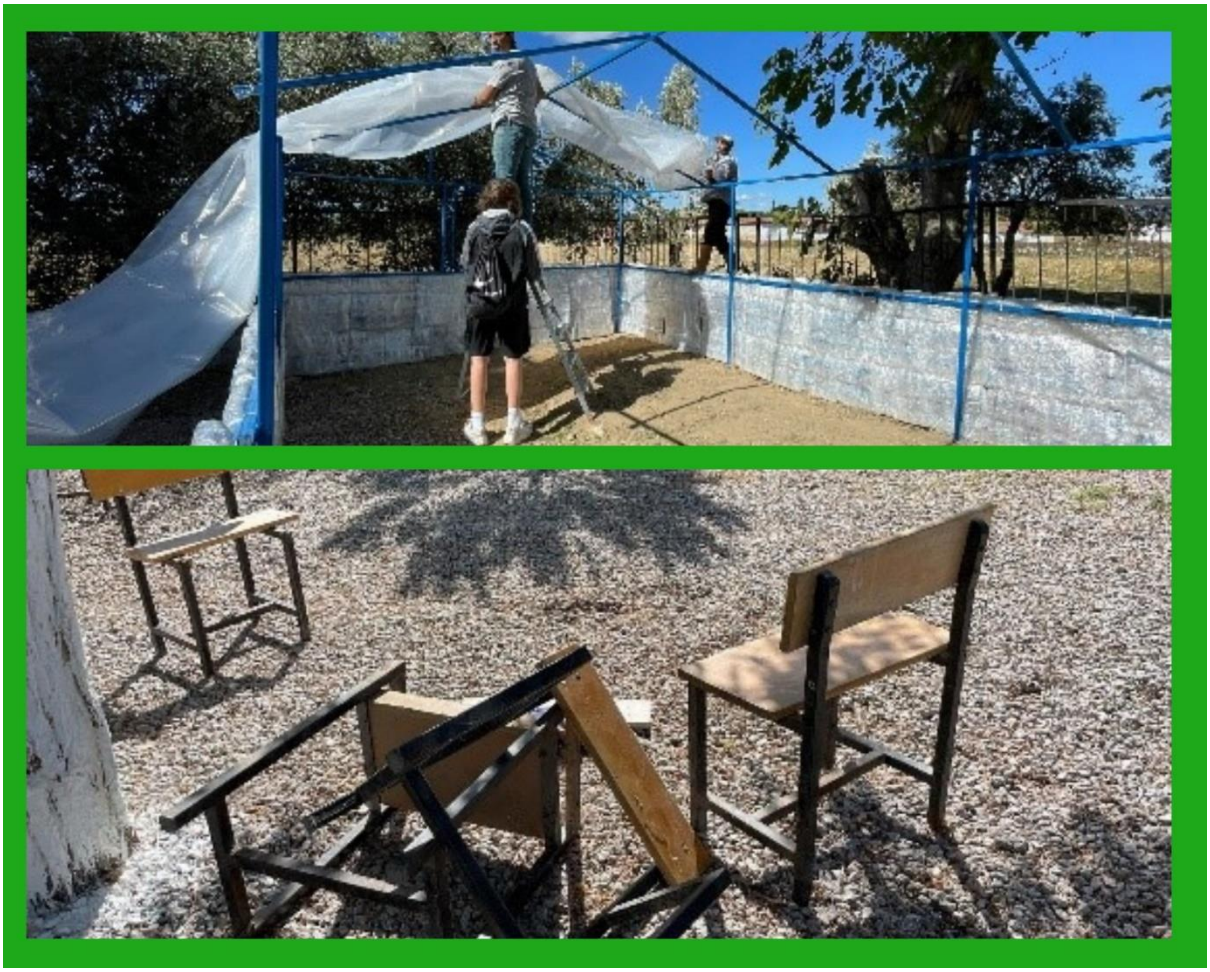
Preparation

For the construction of the greenhouse, the iron parts of the old school desks were cut and made ready to form the main frame of the greenhouse. Plastic bottles were collected by the students and washed and disinfected by the students to make them hygienic. In order to cover and tape the plastic bottles with stretch film, 30 pieces of stretch film and 24 large size tapes were brought to the school. Blue paint was purchased to paint the iron accents of the greenhouse. 36 square meters of thick greenhouse nylon was purchased for the outer covering of the greenhouse. Ground preparation works were carried out in the area where the greenhouse will be built.



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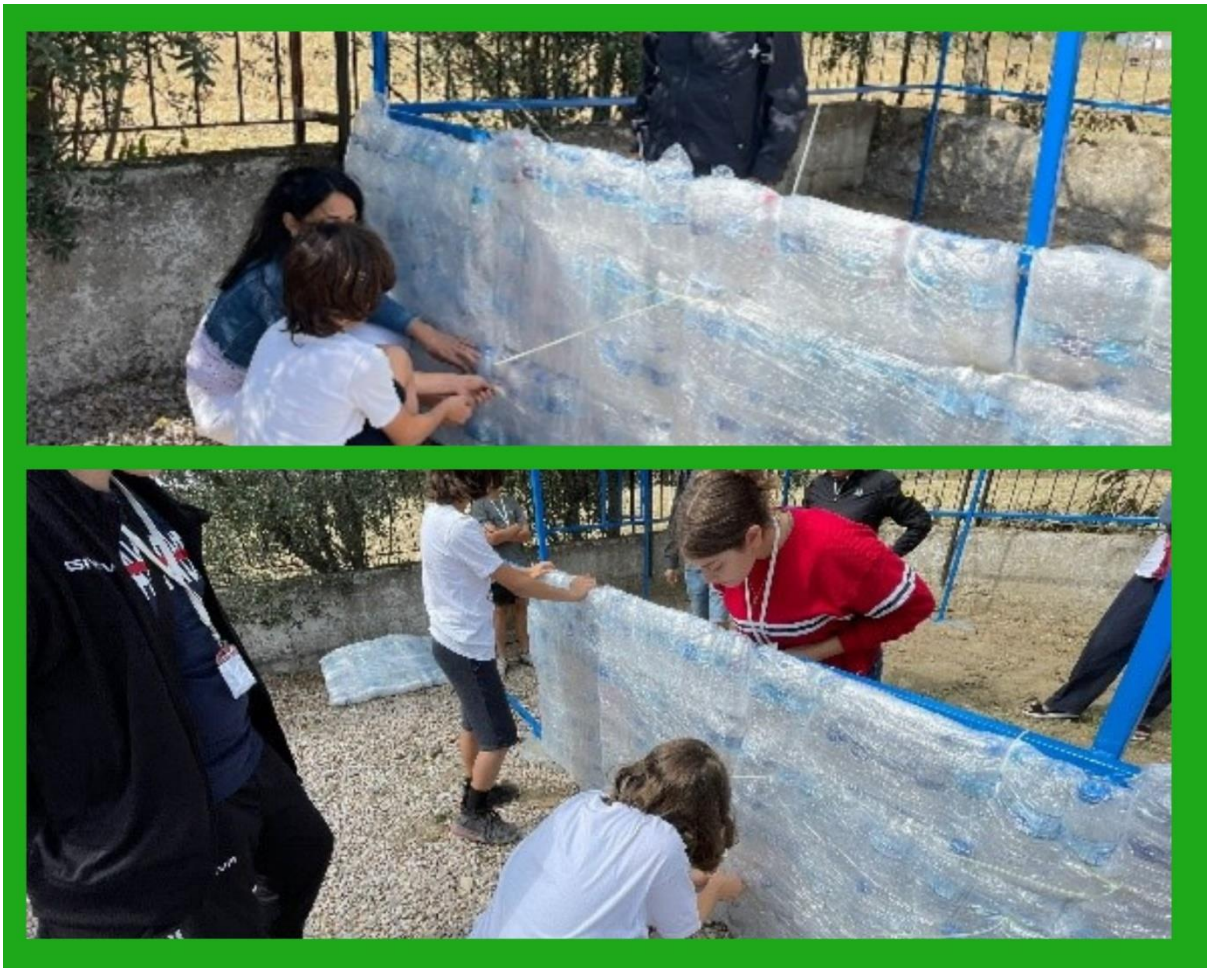
Method / Process description

In the first stage, the ground arrangement was made in the area where the greenhouse would be built, and the irons of the old school desks, which would form the iron accents of the greenhouse, were combined with the help of a welding machine. After the iron accents of the greenhouse were created, the iron accents were painted with blue paint. In the second stage; The plastic bottles, which were previously disinfected by the students, were first taped horizontally in groups of 6 and combined with the help of stretch film. The pet bottles were combined in 6 pieces and then, again with the help of tape and stretch film, they were combined first in 12, then 24 and finally 48 pieces, thus turning them into bricks. After preparing 48 plastic bottles as bricks and creating a total of 36 brick pieces, they were attached to the iron frame of the greenhouse with the help of plastic clamps, accompanied by the students. The lower parts of the iron part of the greenhouse were completely covered with bricks made of plastic bottles.



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In the final stage, together with the students, 36 square meters of greenhouse nylon was covered to cover the iron accents of the greenhouse. The nylon covering the iron part of the greenhouse was then nailed with wooden slats and fixed to the iron part. Finally, nylon tarpaulin areas were created for the door and window of the greenhouse.

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SHORT FACT

Target group	All partners' students
Setting	Group work
Duration	All the 2nd term (about 20 hour-sessions)
ResourceS	Materials: - Old School Desks - Plastic Bottels - Tape Stiks - Strech Film - Plastic Greenhouse Nylon - Scissors

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3.5 Greenhouses developed by Austrian partner

Upcycling greenhouse from wooden crate and windows

Aim of the exercise

To create a greenhouse by upcycling an old wooden crate and window sashes to encourage young people to explore sustainable practices and understand the importance of resource reuse.

Preparation

- Obtain an old wooden crate (120 cm/60 cm/60 cm), two old window sashes and a piece of hard plastic.
- Ensure that clear plastic tarpaulins are available.
- Prepare tools such as hammer, nails, saw and screwdriver.
- Select a suitable outdoor area to build the greenhouse.

Method / process description

Prepare the wooden crate:

Thoroughly clean the old wooden crate and ensure it is free from harmful substances.

If necessary, create holes in the wooden crate for ventilation.

Integration of the window sashes:

Use the two old window sashes as a lid for the wooden crate to close and open the greenhouse.

Attach the window sashes to the wooden box.

Insert hard plastic:

Insert a piece of hard plastic as an additional side wall to reinforce the structure and let in more light.

Fasten the hard plastic securely in the wooden crate.

Attach tarpaulins:

Stretch clear plastic tarps over the window sashes and hard plastic to close the greenhouse.

Secure the tarpaulins firmly to the frame of the wooden box.

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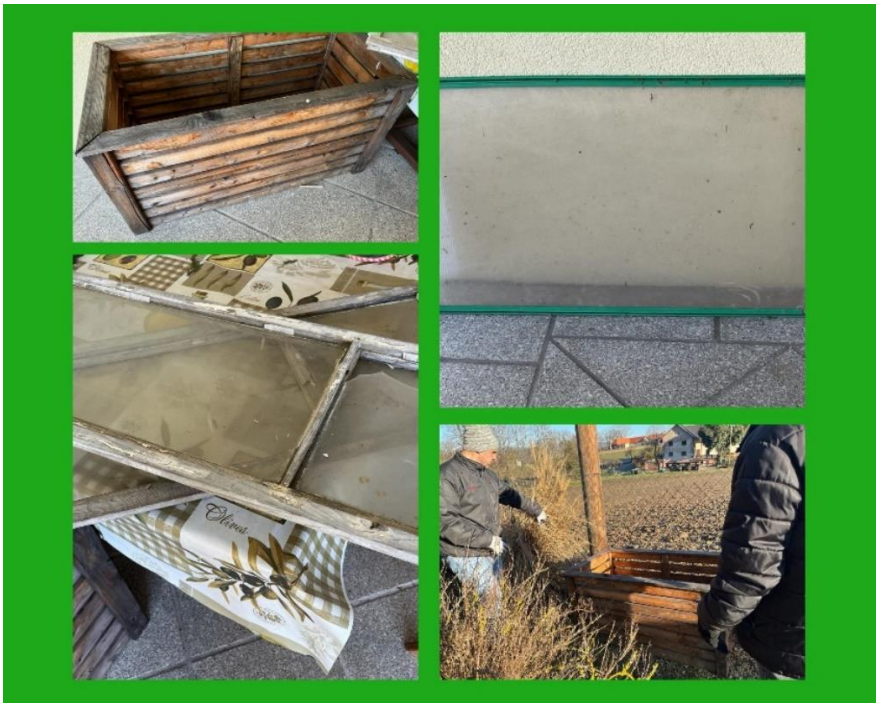
Photos of the activity



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SHORT INFO

Target group	Teenager learners, families, …
Setting	Outdoor area for greenhouse construction
Time	One-off construction time of about one day
Resources	Old wooden crate (120 cm/60 cm/60 cm), two old window sashes, a piece of hard plastic, tarpaulin made of clear plastic, tools (hammer, nails, saw, screwdriver).

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4 Information on the project partners involved

IES Ramón J. Sender - Spain

Ies Ramón J. Sender is a Spanish State high school in Fraga, Huesca. We offer Compulsory Secondary Education, Baccalaureate, basic vocational education and training in Electricity and vocational education and training in Mechanical and Electrical maintenance. 422 students attend our school, comprising 17 different nationalities. In our high school, there are 68 teachers and a wide range of subjects are available: technical, science related, social sciences and literature and arts. In Compulsory Secondary Education, we offer our students the possibility of following a Plurilingual Program, in which students study two subjects in English, two in Catalan and the rest in Spanish, with an optional second foreign language (French).

Why is this project important for IES Ramón J. Sender?

This project is important for us because it is the first time we have participated in an Erasmus project and a great opportunity for us to exchange good practice on Zero Waste and to cooperate with students and teachers from other countries and cultures. Thanks to it, we have also enhanced our students' creativity and design skills and we have developed environmental awareness about recycling and zero waste in our educational community, in other local schools and local people.

How will IES Ramón use the project results?

Ies Ramón J Sender will send a copy of this Learning Kit to other schools and institutions to set an example of good practice so they can also carry out these activities or workshops in their schools. In the following three years after the end of our project, we will leave a copy in the teachers' staff room and we will post it on our school webpage so as new teachers know what activities and workshops we have been doing in our high school up to now and to get them involved in our project. In this way, teachers may repeat some of them for the new students who will attend our high school or organize new activities or workshops related to zero waste for students, families, teachers, other local schools or local people and, cooperate and share them with our partners from Turkey, Italy, Lithuania and Austria too. And we are going to use the greenhouse as an educational tool for our students during the following courses. Our greenhouse and vertical garden will be open to students, families and local people.

Motto in relation to the project

"Recycle for a cleaner today, zero waste for a greener tomorrow."

Contact

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Vilniaus r. Nemencines Konstanto Parcevskio gimnazija – Lithuania

The school has a rich history dating back to 1865. Dedicated to providing primary and secondary education to students in the small town of Nemenčinė and nearby villages, the institution creates a multicultural environment for national minorities, offering instruction in Polish and Russian. Lithuanian serves as the state language, while English and French are taught as the first and second foreign languages, respectively. Nestled in a serene urban area, the school spans three buildings and caters to 594 students across primary and secondary levels, led by a devoted team of 70 teachers. The primary mission is to ensure the success of every student.

Why is this project important for Vilniaus r. Nemencines Konstanto Parcevskio gimnazija?

By participating in this project, our school community strived for a cleaner environment, aiming to make our students and families more environmentally friendly, developing crucial skills for sustainability in our daily lives, and expanding 'green' ideas far beyond our school. Being novices to the idea of Zero Waste, our school learned from our foreign project partners numerous good practices, as well as shared within the project partnership some educational methods developed by our school. Some things came by way of trial and error, but it did not stop us on the way to becoming 'greener.'

How will Vilniaus r. Nemencines Konstanto Parcevskio gimnazija use the project results?

Our school will carry on using the methods developed by our project partnership and seize all possible opportunities to spread the word about the Zero Waste Lifestyle, encouraging other schools to follow our path in becoming greener by adopting our sustainability practices. For this purpose, we will use the Learning Kit, Zero Waste leaflets, and a wealth of other printed as well as online resources created by our partnership. We will maintain the greenhouse and other planting areas in the following years to educate students of different age groups in sustainable gardening. We will take pride in inviting guests visiting our school to see the greenhouse area, which will be further expanded.

Motto in relation to the project

Towards a Greener Future: Zero Waste Starts from YOU.

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I.C. PADRE ISAIA COLUMBRO - Italy

Our "Padre Isaia Columbro" institute encompasses three schools in the Benevento province of Campania: Foglianise, Castelpoto, and Tocco Caudio. Leveraging the rich resources of these municipalities, we focus on extracurricular planning to promote awareness, knowledge, and appreciation of historical, artistic, and cultural heritage. Actively participating in European and regional projects enhances our educational offerings and financial resources, providing students with cultural growth opportunities. Our dedicated teachers, some on the eTwinning platform, undergo continuous professional development for improved teaching methods. With approximately 520 students across Nursery, Primary, and Secondary levels, we prioritize regular attendance, diverse activities, and active community participation. Despite challenges, including students facing social and economic obstacles, our school remains proud of our students' achievements in competitions, reflecting their resilience and commitment to excellence.

Why is this project important for I.C. PADRE ISAIA COLUMBRO?

Our Institute is the lead partner for the province of Benevento of Rete Scuole Green, a network of around 1,000 Italian schools whose main objective is to educate the younger generations to respect nature in order to preserve our Planet. Participation in the Erasmus+ Project "Leave zero waste to the future" is a great opportunity to :

- Enhance sharing of waste management best practices for a zero waste approach across European countries.
- Advocate for waste reduction through re-use, recycling, repair, and efficient waste management systems, aiming for the zero waste target.
- Contribute to developing sustainable waste management systems and identifying key elements for resource conservation in partner countries.

How will I.C. PADRE ISAIA COLUMBRO use the project results?

The I.C "Padre Isaia Columbro" will share its Erasmus experience and the material produced, which can also be found on our institutional website, with other local and national schools in order to give an example of good practice to future generations. Furthermore, the realisation of the greenhouse, experienced by our students with great enthusiasm, allowed us to work in a practical, experiential and lasting learning environment.

Motto in relation to the project

“Recycle the present, Sustain the future”.

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Ayaskent İrfan Kırdar Ortaokulu – Turkey

Ayaskent İrfan Kırdar Secondary School, located 17 km from Bergama's center in Izmir, has become a hub for students beyond the village due to a reverse migration trend. With 128 students and 12 teachers, the school is renowned for its academic, social, cultural, and sports achievements. Noteworthy for concurrently managing three Erasmus+ Projects, the school shines with its environmental initiatives focused on Zero Waste and Recycling. The Zero Waste Library and Recycling Greenhouse mark it as a leader in diverse environmental practices nationwide. The school's entrepreneurship club aims to cultivate students' entrepreneurial skills, engaging in organic, vertical, and soilless agriculture practices. The "Ayasköy" brand promotes products, including olive oil produced from the school's garden, showcasing various items from fruit drying to jam making. Beyond its rural origins, the school has excelled in Robotic Coding, clinching the Turkish Championship and adopting the motto "From Ayaskent to the World."

Why is this project important for Ayaskent İrfan Kırdar Ortaokulu?

With this project, there was an increase in our students' knowledge and skills on Zero Waste and Recycling.Zero Waste and Recycling areas were created in the interior and exterior areas of our school and the waste generated in our school was stored and recycled.Our students' families also raised awareness about Zero Waste and Recycling.As a school, we have set an example for our environment and there has been an increase in recycling practices in our city.As a result of our work on Zero Waste, there has been a significant decrease in the amount of waste in our school.Our students have raised awareness about reducing the Carbon Footprint.Our students, who developed their skills in artistic designs through recycling, started to produce products in this field. We also created a Zero Waste Library in our school and built a Greenhouse made of Recycled materials.

How will Ayaskent İrfan Kırdar Ortaokulu use the project results?

Zero Waste and Recycling awareness is a lasting initiative. If our school community embraces this awareness, it will instill a lifelong commitment in students, teachers, and parents. Graduating students and their families adopting this culture means thousands will be environmentally conscious over time. Our school's project is becoming a model for neighboring schools, fostering similar practices supported by local governments. By sharing project experiences, it has the potential to evolve into a larger citywide environmental initiative. Today's environmental efforts will reap long-term benefits.

Implementing vertical, soilless, and organic farming in our recycling greenhouse has established sustainable agricultural practices with students. The Zero Waste Library is a enduring project, pioneering recycling initiatives in libraries and inspiring other schools.

Motto in relation to the project

“One less waste, the world is more beautiful”

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Akademie für Politische Bildung und demokratiefördernde Maßnahmen - Austria

Akademie für Politische Bildung und demokratiefördernde Maßnahmen is an Austrian organization that specializes in political education and promoting democracy. They have expertise in the field of zero waste, permaculture, and nature education for students and youth groups. The training director, Petra Hauser, is a certified specialist in permaculture and is involved in designing educational materials and providing professional coaching for children. The organization has been chosen for its work in zero waste and the qualifications of Ms. Hauser for specific projects

Why is this project important for Akademie für Politische Bildung und demokratiefördernde Maßnahmen?

This project is important for Akademie für Politische Bildung und demokratiefördernde Maßnahmen due to their expertise in zero waste, permaculture, and nature education for students and youth groups. Their involvement in the project allows them to contribute their knowledge and skills to promote waste management practices, environmental awareness, and sustainability within communities. Additionally, their participation aligns with their focus on political education and promoting democracy, as environmental issues are often intertwined with social and political aspects.

How will Akademie für Politische Bildung und demokratiefördernde Maßnahmen use the project results?

Akademie für Politische Bildung und demokratiefördernde Maßnahmen will coordinate the activities and plans for the sustainability of the project. They will conduct a 3-year sustainability study after the end of the project activities. Additionally, all partner institutions will support their stakeholders in new projects and collaborations related to the project subject and carry out studies in this field.

Motto in relation to the project

"Empowering Communities for Sustainable Change." This motto reflects the project's focus on waste management, environmental awareness, and the development of sustainable practices within communities.

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